

**CLASS 219, ELECTRIC HEATING**

**SECTION I - CLASS DEFINITION**

This class includes all those devices commonly known as electric heaters, electric-heating metal working apparatus, electrically-heated tools and instruments. Processes are classified with the apparatus unless otherwise indicated by the subclass title.

This is the generic class for electric heating devices, per se. Devices and systems equipped with electric heating means in which the electric heating means is combined with or includes specific other art structure whereby the heated material is withdrawn, stored or otherwise utilized will be classified in the appropriate other art class to which it pertains and cross referenced back to Class 219.

**SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS**

An example of other classes as mentioned above in the Class Definition is Class 122, Liquid Heaters and Vaporizers in which such terms as steam dome, super heaters, steam separators, condensers, traps, etc., are considered to be art structure over and beyond the mere heating of a liquid and comprising specific means for further storing or utilizing the liquid or vapor resulting from a heating step and sufficient to exclude the claimed subject matter from this class.

The liquid heaters to be found in this class, subclasses 281+ are very similar to those classified in Class 122 and in Class 126, subclasses 344+. The general line to be followed in distinguishing between this and those classes is as follows: Where the claims recite specific electrical means for heating a liquid only and the end result recited is a heated liquid only and no further means is claimed for withdrawing the liquid for further use the device will be considered a liquid heater for this class. For an understanding of the lines between Classes 122 and 126 consult the class definitions and the notes thereunder.

**SECTION III - REFERENCES TO OTHER CLASSES**

**SEE OR SEARCH CLASS:**

5, Beds, subclass 284 for bed structures with devices for heating or cooling of, and subclass

- 421 for devices for supporting bed clothing with heating means.
- 12, Boot and Shoe Making, subclass 1 for miscellaneous shoe machinery with heaters, subclasses 32.1, 33.2 and 41.5 for sole machines with electric heaters, subclasses 53.1, 53.3 and 69.7 for heel machines with electric heaters, subclass 78.5 for sole and/or heel burnishing machines with heating means, and subclasses 114.2, 114.6, 116.2, 117.4, and 129.4 for tools or forms used in shoe manufacturing with heating means.
- 15, Brushing, Scrubbing, and General Cleaning, subclass 1.5 for electrostatic cleaning, subclasses 300.1+ for cleaning by air blast or suction wherein the fluid may be heated and subclasses 104.001+ for implements which may be heated.
- 19, Textiles: Fiber Preparation, subclass .27 for drying apparatus.
- 26, Textiles: Cloth Finishing, subclasses 3+ for singeing devices which may utilize electric heating means.
- 30, Cutlery, subclass 32 for wire razor devices, subclasses 34.05+ for razors combined with heated blade, and subclass 42 for the combination where the blade is movable.
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 519+ for processes which may utilize electric heaters particularly subclass 283 for drying the hair on the head and the subclasses under the title "Apparatus" for particular drying apparatus which may utilize electric heating means.
- 36, Boots, Shoes, and Leggings, subclass 2.6 for boots and shoes with heating means.
- 38, Textiles: Ironing or Smoothing, subclasses 74+ for flat irons which may include electrical heating devices by name only.
- 44, Fuel and Related Compositions, for pertinent subclass(es) as determined by schedule review.
- 48, Gas: Heating and Illuminating, subclass 65 for cupola gas generators wherein electric current is used for heating purposes, and subclass 103 for retorts in which is located an electric heater for gasifying the oil.
- 60, Power Plants, subclass 523 for a motor operated by the expansion and contraction of a unit mass where the expansion is caused by an electrical heating means.
- 62, Refrigeration, particularly subclasses 148, 159+, 167, 238, 275+, 324+, and 351 for heating means associated with refrigeration apparatus.

- 65, Glass Manufacturing, appropriate subclasses for glass working apparatus utilizing electrical heating means particularly subclass 40 for means employing dielectric or joule effects and subclasses 152+ for fusion bonding devices.
- 70, Locks, appropriate subclasses for heater lock combinations according to the particular lock structure.
- 72, Metal Deforming, appropriate subclasses for heating metal by a means other than electricity and deforming it.
- 73, Measuring and Testing, appropriate subclasses for measuring or testing devices with electrical heating means for testing purposes or for maintaining constant temperature.
- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, for patents claiming a metal composition, e.g., an alloy or a composition having a continuous phase of free metal made by consolidating metal particles.
- 81, Tools, appropriate subclasses for particular tool structure which may be combined with heating means.
- 83, Cutting, subclasses 170+ for cutting apparatus combined with means to modify or control the temperature of the apparatus or work.
- 96, Gas Separation: Apparatus, appropriate subclasses, for gas separation apparatus having heating or cooling means.
- 99, Foods and Beverages: Apparatus, takes food support means, peculiar to a food, shape, or condition, (e.g., can, jar, bottle, or slice holders, spits, griddles, waffle irons, sandwich grills, article confining or conforming supports), including a mechanism for manipulating food during cooking, other than mere agitation or stirring (e.g., conveying or bodily moving), or including a mechanism for treating food (e.g., basting, compressing, molding, drip, or gravy segregating), and, in any case, irrespective of whether or not a heat, steam, or vapor generator or enclosure is claimed; subclasses 324+ for cooking apparatus.
- 100, Presses, subclasses 92+ for a press having an additional heating, cooling, or drying means to treat material or subclass 102 for a press that may be combined with an electrical heating means.
- 101, Printing, see subclasses 3.1+, especially subclasses 8, 9+, 21, 25, 27, and 31 for embossing or penetrating devices utilizing heated dies.
- 104, Railways, subclass 15 for electric welders for track joints and subclass 279 for track clearing devices comprising rail heaters.
- 105, Railway Rolling Stock, especially subclass 451 for heating devices which may be electrical.
- 110, Furnaces, subclass 194 for cremation apparatus that may utilize electric heating means; and subclass 250 for a refuse incinerator provided with an electric heater.
- 118, Coating Apparatus, appropriate subclasses, especially subclass 47 for coating burning apparatus, and subclasses 50.1, 58+, 620+, 663+, and 723+ for coating devices with means for applying electrical or radiant energy to work and or coating material, particularly subclasses 641+ for radiant heating devices.
- 119, Animal Husbandry, subclasses 308+ for a brooder warmed by an electrical component, or subclasses 318+ for an incubator warmed by an electrical component.
- 122, Liquid Heaters and Vaporizers, appropriate subclasses for steam generating devices which may utilize electric heating means.
- 123, Internal-Combustion Engines, particularly subclasses 543+ for means for heating the carburetor, subclass 142.5 for the combination of an internal combustion engine combined with external heating means for heating the engine or some adjunct thereof and subclass 145 for incandescent igniters.
- 126, Stoves and Furnaces, appropriate subclasses for structural features peculiar to stoves and furnaces, see particularly subclass 273.5 for domestic ovens with heat accumulators and subclass 400 for heat accumulators, per se.
- 128, Surgery, appropriate subclasses for various instruments combined with heating means or designed for the utilization of heat energy for therapeutic treatment of the human body.
- 131, Tobacco, subclass 185 for tobacco users' appliances with igniter means.
- 132, Toilet, subclass 7 for methods of hair treating comprising permanent waving with heat and subclass 118 for hair combs with heaters and subclass 148 for combs combined with other features; see also subclasses 31+ for hair crimpers or curlers which may include heaters.
- 134, Cleaning and Liquid Contact With Solids, subclasses 105+ for apparatus with heating, cooling or heat exchange means.
- 136, Batteries: Thermoelectric and Photoelectric, for batteries in that class having heating means.
- 137, Fluid Handling, subclass 341 for electric heating means for the system.

- 138, Pipes and Tubular Conduits, subclass 33 for electric thawing or freeze protection means therefor.
- 140, Wireworking, subclass 112 for processes for joining of wires by electric welding.
- 141, Fluent Material Handling, With Receiver or Receiver Coacting Means, subclass 82 for the treatment of material by heating or cooling.
- 148, Metal Treatment, particularly subclasses 520, 525, and 565 for processes of significant heat treatment of metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal wherein electrical heating is utilized. See Lines With Other Classes, "Metal Casing, Metal Fusion Bonding, Machining, or Working Classes" to determine what constitutes significant heat treatment.
- 164, Metal Founding, appropriate subclasses for metal casting apparatus which may employ an electric heater.
- 165, Heat Exchange, appropriate subclasses for systems comprising both heating and cooling means or heat transfer, particularly subclasses 200+ for automatic control; subclass 42 for vehicle heating and cooling and subclasses 47+ for structural installations such as radiant building panels.
- 166, Wells, subclass 60 for well structure with an electric heater in the well.
- 174, Electricity: Conductors and Insulators, appropriate subclasses for insulator devices and structural details of electrical conductors, per se.
- 175, Boring or Penetrating the Earth, subclass 16 for an electrical heating process or device for forming a hole in the earth by directly applying heat to fluidize or comminute the material forming the earth. (See Lines With Other Classes and Within This Class, in the class definition of Class 175 for the line between Class 175 and Class 219).
- 178, Telegraphy, subclass 94 for pyrographic code recorders.
- 184, Lubrication, subclass 104 for heating and cooling devices for lubricators.
- 191, Electricity: Transmission to Vehicles, subclass 62 for trolley heads with heated ice clearers or preventers.
- 196, Mineral Oils: Apparatus, subclass 121 for vaporizing devices with electric heating means.
- 200, Electricity: Circuit Makers and Breakers, for generic circuit maker and breaker structure, or subclasses 308+ for an electrical switch having indicator means.
- 201, Distillation: Processes, Thermolytic, subclass 19 for a thermolytic distillation in which electrical energy is applied.
- 204, Chemistry: Electrical and Wave Energy, particularly subclasses 210, 236, 239, 241, 262, and 274 for electrolytic apparatus utilizing heating or cooling means.
- 210, Liquid Purification or Separation, subclasses 175+ for devices with heating or heat exchange means.
- 216, Etching a Substrate: Processes, with the use of a plasma, note subclasses 67+. The use of a cold plasma, which is a chemical reaction involving reactive ions and an article or substrate is not proper for Class 219, Electric Heating. However, cold plasma is proper for Class 216, Etching a Substrate: Processes. The use of a high temperature thermal plasma which removes or alters material by thermal means is proper for Class 219, Electric Heating.
- 221, Article Dispensing, subclass 143 for dispensing devices with electrical ignition means and subclass 150 for such devices with article treatment involving heating or cooling.
- 222, Dispensing, subclass 146 for dispensers with heating or cooling.
- 223, Apparel Apparatus, subclass 26 for heated hat forms, subclasses 51, 70, 73, and 76 for apparatus including heating and steaming means and subclass 79 for heated glove forms.
- 236, Automatic Temperature and Humidity Regulation, appropriate subclass for heating systems beyond the scope of Class 219 and involving automatic temperature control devices.
- 237, Heating Systems, appropriate subclasses for complete heating systems in which the heat source may be electrical.
- 239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 128+ for heating or cooling means for the fluid or system.
- 244, Aeronautics and Astronautics, subclass 134 for ice prevention devices utilizing electric heating means.
- 250, Radiant Energy, subclasses 316+ for infrared or thermal pattern recorders or document copiers, subclass 337 for a radiant energy electric signalling device responsive to luminous energy emitted from a heated luminophor irradiated by invisible radiation subclass 352 but

- conduction to or from some part of an infrared responsive electric signalling means, subclass 429 for temperature control of contained supported transferred fluent material, subclass 443.1 for a support for an object to be irradiated with charged particles with heat transfer to or from the object, and subclass 495.1 for plural invisible radiation sources including an infrared source, subclass 504 for an infraradiation source with a radiation modifying member and subclass 238 for photocells with temperature control.
- 261, Gas and Liquid Contact Apparatus, subclasses 139 and 142 for such apparatus with an electrical external heat supply.
- 266, Metallurgical Apparatus, appropriate subclasses for such apparatus with electrical heating devices.
- 285, Pipe Joints or Couplings, subclass 41 for such devices with heating or cooling means.
- 290, Prime-Mover Dynamo Plants, for prime mover dynamo plants for producing heat.
- 307, Electrical Transmission or Interconnection Systems, subclasses 112+ for a residual switching system.
- 310, Electrical Generator or Motor Structure, subclasses 341+ for piezoelectric crystals with temperature control means in which electrical circuit connections and the crystal are claimed.
- 312, Supports: Cabinet Structure, subclass 236 for such structures with heating, cooling or heat exchange means.
- 313, Electric Lamp and Discharge Devices, appropriate subclasses for electric lamp, filament or cathode heaters, particularly subclasses 11+ including indented subclass 14 for pyroelectric devices and subclasses 15+ for such devices with electric heater temperature modifier means.
- 314, Electric Lamp and Discharge Devices: Consumable Electrodes, particularly subclasses 26+ for such devices with temperature modifying means.
- 315, Electric Lamp and Discharge Devices: Systems, particularly subclasses 46+ 49, 50, 94+, and 112+ for systems with heated filaments, cathodes or device temperature modifiers.
- 323, Electricity: Power Supply or Regulation Systems, for a generic class of electrical systems wherein a single electrical source is coupled to a single electrical load circuit and means are provided which control the magnitude or level of the current or voltage of either or both of said circuits, especially subclass 236 for other than an electrical zero switching output level condition responsive (e.g., heat, etc.) circuit.
- 331, Oscillators, subclass 70 for oscillator with temperature modifier.
- 336, Inductor Devices, subclasses 55+ for inductors with temperature modifiers.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for specific switch structure with thermal actuating means.
- 338, Electrical Resistors, appropriate subclasses for electrical resistors, per se. The mere claiming of a resistor having a heat insulating or heat conducting casing or housing does not exclude Class 338. However, as between Classes 219 and 338 the combination of a resistor used for heating purposes surrounded or incased by the structure to be heated or a resistor with structure or configuration for distributing, directing or concentrating the heat produced by the resistance is classified in this class (219), especially subclasses 200+. See also Lines With Other Classes and Within This Class, "Electrical Resistance Heaters," in the class definition of Class 338 for a more detailed treatment of the line between the two classes.
- 340, Communications: Electrical, subclasses 12.22 through 12.55 for miscellaneous remote control systems; subclasses 309.16-309.9 for a timer controlled system; subclasses 384.1-404.3 for an audible signaling device, especially subclass 387.1 for weatherproofing (e.g., means to melt sleet off of a signal device, etc.); subclasses 577-579 for a flame condition responsive system; subclasses 584-599 for a thermal condition responsive system; subclass 600 for radiant energy condition responsive system; subclasses 635-656 for electrical apparatus condition responsive system, especially subclass 640 for a heater element condition responsive system and subclass 655 for a condition responsive system indicating heating circuit energization; and subclasses 815.4-815.92 for visual indication systems.
- 343, Communications: Radio Wave Antennas, subclass 704 for antennas with ice clearer or preventers which may utilize electric heaters.
- 346, Recorders, subclass 76.1 for thermal recording of phenomenon.
- 347, Incremental Printing of Symbolic Information, subclasses 171.1+ for thermal marking processes or apparatus.

- 355, Photocopying, subclasses 3+ for electrophotography devices utilizing heating means.
- 361, Electricity: Electrical Systems and Devices, subclasses 1+ for safety and protection of systems and devices; indented subclasses 24, 25+, 32, 34, 37, and 103+ provide thermal sensing devices in various circuits or systems; subclasses 99 and 211 for combinations including thermal relays and control circuits for thermal relays; subclass 158 for thermal indicating instrument; subclasses 161+ for control circuits including a thermal device and subclasses 247+ for igniting systems.
- 362, Illumination, subclasses 92+ for the combination of illuminating means and a heating device.
- 373, Industrial Electric Heating Furnaces, for furnaces which are especially adapted to metallurgical and related work. Such furnaces are generally characterized by electrical heating means within the chamber containing the material to be heated, the heating means being either an arc, a resistance, the material itself or a combination of such means and are further characterized by adaptation for operation on a granular material, such as crushed ore or for handling molten material fusing at a very high temperature, the material in both cases being received immediately within the body of the furnace.
- 374, Thermal Measuring and Testing, including electric heating arrangements to perfect a measurement or test or to maintain a constant temperature.
- 401, Coating Implements With Material Supply, subclasses 1+ for a hand-manipulated coating implement with means to heat the material supply contained therein.
- 405, Hydraulic and Earth Engineering, subclasses 56 and 131 for devices for heating the earth which may use electrical heating means; and subclass 234 for a heating means employed in the installation of piling.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 21 and 22+ for processes of sterilizing with electric energy subclasses 186.19 and 186.2 for radiant energy chemical reactors with heating or cooling means; and subclasses 242 and 295+ for autoclaves.
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, appropriate subclasses for a molding machine for shaping or reshaping nonmetals combined with means to heat or cool, see subclass 407 and the search notes thereunder.
- 427, Coating Processes, subclasses 457+ for coating processes utilizing direct application of electrical magnetic, wave, or particulate energy.
- 429, Chemistry: Electrical Current Producing Apparatus, Product, and Process, subclass 62 for battery having a temperature control and subclass 120 for battery having heat exchange feature.
- 431, Combustion, subclasses 258+ for a burner having an electrical heater or igniter.
- 432, Heating, appropriate subclass for a residual heating apparatus that may include a broadly recited electrical heater as a source of heat.
- 452, Butchering, subclass 73 for hot wire singers for fowl.
- 454, Ventilation, especially subclasses 83, 93, 121+, and 198 for condensation prevention devices which may use hot or heated air blown on a window or windshield.
- 606, Surgery, subclass 2.5 for subject matter relating to removal of a calculus (e.g., stone) from the body wherein the calculus is fractured or disintegrated by use of light energy.
- 901, Robots, subcollection 10 for a robot arm in which a sensor physically contacts and follows the work contour to control the arm movement and subcollection 42 for an art collection of welding robots.
- D23, Environmental Heating and Cooling; Fluid Handling and Sanitary Equipment, subclasses 314+ for heating equipment.

## SUBCLASSES

**50 METAL HEATING (E.G., RESISTANCE HEATING):**

This subclass is indented under the class definition. Subject matter relating to the electrical heating of metal.

- (1) Note. The heating in this and indented subclasses is often, but not necessarily, accompanied by working of the metal.
- (2) Note. The metal heated is a workpiece and is separable and distinct from the heater, which is a tool. However, heat may be developed within the metal by the passage of electric current.

- (3) Note. The heating may be for welding, brazing, soldering, heat treating or other purpose.
- (4) Note. The art in miscellaneous subclass 50 relates, for example, to mere heating of metal by the passing of an electric current through it.
- (5) Note. Subclasses 7.5, 8.5, 9.5, and 50 to 162 were formed in 1956 by making official some unofficial digests which had been established during the previous two decades by the Examiners of Divisions 37 and 60. A caveat is given: While it is believed that the titles and definitions are reasonably correct, no assurance can be given that all of the patents, issued prior to the date of reclassification, are in the proper subclass, since the individual patents were not read during the reclassification project. Consequently, in making a thorough search in these subclasses, it is advisable to investigate every subclass which may possibly be pertinent and not, in order to shorten the search, to rely upon the principle of superiority of subclass subject matter because of position in the schedule, since the principle is applicable only in classes where each patent has been analyzed and placed in the schedule in accordance with that portion of the disclosed subject matter which is claimed.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 600+, for this subject matter where the heating is inductive heating.
- 678+, for microwave heating.
- 764+, for capacitive dielectric heating.
- SEE OR SEARCH CLASS:
- 148, Metal Treatment, particularly subclasses 520, 525, and 565 for processes of significant heat treatment of metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal wherein electrical heating is utilized. See Lines With Other Classes, "Metal Casing, Metal Fusion Bonding, Machining, or Working Classes"
- 373, Industrial Electric Heating Furnaces, appropriate subclasses where the metal is heated in an electric furnace.
- 428, Stock Material or Miscellaneous Articles, subclass 934 for metallic stock produced by an electrical process, and subclass 939 for stock having a molten or fused coating.
- 483, Tool Changing, generally for a process or apparatus including a tool transfer means combined with either a tool support or storage means. A process or apparatus for electric heating wherein the sole significantly recited feature is changing a tool (e.g., a non-consumable electrode) is properly classified in Class 483, and may be cross referenced into this class (Class 219, Electric Heating).
- 51 Chain:**  
This subclass is indented under subclass 50. Subject matter relating to the manufacture of chain link.
- SEE OR SEARCH CLASS:  
59, Chain, Staple, and Horseshoe Making, subclasses 1+, and the search notes thereto, for miscellaneous chain making, not involving significant electric heating.
- 52 Methods:**  
This subclass is indented under subclass 51. Methods.
- 53 Rail bond:**  
This subclass is indented under subclass 50. Subject matter relating to the making of rail bonds.
- (1) Note. The bond may be for the purpose of furnishing a low resistance electrical shunt around the mechanical joint between rail sections of a railroad track or it may be for the purpose of mechanically uniting rail sections.
- 54 Arc weld:**  
This subclass is indented under subclass 53. Subject matter in which the rail bond is made by means of an arc weld.

- 55 Resistance weld methods:**  
This subclass is indented under subclass 53. Subject matter relating to resistance welding methods.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
53, for resistance welding apparatus for making rail bonds.
- 56 Wire, rod, or bar bonding:**  
This subclass is indented under subclass 50. Subject matter relating to the bonding of wire or bar.
- (1) Note. The wire, for example, may be part of a fabric mesh, or the bar may form a grating or a metal window.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
156, for mere electric heating of rods or bars.
- SEE OR SEARCH CLASS:  
140, Wireworking, subclass 112 for this subject matter not having significant welding.
- 56.1 Of wire leads:**  
This subclass is indented under subclass 56. Subject matter wherein the wire is connected to or from a circuit element.
- 56.21 By microbonding:**  
This subclass is indented under subclass 56.1. Subject matter wherein the bonding is produced between miniature or microminiature workpieces.
- 56.22 Methods:**  
This subclass is indented under subclass 56.1. Subject matter including processes of bonding wire leads.
- 57 Butt bonding (e.g., welding):**  
This subclass is indented under subclass 56. Subject matter relating to butt bonding.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
101, for miscellaneous butt bonding.
- 58 Methods:**  
This subclass is indented under subclass 56. Methods.
- 59.1 Of cylinders (e.g., pipes and tubes):**  
This subclass is indented under subclass 50. Subject matter relating to the bonding of a seam of a cylinder.
- (1) Note. The seam may be helical, as in indented subclass 62.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
101+, for resistance butt bonding of cylindrical shaped tubing.  
607+, for this subject matter where the heating is inductive.
- SEE OR SEARCH CLASS:  
413, Sheet Metal Container Making, subclasses 58+ for the longitudinal seaming of containers, such as cans, where no significant electric heating is involved.
- 60 Electric arc:**  
This subclass is indented under subclass 59.1. Subject matter in which the bonding is accomplished by an electric arc.
- 60.2 Tube sheet welding:**  
This subclass is indented under subclass 60. Subject matter wherein heat exchange tubes are arc butt welded to a perforated plate.
- 61 Methods:**  
This subclass is indented under subclass 60. Methods.
- 61.1 Having internal support means:**  
This subclass is indented under subclass 59.1. Subject matter including support means for the cylinder, positioned inside the cylinder during the welding process.
- 61.11 With forming means:**  
This subclass is indented under subclass 61.1. Subject matter including means for shaping the workpiece.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
78.16, for tube sealing apparatus.  
91.23, for tube sealing methods.
- 61.12 With cleaning means:**  
This subclass is indented under subclass 61.1. Subject matter including means to remove excess or undesirable material from the work.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
78.14, for work cleaning in bonding with pressure.
- 61.13 With edge guidance means:**  
This subclass is indented under subclass 61.1. Subject matter including means to direct the path of the edges to be welded through the welding process.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
61.3, for edge guidance subject matter without cylinder internal support means.
- 61.2 Utilizing high frequency resistance heating:**  
This subclass is indented under subclass 59.1. Subject matter wherein the welding apparatus is operated by high frequency current.
- 61.3 With edge guidance means:**  
This subclass is indented under subclass 59.1. Subject matter including means to direct the path of the workpiece edges through the welding process.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
61.13, for this subject matter along with cylinder internal support means.
- 61.4 With adjustable electrode means:**  
This subclass is indented under subclass 59.1. Subject matter including means to change the position of an electrode used in the welding process.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
86.33+, for spot bonding adjustable electrodes.  
86.8, for interchangeable electrodes.
- 88, for positioning an electrode along a bus bar.
- 61.5 With condition responsive control of the welding process:**  
This subclass is indented under subclass 59.1. Subject matter wherein the control means of the welding apparatus responds to a sensed condition.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
86.41+, for spot bonding with electrode condition responsive control means.  
91.1, for spot bonding with condition responsive control means.  
124.1+, for automatic positioning of an arc.
- 61.6 Using three or more electrodes:**  
This subclass is indented under subclass 59.1. Subject matter including the use of three or more electrodes in the welding process.
- 61.7 With cooling means:**  
This subclass is indented under subclass 59.1. Subject matter including means to maintain or lower the temperature of part or all of the welding apparatus or work.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
76.11, for deposition welding with cooling means.  
86.31, for spot bonding electrode support with cooling means.  
137.62, for consumable electrode gun with cooling means.
- 62 Helical seam:**  
This subclass is indented under subclass 59.1. Subject matter in which the longitudinal bond or seam is helical.
- 63 Rotary transformer part:**  
This subclass is indented under subclass 59.1. Subject matter having a transformer of which at least a portion rotates in relation with the feed of the workpiece.
- (1) Note. The entire transformer, including its secondary terminals and their electrodes may rotate in unison as the electrodes ride along the work, or only a

portion of the transformer, such as the secondary and electrodes, may rotate.

SEE OR SEARCH CLASS:

336, Inductor Devices, appropriate subclasses for the structure of rotary transformers, per se.

**64 Container (e.g., cans):**

This subclass is indented under subclass 59.1. Subject matter in which the tube is a container.

SEE OR SEARCH CLASS:

413, Sheet Metal Container Making, subclasses 58+ for the longitudinal seaming of containers, such as cans, where no significant electric heating is involved.

**65 Nonrotary electrode (e.g., oscillating):**

This subclass is indented under subclass 59.1. Subject matter having nonrotating electrodes.

- (1) Note. The electrodes, for example, may oscillate to and from each other with the longitudinally split tube between them.

**66 Inside electrode:**

This subclass is indented under subclass 59.1. Subject matter having at least one electrode inside the cylinder being bonded.

- (1) Note. The inside electrode, for example, may be opposed to an exterior electrode, with the current flow between them traversing the region of the cylinder adjacent the longitudinal seam.

SEE OR SEARCH THIS CLASS, SUBCLASS:

64, for this subject matter where the cylinder is a container.

**67 Resistance heating methods:**

This subclass is indented under subclass 59.1. Resistance heating methods.

**68 Cutting or disintegrating (e.g., machining engraving):**

This subclass is indented under subclass 50. Subject matter utilized for cutting or disintegrating.

- (1) Note. This subclass relates, for example, to the severing of a wire cable by passing a fusing current through a short section thereof, or to the etching of a monogram into the surface of the metal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 19, for similar subject matter not having metallic workpieces as, for example, perforating of paper by sparks and machining of nonmetal by electron beams.

SEE OR SEARCH CLASS:

- 175, Boring or Penetrating the Earth, subclass 16 for an electrical heating process or device for forming a hole in the earth by directly applying heat to fluidize or comminute the material forming the earth.
- 205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, subclasses 640+ for electrolytic erosion of a workpiece to change the shape or surface configuration thereof.
- 216, Etching a Substrate: Processes, subclasses 75 and 100 for the etching of metal.

**69.1 Electric arc:**

This subclass is indented under subclass 68. Subject matter utilizing a continuous or sustained electric space discharge between an electrode and a work piece.

- (1) Note. The disintegrating action of the arc may be assisted, e.g., by a flow of compressed air or oxygen.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 121+, for this subject matter not utilized for cutting or disintegrating.

SEE OR SEARCH CLASS:

- 148, Metal Treatment, subclass 9.5 for using heat to desurface or gorge metal.
- 204, Chemistry: Electrical and Wave Energy, subclass 224 for apparatus used for electrochemical machining.

266, Metallurgical Apparatus, subclass 48 for flame cutting apparatus.

**69.11 Electric spark machining:**

This subclass is indented under subclass 68. Subject matter utilizing a brief electric space discharge between an electrode and a work piece (i.e., A. C. voltage).

- (1) Note. This subclass and the subclasses indented hereunder were formerly unofficial digests. Hence, the placement of documents therein might not reflect schedule hierarchy.

SEE OR SEARCH CLASS:

204, Chemistry: Electrical and Wave Energy, appropriate subclasses for apparatus and methods of electrochemical machining.

**69.12 Wire cutting:**

This subclass is indented under subclass 69.11. Subject matter utilizing a wire electrode for cutting a workpiece.

SEE OR SEARCH THIS CLASS, SUBCLASS:

69.13, for electrical circuits specially adapted to subject matter under subclass 69.1.  
69.2, for vibrating a wire electrode during cutting.

SEE OR SEARCH CLASS:

204, Chemistry: Electrical and Wave Energy, subclass 206 for apparatus used in wire cutting use electrochemical machining.

**69.13 Circuits:**

This subclass is indented under subclass 69.11. Subject matter utilizing an electrical circuit specially adapted for cutting or gouging.

- (1) Note. The electrical circuit may, for example, be the power supply or a control circuit.

SEE OR SEARCH CLASS:

320, Electricity: Battery or Capacitor Charging or Discharging, subclasses 166+ for capacitor charging or discharging.

700, Data Processing: Generic Control Systems or Specific Applications, subclasses 159 through 195 for machining using a numeric controller.

**69.14 Dielectric composition and purification:**

This subclass is indented under subclass 69.11. Subject matter involving a dielectric medium between a workpiece and an electrode and any reuse or purification of the dielectric medium.

- (1) Note. The dielectric medium may be a gas or a liquid.  
(2) Note. The medium under this definition does not include electrolyte.

SEE OR SEARCH CLASS:

210, Liquid Purification or Separation, appropriate subclasses for liquid purification in general.

**69.15 Electrodes:**

This subclass is indented under subclass 69.11. Subject matter involving an electrode's shape, composition or holder used in an electric arc or electric spark cutting (EDM) operation.

SEE OR SEARCH CLASS:

204, Chemistry: Electrical and Wave Energy, subclasses 280+ for electrodes used in electrochemical machining.

**69.16 Gap spacing control:**

This subclass is indented under subclass 69.11. Subject matter including apparatus to control the gap distance between an electrode and a workpiece.

SEE OR SEARCH CLASS:

205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, subclasses 652+ for electrolytic erosion of a workpiece to change the shape or surface configuration thereof in which the gap between a tool and a workpiece is either maintained or defined.  
318, Electricity: Motive Power Systems, subclasses 560+ for positional servo systems.

**69.17 Methods:**

This subclass is indented under subclass 69.11. Subject matter including a method of machining specially adapted for treating particular objects or for obtaining special results.

## SEE OR SEARCH CLASS:

205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, subclasses 640+ for electrolytic erosion of a workpiece to change the shape or surface configuration thereof.

**69.18 Pulse:**

This subclass is indented under subclass 69.11. Subject matter including a circuit used to shape a particular electric pulse to be applied between an electrode and a workpiece.

**69.19 Safety circuits:**

This subclass is indented under subclass 69.11. Subject matter utilizing a safety circuit in the event of electric arcing or a short circuiting or in the event of danger (e.g., an earthquake or fire).

**69.2 Vibrating electrodes or workpiece:**

This subclass is indented under subclass 69.11. Subject matter wherein the electrode or workpiece is vibrating during machining.

- (1) Note. Any movement of the electrode or workpiece during machining will cause vibratory movement.

## SEE OR SEARCH CLASS:

205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, subclass 671 for electrolytic erosion of a workpiece to change the shape or surface configuration thereof which provides for agitation or vibration of the electrolyte.

**70 Hand-type tools:**

This subclass is indented under subclass 69. Subject matter relating to hand held tools.

SEE OR SEARCH THIS CLASS, SUBCLASS:

138+, especially subclass 139, for similar subject matter not utilized for disintegration or cutting.

**71 Liquid electrode:**

This subclass is indented under subclass 50. Subject matter in which the metal is heated by means of current flow between it and a surrounding liquid.

- (1) Note. The liquid may be quiet, as in a tank, or flowing, as in a jet.

SEE OR SEARCH THIS CLASS, SUBCLASS:

72+, for analogous subject matter where the liquid is not used as an electrode.

## SEE OR SEARCH CLASS:

204, Chemistry: Electrical and Wave Energy, appropriate subclasses for analogous subject matter utilized for electrochemistry.

**72 Nonatmospheric environment at hot spot (e.g., resistance weld under oil, vacuum):**

This subclass is indented under subclass 50. Subject matter in which a nonatmospheric environment is created at the region of electric heating.

- (1) Note. The environment may, for example, be a bath of oil which prevents overheating and oxidation during resistance welding, or it may be a vacuum.

SEE OR SEARCH THIS CLASS, SUBCLASS:

68+, for similar subject matter utilized for cutting or disintegrating.

71, for similar subject matter in which a liquid environment acts as an electrode.

## SEE OR SEARCH CLASS:

228, Metal Fusion Bonding, subclasses 218+ for formation of a metallic bond in a nonatmospheric environment wherein heating is other than electrical.

**73 Slag (e.g., submerged arc):**

This subclass is indented under subclass 72. Subject matter in which the non-atmospheric environment is slag or a slag forming material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

124.1+, for this subject matter in combination with means to automatically position an electric arc.

145.22, 145.23 and 146.1+, for mere arc electrodes having fluxing or slagging means.

SEE OR SEARCH CLASS:

314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclasses 21+ for arc lamps having an auxiliary material supply to the arc.  
501, Compositions: Ceramic, subclass 28 for glass batch forming compositions containing slag.

**73.1 Including electroslag welding:**

This subclass is indented under subclass 73. Subject matter including welding processes wherein coalescence is produced by molten slag which melts the filler metal and the surfaces of the work being welded.

**73.11 For coating:**

This subclass is indented under subclass 73.1. Subject matter wherein at least one layer of weld material is applied to cover a portion of the surface area of a workpiece.

SEE OR SEARCH THIS CLASS, SUBCLASS:

73.21, for submerged arc coating.  
76.1+, for deposition welding.

**73.2 With granular flux supply:**

This subclass is indented under subclass 73. Subject matter including means for depositing particulate weld protection material.

**73.21 For deposition welding:**

This subclass is indented under subclass 73.2. Subject matter including welding processes wherein coalescence is produced by heating with an arc or arcs between a bare metal electrode or electrodes and the work, with the arc

being shielded by a blanket of granular, fusible material on the work.

SEE OR SEARCH THIS CLASS, SUBCLASS:

73.11, for electroslag coating.

76.1+, for other deposition welding subject matter.

**74 Gas supply (e.g., by ingredient of electrode, by external source):**

This subclass is indented under subclass 72. Subject matter in which the nonatmospheric environment is a gas whose composition is not that of air or in which the nonatmospheric environment is compressed or rarified air.

(1) Note. The environment may be formed by the gases liberated by the coating of a "shielded" electrode (e.g., coated electrode) when an arc is struck from the electrode, or by an external gas supply connected to a hand held torch.

SEE OR SEARCH THIS CLASS, SUBCLASS:

122, for this subject matter.

SEE OR SEARCH CLASS:

313, Electric Lamp and Discharge Devices, subclasses 231.01+ for analogous subject matter, not utilized to heat metal.

314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclass 22 for arc lamps having auxiliary fluent material feed to the arc.

315, Electric Lamp and Discharge Devices: Systems, subclasses 111.01+ for systems, not utilized to heat metal, analogous to the systems of this subclass.

**75 Nonconsumable electrode (e.g., atomic hydrogen):**

This subclass is indented under subclass 74. Subject matter in which the electric heating arc is of the nonconsumable electrode type.

(1) Note. This subclass relates, for example, to arc torches utilized in atomic hydrogen welding, in which the tungsten electrodes wear away only slowly.

- 76.1 For deposition welding (e.g., coating or building up):**  
This subclass is indented under subclass 50. Subject matter relating to the coating or building up of a base by means of deposited metal.
- SEE OR SEARCH CLASS:  
427, Coating Processes, appropriate subclasses for coating in general.
- 76.11 With cooling means:**  
This subclass is indented under subclass 76.1. Subject matter including means to maintain or lower the temperature of part or all of the welding apparatus or work.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
86.31, for spot bonding electrode support with cooling means.  
137.62, for consumable electrode arc welding with cooling means.
- 76.12 Of multiple distinct layers:**  
This subclass is indented under subclass 76.1. Subject matter wherein the deposited weld material is a composite of separate strata.
- (1) Note. The layers are usually, but not necessarily, dissimilar in composition.
- 76.13 By spark discharge:**  
This subclass is indented under subclass 76.1. Subject matter wherein a mixture of powders and combustible gases is detonated by an electrically produced spark, thereby simultaneously heating the powders and propelling them onto the workpiece surface at very high velocities.
- 76.14 By electric arc:**  
This subclass is indented under subclass 76.1. Subject matter wherein the welding process includes heating with an electrically produced arc.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
121.11+, for electric arc welding.
- 76.15 With nonconsumable electrode:**  
This subclass is indented under subclass 76.14. Subject matter including electrode arc producing means without consumption of the electrode.
- 76.16 Plasma:**  
This subclass is indented under subclass 76.14. Subject matter wherein coalescence is produced by heating with a constricted arc between an electrode and the work or the electrode and the constricting nozzle, and with shielding obtained from hot ionized gases.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
121.36+, for other arc plasma heating subject matter.
- 76.17 By resistance heating:**  
This subclass is indented under subclass 76.1. Subject matter including heating processes wherein coalescence is produced by the heat obtained from resistance of the work to electric current in a circuit of which the work is a part, and by the application of pressure.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
53, and 55, for rail bond resistance welding.  
59.1, 61.1+, 61.2, 61.3, 61.4, 61.5, 61.6, 61.7, and 67 for cylinder resistance heating methods.  
78+, for other resistance heating subject matter.
- 77 Cutting edges of tools:**  
This subclass is indented under subclass 76.1. Subject matter in which the part coated or built up is the cutting edge of a tool.
- 78.01 For bonding with pressure (e.g., resistance welding):**  
This subclass is indented under subclass 50. Subject matter relating to the bonding of metal by means of pressure while heated by the electric current.
- (1) Note. The bond is usually, but not necessarily, a metal-to-metal weld.

- (2) Note. The heat is generally created by resistance heating, but may, as in the case of indented subclasses 97+, be created by an electric arc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 53, and 55, for rail bond resistance welding.  
 59.1, 61.1+, 61.2, 61.3, 61.4, 61.5, 61.6, and 61.7 for cylinder resistance welding subject matter.  
 76.17, for deposition welding by resistance heating.  
 603+, for this subject matter where the electric current is induced in the metal by electromagnetic or electrostatic induction.

**78.02 By solid-state bonding (e.g., diffusion):**

This subclass is indented under subclass 78.01. Subject matter wherein the workpiece joint interface coalescence is produced essentially at temperatures below the melting point of the metals being joined, without the addition of a brazing filler metal.

**78.11 Honeycomb:**

This subclass is indented under subclass 78.01. Subject matter wherein the bonded work has the structure or appearance of a honeycomb.

SEE OR SEARCH CLASS:

- 228, Metal Fusion Bonding, subclass 181 for metal fusion bonding processes for honeycombs.

**78.12 Methods:**

This subclass is indented under subclass 78.11. Subject matter including processes of making honeycombs.

**78.13 With additional heating device:**

This subclass is indented under subclass 78.01. Subject matter including means for heating part or all of the work being welded other than the heating means used principally for accomplishing the welding process.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 91.22, for methods of additional heating to the same spot.

**78.14 With work cleaning means:**

This subclass is indented under subclass 78.01. Subject matter including means to remove excess or undesirable material from the work.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 61.12, for electric heating of metal cylinders with internal support having cleaning means.

**78.15 With work cutting means:**

This subclass is indented under subclass 78.01. Subject matter including means to sever work during or after the welding process.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 124.21, for work cutting with automatic positioning of an electric metal heating arc.

**78.16 With work deforming means (e.g, tube sealing):**

This subclass is indented under subclass 78.01. Subject matter including means for forging or shaping of the work.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 61.11, for forming means with the electric heating of cylinders having internal support means.  
 91.23, for methods of spot bonding with work deforming.

**79 With conveyer for workpiece:**

This subclass is indented under subclass 78.01. Subject matter having a conveyer for handling the workpiece.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 124.1, and 125.1+, for similar subject matter in arc welding.

SEE OR SEARCH CLASS:

- 198, Conveyors: Power-Driven, appropriate subclasses (e.g., subclasses 373+ for a conveyer provided with an orienting device) for power driven conveyors, per se, and consult the search notes for related art.

- 80 Spot bond:**  
This subclass is indented under subclass 79. Subject matter in which the bond is a spot bond.
- 81 Roller electrode:**  
This subclass is indented under subclass 78.01. Subject matter in which the electric current is applied to the metal by roller type electrodes.
- (1) Note. The roller electrode may produce a continuous weld or an interrupted weld, consisting of distinct spots.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
102, for similar subject matter.
- SEE OR SEARCH CLASS:  
191, Electricity: Transmission to Vehicles, appropriate subclasses for current collecting and current distributing rollers.  
492, Roll or Roller, for a roll, per se, not elsewhere provided for, and see the notes thereunder.
- 82 Roller moves over work:**  
This subclass is indented under subclass 81. Subject matter in which the workpiece is stationary and the roller moves.
- 83 Methods:**  
This subclass is indented under subclass 81. Methods.
- 84 Electrode structure:**  
This subclass is indented under subclass 81. Roller electrodes.
- 85.1 Brazing or soldering:**  
This subclass is indented under subclass 50. Subject matter in which the metal is heated and filler metal is used to produce a weld by means of brazing or soldering.
- (1) Note. The filler metal (flux or solder) is to be applied to at least one surface of the metals to be joined.
- (2) Note. This subclass and the subclasses indented hereunder were formerly unofficial digests. Hence, the placement of documents therein might not reflect schedule hierarchy.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
129, for brazing or soldering where an electric arc (torch) provides the required heat.  
615, and 616, for specific means of applying the heat.
- SEE OR SEARCH CLASS:  
29, Metal Working, for generic brazing and soldering means and methods.
- 85.12 Utilizing radiant energy:**  
This subclass is indented under subclass 85.1. Subject matter in which the heat is applied to the metal by means of radiant energy (e.g., infrared lamps, resistance heaters, lasers, etc.).
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
121+, for additional metal heating where the radiant energy source is an electron beam or laser.  
347+, for heat energy reflector means.  
523+, for the particular structure of resistance heater.
- 85.13 Methods:**  
This subclass is indented under subclass 85.12. Subject matter including methods of brazing or soldering.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
121, for methods of welding metal workpieces by means of electron beam heating or by means of laser heating.
- 85.14 With filler metal in circuit:**  
This subclass is indented under subclass 85.1. Subject matter wherein the filler metal is melted by the passage of electrical current therethrough.
- 85.15 Methods:**  
This subclass is indented under subclass 85.14. Subject matter which includes methods of brazing or soldering.

**85.16 Electrically heated tool (e.g., electrodes, heaters, etc.):**

This subclass is indented under subclass 85.1. Subject matter in which the required heat is applied to the metal workpiece by means of a resistance heated tool having a particular structure. Electrical current passes through the tool and produces the heat (e.g., electrodes, heaters, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 119, for the particular structure of an electrode.
- 229+, for a hand-manipulative tool with heated tip or heat applied to localized area.
- 523+, for resistance heater structure.

**85.17 Furnaces or enclosures:**

This subclass is indented under subclass 85.1. Subject matter in which the required heat is applied to the metal by means of a particular furnace or enclosure (e.g., a heating chamber).

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 388+, for oven type enclosures including means whereby the material to be heated may be passed continuously through heated area.
- 651, for inductively heated furnaces or enclosures.

**85.18 Wire lead bonders:**

This subclass is indented under subclass 85.1. Subject matter wherein the metal workpiece to be joined is wired.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 56.1+, for the electrical bonding of wire leads.

SEE OR SEARCH CLASS:

- 228, Metal Fusion Bonding, subclass 4.5 and 904 for miscellaneous wire lead bonders (i.e., bonders which do not necessarily specify electric heating).

**85.19 Machine for predetermined operation:**

This subclass is indented under subclass 85.1. Subject matter in which the required heat and filler metal are applied to the metal workpiece by means of a machine including means for conveying the workpiece and/or positioning the heated tool.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 59.1+, where the predetermined operation is the welding of pipes or tubes.
- 79, for electrical heating machines with a conveyor for workpiece.

SEE OR SEARCH CLASS:

- 228, Metal Fusion Bonding, subclasses 4.1+ for machines with means to apply the flux, to handle or move the work, and to align and bond the work.

**85.2 Fluxes or solders:**

This subclass is indented under subclass 85.1. Subject matter in which the composition of a filler metal (flux or solder) can be used in a brazing or soldering operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 146.1+, for the composition of a weld rod.

SEE OR SEARCH CLASS:

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 122.1+ for alloy of metallic compositions; and subclass 257 for flux composition.
- 148, Metal Treatment, subclasses 23+ for fluxing compositions.
- 228, Metal Fusion Bonding, subclasses 262.1+ for a process of bonding wherein the work component, temperature, or pressure is critical.
- 420, Alloys or Metallic Compositions, for the particular alloy composition.

**85.21 Solder preforms:**

This subclass is indented under subclass 85.1. Subject matter in which the structure or shape of the filler metal (flux or solder) is predeter-

mined to form the resultant joint (braze or weld).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

85.2, and 146.1, for the specific composition of the solder preform.

SEE OR SEARCH CLASS:

228, Metal Fusion Bonding, subclass 56.3 for additional solder forms used in bonding.

**85.22 Methods:**

This subclass is indented under subclass 85.1. Subject matter with miscellaneous methods of brazing or soldering.

**86.1 By spot bonding:**

This subclass is indented under subclass 78.01. Subject matter wherein welding is made between or upon overlapping members, coalescence may start and occur on the faying surfaces or may have proceeded from the surface of one member, and the weld cross section is approximately circular.

- (1) Note. This subclass relates, for example, to spot welding of two overlapped plates where the spot weld is a substitute for a bolt or rivet connection.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

56, for spot bonding of wires, rods, or bars.

SEE OR SEARCH CLASS:

140, Wireworking, subclass 112 for non-electric spot welders utilized to join wire.

**86.21 With hand-manipulative portable devices:**

This subclass is indented under subclass 86.1. Subject matter wherein the bonding apparatus includes structure adapted to manually hold or manipulate the bonding tool or instrument while in use.

**86.22 With separately applied pressure and heat:**

This subclass is indented under subclass 86.1. Subject matter wherein the pressure and heat are not applied simultaneously during the welding process.

**86.23 With welding pressure controlled by the work support:**

This subclass is indented under subclass 86.1. Subject matter wherein the welding pressure is controlled by work support condition responsive means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

86.41+, for significant electrode support condition responsive control means.

**86.24 With work orientation means:**

This subclass is indented under subclass 86.1. Subject matter including means for positioning the work with respect to the welding apparatus.

**86.25 With significant electrode support:**

This subclass is indented under subclass 86.1. Subject matter including means to position or orient the welding electrode with respect to the work.

**86.31 Having cooling means:**

This subclass is indented under subclass 86.25. Subject matter including means to maintain or lower the temperature of part or all of the welding apparatus or work.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

61.7, for cylinder welding with cooling means.

76.11, for deposition welding with cooling means.

**86.32 Having magnetic force actuated electrode:**

This subclass is indented under subclass 86.25. Subject matter wherein the bonding electrode is controlled by magnetically actuated means during the welding process.

**86.33 Having adjustment means:**

This subclass is indented under subclass 86.25. Subject matter including means to change the position of the electrode.

**86.41 With condition responsive control means:**

This subclass is indented under subclass 86.33. Subject matter wherein the electrode is automatically controlled in response to a sensed condition.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
61.15, for cylinder bonding with condition responsive control means.  
91.01, for spot bonding with condition responsive control means.  
108+, for automatic output control circuits.
- 86.51 Responsive to pressure:**  
This subclass is indented under subclass 86.41. Subject matter wherein the control means is affected by changes in the force applied to the work.
- 86.61 By force balancing:**  
This subclass is indented under subclass 86.51. Subject matter including means to equalize the welding pressure of plural, simultaneously applied electrodes.
- 86.7 For predetermined welding operation:**  
This subclass is indented under subclass 86.33. Subject matter wherein the welding process is performed in accordance with a preset schedule of operation.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
125.1+, for arc welding with predetermined welding operation.
- 86.8 Having interchangeable welding electrodes:**  
This subclass is indented under subclass 86.25. Subject matter having means for allowing plural electrodes to be used in place of each other.
- 86.9 For one-face welding:**  
This subclass is indented under subclass 86.1. Subject matter wherein all electrical welding contact is applied to one side of the work.
- 87 Multiple spot type:**  
This subclass is indented under subclass 86.1. Subject matter in which multiple spot bonds are produced.
- (1) Note. The multiple spot bonds can be produced, simultaneously by plural pairs of electrodes.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
81+, for this subject matter where the multiple bonds are produced by roller type electrodes.
- 88 Electrode positionable along fixed bus bar (e.g., reaction bar type):**  
This subclass is indented under subclass 86.1. Subject matter having fixed bus bars of extended length for supplying the heating current and having electrodes for transferring the current to the work, said electrodes being movably positioned along the bus bar.
- (1) Note. The bus bars, for example, may serve as backing members for absorbing mechanical thrust produced when the electrodes are clamped to the workpiece.
- SEE OR SEARCH CLASS:  
191, Electricity: Transmission to Vehicles, subclasses 43+ for trolleys for transferring electric current from a stationary conductor to a movable load.
- 89 Fluid pressure actuated electrode:**  
This subclass is indented under subclass 86.1. Subject matter in which the electrode is actuated by fluid pressure means.
- (1) Note. The electrode may, for example, have a hydraulic cylinder attached to it to obtain a high clamping or indenting force.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
418, Rotary Expansible Chamber Devices, appropriate subclasses for rotary expansible chamber type pumps or motors, per se.
- SEE OR SEARCH CLASS:  
91, Motors: Expansible Chamber Type, appropriate subclasses, for miscellaneous fluid pressure actuated motors.
- 90 Plier or tong type:**  
This subclass is indented under subclass 86.1. Subject matter in which opposing electrodes are mounted on the jaws of a plier or tong.

- 91.1 With condition responsive control of the welding process:**  
This subclass is indented under subclass 86.1. Subject matter wherein the spot bonding process is automatically controlled in response to a sensed condition.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
61.5, for cylinder bonding with condition responsive control means.  
86.41+, for spot bonding electrode support condition responsive means.  
108+, for automatic output control circuits.
- 91.2 Methods:**  
This subclass is indented under subclass 86.1. Subject matter including processes of spot bonding.
- 91.21 Of welding through insulation:**  
This subclass is indented under subclass 91.2. Subject matter including the processes of bonding through material through which essentially no current will flow.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
92+, for methods of welding current limitation including interposed insulation.
- 91.22 With additional heating to same spot:**  
This subclass is indented under subclass 91.2. Subject matter including means to apply heat more than once to same area of the work.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
78.13, for additional heating devices.
- 91.23 With work deforming:**  
This subclass is indented under subclass 91.2. Subject matter including means for forging or shaping of the work.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
61.11, for forming means with the electric heating of cylinders having internal support means.  
78.16, for forming means with resistance welding.
- 92 Current limitation (e.g., by interposed insulation):**  
This subclass is indented under subclass 91.2. Subject matter in which the heating current is made to localize at particular points of the workpiece by means other than the electrodes.
- (1) Note. The workpieces to be bonded, for example, may be coated with insulating paint on the contacting faces except at those points where bonding is to take place.
- 93 By localized projection:**  
This subclass is indented under subclass 92. Subject matter in which the current localizing means comprises localized projections on the workpiece.
- 94 By interposed button:**  
This subclass is indented under subclass 92. Subject matter in which the current localizing means comprises a member which is interposed between either the workpiece and electrode or between the workpieces being bonded, said member becoming part of the bond.
- 95 Percussive:**  
This subclass is indented under subclass 78.01. Subject matter in which the members to be bonded are brought together percussively to developed the bonding pressure.
- SEE OR SEARCH CLASS:  
428, Stock Material or Miscellaneous Articles, subclass 940 for metallic stock comprising components bonded by percussive or explosive-type force.
- 96 Methods:**  
This subclass is indented under subclass 95. Methods.
- 97 Flash:**  
This subclass is indented under subclass 78.01. Subject matter in which the metal workpieces to be bonded are heated by an electric arc created between them before pressure is applied.
- (1) Note. The metal workpieces may or may not be further heated, after pressure is applied, by means of resistive heating

arising from current flowing through the workpiece.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

95+, for this subject matter in which the pressure is developed percussively.

**98 Stud:**

This subclass is indented under subclass 97. Subject matter in which the metal workpiece is a stud which is bonded to a base.

**99 Methods:**

This subclass is indented under subclass 98. Methods.

**100 Methods:**

This subclass is indented under subclass 97. Methods.

**101 Butt:**

This subclass is indented under subclass 78.01. Subject matter in which the bond is a butt joint between the end of a member and another member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

95+, for this subject matter using percussively developed pressure.

97+, for this subject matter in which the heat is developed by an electric arc.

SEE OR SEARCH CLASS:

156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 304.1+ for processes of butt joining nonmetallic elements.

**102 Extended seam:**

This subclass is indented under subclass 101. Subject matter in which the bond is an extended seam.

(1) Note. Two narrow sheets of metal, for example, may be edge bonded to form a wide sheet.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

81+, for similar subject matter utilizing roller electrodes.

**103 One part fed:**

This subclass is indented under subclass 101. Subject matter in which one workpiece only is fed to develop the bonding pressure.

**104 Methods:**

This subclass is indented under subclass 101. Methods.

SEE OR SEARCH CLASS:

428, Stock Material or Miscellaneous Articles, subclasses 615+ for composite metallic stock comprising welded joints characterized by the composition of the parts joined and/or the filler metal.

**105 Preparation of edges:**

This subclass is indented under subclass 104. Subject matter relating to the preparation of the edges to be bonded.

(1) Note. The edges, for example, may be preshaped.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

73, for arc welding with flux.

SEE OR SEARCH CLASS:

228, Metal Fusion Bonding, appropriate subclasses for metallurgical bonding by nonelectrical heating; particularly subclasses 141.1+ when combined with work shaping; and subclasses 203+ when combined with other pre-treating of the work.

**106 By use of a bridging member (e.g., splice plate):**

This subclass is indented under subclass 104. Subject matter in which a bridging member is utilized in bonding the butt joint.

**107 End or edge to surface:**

This subclass is indented under subclass 104. Subject matter relating to the bonding of an edge or end to a surface.

**108 Systems of current supply:**

This subclass is indented under subclass 78.01. Subject matter relating to the system for supplying the electric current which produces the heating.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

130.1+, for similar subject matter used in arc welding.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, for miscellaneous voltage or current control systems.

**109 With indicator (e.g., recorder):**

This subclass is indented under subclass 108. Subject matter having indicating means.

(1) Note. The indicator may be, for example, a signal, alarm or recorder.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing, appropriate subclasses for electric testing. Note subclasses 76.11+ for electric meters.

340, Communications: Electrical, subclass 655 for a condition responsive system indicating heating circuit energization.

**110 Controlled in response to current, voltage, or temperature:**

This subclass is indented under subclass 108. Subject matter which is controlled in response to current in, voltage at or temperature of the workpiece.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclasses 234 through 298 for automatically controlled voltage or current regulation systems.

**111 Repeat or interrupted current systems (e.g., multiple welds, multiple heated weld):**

This subclass is indented under subclass 108. Subject matter wherein the current is repeated or interrupted automatically.

(1) Note. This subclass relates, for example, to systems where the current is interrupted so as to give alternate periods of heating and cooling at the same weld, and to systems where the current is interrupted so that it may be distributed to different weld areas.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

81+, for roller electrode bonding, some of which utilize interrupted current supply systems.

**112 Stored energy discharge (e.g., inductive):**

This subclass is indented under subclass 108. Subject matter in which the heating current is derived from a stored energy source.

(1) Note. The stored energy source, for example, may be an inductor with a large flux in its core or it may be a storage battery.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclasses 289+ for miscellaneous space discharge tube systems having a surge generator, and consult the search notes thereto for related art.

320, Electricity: Battery or Capacitor Charging or Discharging, appropriate subclass for charging or discharging a battery or capacitor energy storage system.

**113 Condenser discharge:**

This subclass is indented under subclass 112. Subject matter having a condenser to store the energy.

SEE OR SEARCH CLASS:

320, Electricity: Battery or Capacitor Charging or Discharging, appropriate subclasses for charging or discharging a battery or capacitor energy storage system, especially subclasses 166+ for capacitor charging or discharging.

- 114 With space-discharge tube control (e.g., thyatron, ignitron):**  
This subclass is indented under subclass 108. Subject matter having a space discharge control tube.
- (1) Note. The tube may be, for example, an ignitron or thyatron.
- SEE OR SEARCH CLASS:  
315, Electric Lamp and Discharge Devices: Systems, subclasses 246+ for miscellaneous gas tube systems having alternating current supply and consult the search notes thereto for related art.  
323, Electricity: Power Supply or Regulation Systems, subclass 291 for miscellaneous space discharge tube type voltage or current control systems.
- 115 Synchronous switching on and off:**  
This subclass is indented under subclass 108. Subject matter having means to energize or deenergize the system in timed relation to the voltage oscillation of an alternating current supply system.
- (1) Note. Switching may be accomplished, for example, only at the voltage or current zero, or in such a manner as not to cause saturation of a transformer.
- 116 With transformer:**  
This subclass is indented under subclass 108. Subject matter having a transformer.
- SEE OR SEARCH CLASS:  
323, Electricity: Power Supply or Regulation Systems, subclass 355 for miscellaneous transformer systems.  
336, Inductor Devices, appropriate subclasses, for transformers, per se.
- 117.1 Methods:**  
This subclass is indented under subclass 78.01. Subject matter comprising processes of electric heating of metal for bonding with pressure.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
78.12, for resistance welding methods of making honeycombs.
- 118 Particular material (e.g., dissimilar, aluminum):**  
This subclass is indented under subclass 117.1. Subject matter involving a particular metal.
- (1) Note. This subclass relates, for example, to the welding of dissimilar metals, and to the welding of aluminum, titanium and molybdenum.
- SEE OR SEARCH CLASS:  
428, Stock Material or Miscellaneous Articles, subclass 650 for a metallic composite in which a component has an aluminum base.
- 119 Electrodes (e.g., structure):**  
This subclass is indented under subclass 78.01. Subject matter relating to the electrodes utilized in pressure welding.
- SEE OR SEARCH CLASS:  
439, Electrical Connectors, appropriate subclasses for terminals.
- 120 With cooling:**  
This subclass is indented under subclass 119. Subject matter having cooling means for the electrode.
- SEE OR SEARCH CLASS:  
313, Electric Lamp and Discharge Devices, subclasses 11+ for analogous subject matter in the electric lamp and space discharge device art.  
439, Electrical Connectors, subclass 112 for cooled terminals.
- 121.11 By Arc:**  
This subclass is indented under subclass 50. Subject matter where a working arc of charged particles is caused to impinge on a workpiece.
- 121.12 Using electron beam:**  
This subclass is indented under subclass 121.11. Subject matter wherein the working arc is an electron beam in a vacuum.
- SEE OR SEARCH CLASS:  
250, Radiant Energy, subclass 492.1 for irradiation of objects or material and subclass 492.2 for irradiation of semi-conductive devices.

**121.13 Welding:**

This subclass is indented under subclass 121.12. Subject matter for joining two workpieces.

**121.14 Methods:**

This subclass is indented under subclass 121.13. Subject matter including methods of joining two workpieces.

**121.15 Deposition (e.g., sputtering):**

This subclass is indented under subclass 121.12. Subject matter wherein an electron beam impinges on a workpiece to evaporate material therefrom.

**121.16 Melting:**

This subclass is indented under subclass 121.12. Subject matter wherein the electron beam liquifies the workpiece.

## SEE OR SEARCH CLASS:

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclass 65 for nonferrous electron beam melting processes.
- 373, Industrial Electric Heating Furnaces, subclasses 10 and 11 for an electron beam furnace device.

**121.17 Methods:**

This subclass is indented under subclass 121.16. Subject matter including methods of liquifying a workpiece.

## SEE OR SEARCH CLASS:

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclass 65 for nonferrous electron beam melting processes.
- 373, Industrial Electric Heating Furnaces, subclasses 10 and 11 for an electron beam furnace device.

**121.18 Cutting:**

This subclass is indented under subclass 121.12. Subject matter wherein a workpiece is severed by an electron beam.

**121.19 Etching or trimming:**

This subclass is indented under subclass 121.18. Subject matter wherein the cut is superficial or partially through the workpiece.

## SEE OR SEARCH CLASS:

- 216, Etching a Substrate: Processes, subclasses 63 and 94 for the use of an electron beam in etching.
- 438, Semiconductor Device Manufacturing: Process, particularly subclass 661 for combined processes for trimming a conductive pathway on a semiconductive substrate.

**121.2 Methods:**

This subclass is indented under subclass 121.19. Subject matter including processes of cutting a workpiece.

**121.21 Chamber:**

This subclass is indented under subclass 121.12. Subject matter wherein an evacuated housing structure is provided for partially or completely enclosing the workpiece.

**121.22 Sealing:**

This subclass is indented under subclass 121.21. Wherein vacuum or subatmospheric pressure securing means is provided on the chamber.

**121.23 Monitoring:**

This subclass is indented under subclass 121.21. Subject matter wherein means are provided for visual or electronic communication with the interior of the chamber.

- (1) Note. Communication includes such things as microscope and T.V. view.

**121.24 Nonvacuum environment:**

This subclass is indented under subclass 121.12. Subject matter wherein the working electron beam is in the ambient atmosphere.

**121.25 Shaping:**

This subclass is indented under subclass 121.12. Subject matter wherein the working are of the charged particle beam is geometrically configured by using a plate, mask electromagnetic lens electrostatic and electromagnetic deflectors.

**SEE OR SEARCH CLASS:**

- 250, Radiant Energy, subclass 396 for focusing and magnetic lenses.  
373, Industrial Electric Heating Furnaces, subclass 14 for deflection control.

**121.26 With focusing:**

This subclass is indented under subclass 121.25. Subject matter wherein the location of the charged particle beam is directed to a particular location by focusing (e.g., dynamic of static coil means).

**SEE OR SEARCH CLASS:**

- 250, Radiant Energy, subclass 396 for beam focusing.

**121.27 With electrode or gun structure:**

This subclass is indented under subclass 121.25. Subject matter wherein a particular electrode configuration is provided or a particular electron beam generator housing structure is set forth.

**SEE OR SEARCH CLASS:**

- 373, Industrial Electric Heating Furnaces, subclass 13 for electron beam gun assembly.

**121.28 Position control:**

This subclass is indented under subclass 121.12. Subject matter wherein the charged particle beam is located by deflecting the beam or moving the workpiece.

**121.29 Swept or scanned:**

This subclass is indented under subclass 121.28. Subject matter wherein the beam of charged particles is continuously deflected in opposite directions by electrostatic or electromagnetic means.

**121.3 Condition responsive:**

This subclass is indented under subclass 121.28. Subject matter wherein the charge particle beam is located in response to a position detector (e.g., a detector circuit encoder and computer or a secondary emission detector).

**121.31 Workpiece position control:**

This subclass is indented under subclass 121.12. Subject wherein the workpiece or a support therefore is located by moving the

workpiece or the support (e.g., by servo control driving circuit for an XY table).

**121.32 Condition responsive:**

This subclass is indented under subclass 121.31. Subject matter wherein the workpiece or the support is moved in response to secondary emission detection of a faulty location.

**121.33 With fluid supply (e.g., shielding gas or coolant):**

This subclass is indented under subclass 121.12. Subject matter wherein the particle beam generator structure is provided with means for receiving and utilizing a fluid as a working fluid in machining or as a cooling or shield fluid.

- (1) Note. Machining includes welding, cutting, etching, etc.

**121.34 Power supply:**

This subclass is indented under subclass 121.12. Subject matter including a source of electrical energy.

**121.35 Method:**

This subclass is indented under subclass 121.12. Subject matter including methods of heating a workpiece.

**121.36 Using plasma:**

This subclass is indented under subclass 121.11. Subject matter wherein the working arc is an ionized gas plasma.

- (1) Note. A plasma torch exclusive of furnace structure can be employed to heat the workpiece under this gas plasma.

**SEE OR SEARCH CLASS:**

- 216, Etching a Substrate: Processes, subclasses 67+ for the use of plasma in an etching process.

**121.37 Melting:**

This subclass is indented under subclass 121.36. Subject matter wherein the ionized gas plasma liquifies the workpiece.

**121.38 Methods:**

This subclass is indented under subclass 121.37. Subject matter including a process of liquifying a workpiece by a plasma.

**121.39 Cutting:**

This subclass is indented under subclass 121.36. Subject matter wherein a plasma torch is used to sever a workpiece.

**121.4 Etching:**

This subclass is indented under subclass 121.39. Subject matter wherein eroding or abrading is accomplished with a plasma torch.

**SEE OR SEARCH CLASS:**

- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 345.1 through 345.55 for differential etching apparatus.
- 204, Chemistry: Electrical and Wave Energy, subclasses 192.32+ for a sputter etching process and subclasses 298.31+ for the corresponding apparatus.
- 216, Etching a Substrate: Processes, subclasses 67+ for chemically etching a substrate with a plasma.
- 313, Electric Lamp and Discharge Devices, subclasses 231.31+ fluid supply with plasma devices.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 111.21+ for plasma generating systems.

**121.41 Methods:**

This subclass is indented under subclass 121.4. Subject matter relating to the process of eroding and abrading a workpiece with a plasma torch.

**SEE OR SEARCH CLASS:**

- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 345.1 through 345.55 for differential etching apparatus
- 204, Chemistry: Electrical and Wave Energy, subclasses 192.32+ for a sputter etching process.
- 216, Etching a Substrate: Processes, subclasses 67+ for chemically etching a substrate with a plasma.
- 313, Electric Lamp and Discharge Devices, subclasses 231.31+ fluid supply with plasma devices.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 111.21+ for plasma generating systems.

**121.42 Rate control:**

This subclass is indented under subclass 121.4. Subject matter wherein the speed of removal of material from a workpiece by a plasma torch is regulated (e.g., by controlling gas flow or power to the torch).

**SEE OR SEARCH CLASS:**

- 313, Electric Lamp and Discharge Devices, subclasses 231.31+ fluid supply with plasma devices.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 111.21+ for plasma generating systems.

**121.43 With chamber:**

This subclass is indented under subclass 121.4. Subject matter wherein eroding or abrading of the workpiece is accomplished in an enclosure.

**SEE OR SEARCH CLASS:**

- 313, Electric Lamp and Discharge Devices, subclasses 231.31+ fluid supply with plasma devices.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 111.21+ for plasma generating systems.

**121.44 Methods:**

This subclass is indented under subclass 131.39. Subject matter relating to the process of eroding or abrading of a workpiece by a plasma torch.

**121.45 Welding:**

This subclass is indented under subclass 121.36. Subject matter wherein workpiece are fused together by the plasma gas from a torch.

**121.46 Method:**

This subclass is indented under subclass 121.45. Subject matter relating to processes of fusing workpieces by a plasma gas from a torch.

**121.47 Spray coating:**

This subclass is indented under subclass 121.36. Subject matter wherein material is deposited on a workpiece with a plasma.

SEE OR SEARCH THIS CLASS, SUB-CLASS:  
76.16, for deposition welding (e.g., coating or building up with a plasma).

SEE OR SEARCH CLASS:  
427, Coating Processes, subclasses 446+ for spraying involving flame or plasma coating agent.

**121.48 Plasma torch structure:**

This subclass is indented under subclass 121.36. Subject matter having a housing including at least one electrode, a nozzle for fluid flow passage and a power supply.

- (1) Note. The fluid flow passage may carry the working fluid, shielding fluid or cooling fluid.

**121.49 Cooling system:**

This subclass is indented under subclass 121.48. Subject matter wherein a fluid is supplied to the torch for cooling the nozzle.

**121.5 Nozzle system:**

This subclass is indented under subclass 121.48. Subject matter relating to the structural configuration of the distal end of the torch structure which influence the exit gas flow rate.

**121.51 Gas supply system:**

This subclass is indented under subclass 121.48. Subject matter including structure for delivering working and shielding gases.

**121.52 Electrode structure:**

This subclass is indented under subclass 121.48. Subject matter relating to the cathode configuration.

**121.53 Consumable electrode:**

This subclass is indented under subclass 121.48. Subject matter wherein a feed wire electrode is consumed during heating.

**121.54 Control systems:**

This subclass is indented under subclass 121.36. Subject matter including a system to regulate the associated components of a plasma system.

**121.55 Gas supply:**

This subclass is indented under subclass 121.54. Subject matter relating to various gas supplies to the plasma torch and specific control of the same.

**121.56 Arc positioning:**

This subclass is indented under subclass 121.54. Subject matter relating to controlling the location of the arc of the plasma torch (e.g., by magnetic deflection, XYZ control, etc.).

**121.57 Arc ignition:**

This subclass is indented under subclass 121.54. Subject matter including means for starting an arc.

- (1) Note. Between a starter nonconsumable electrode and the workpiece.

- (2) Note. Between a consumable electrode and the workpiece.

- (3) Note. Between the nonconsumable electrode of the torch and the torch structure.

- (4) Note. Arc ignition includes interalia straight and reverse polarity and the control of power to the electrode.

**121.58 With work holder:**

This subclass is indented under subclass 121.36. Subject matter including the support of the workpiece, (e.g., by roller support, XY table, clamp, etc.).

**121.59 Methods:**

This subclass is indented under subclass 121.36. Subject matter relating to processes of heating by an ionized gas plasma in a furnace or by a plasma torch.

**121.6 Using laser:**

This subclass is indented under subclass 121.11. Subject matter using coherent source of amplified light.

- (1) Note. Produced by the relaxation of stimulated molecules or atoms.

## SEE OR SEARCH CLASS:

- 216, Etching a Substrate: Processes, subclass 65 for the use of a laser in etching.
- 372, Coherent Light Generators, appropriate subclasses for a particular coherent light generator or cavity structure.

**121.61 Beam energy control:**

This subclass is indented under subclass 121.60. Subject matter which regulates the output of the beam (e.g., controlling the excitation source, switching, etc.).

**121.62 Condition responsive:**

This subclass is indented under subclass 121.61. Subject matter which controls the beam energy in response to a detected condition (e.g., reflected radiation).

**121.63 Welding:**

This subclass is indented under subclass 121.60. Subject matter wherein a coherent light beam is used to cause two workpieces to unite by heating.

**121.64 Methods:**

This subclass is indented under subclass 121.63. Subject matter including processes of uniting workpieces.

**121.65 Melting:**

This subclass is indented under subclass 121.60. Subject matter wherein the coherent light beam liquifies the workpiece.

**121.66 Methods:**

This subclass is indented under subclass 121.65. Subject matter including processes of melting a workpiece using a coherent light beam.

**121.67 Cutting:**

This subclass is indented under subclass 121.60. Subject matter wherein the workpiece is severed by a coherent light beam.

## SEE OR SEARCH CLASS:

- 607, Surgery: Light, Thermal, and Electrical Application, subclasses 303.1, 84, and 88 for lasers used in surgery for cutting, coagulation, etc.

**121.68 Etching or trimming:**

This subclass is indented under subclass 121.67. Subject matter wherein the cut is superficial or partially through the workpiece.

## SEE OR SEARCH CLASS:

- 438, Semiconductor Device Manufacturing: Process, particularly subclass 662 for combined processes for trimming a conductive pathway on a semiconductive substrate.

**121.69 Methods:**

This subclass is indented under subclass 121.68. Subject matter including processes of etching or trimming the workpiece.

**121.7 Hole punching:**

This subclass is indented under subclass 121.67. Subject matter including perforating a workpiece.

## SEE OR SEARCH CLASS:

- 131, Tobacco, subclass 281 for cigarette making including perforating.

**121.71 Methods:**

This subclass is indented under subclass 121.70. Subject matter including the processes of perforating a workpiece.

## SEE OR SEARCH CLASS:

- 131, Tobacco, subclass 281 for cigarette making including perforating.

**121.72 Methods:**

This subclass is indented under subclass 121.67. Subject matter including the process of severing a workpiece.

**121.73 Shaping:**

This subclass is indented under subclass 121.60. Subject matter including focusing of a coherent light beam.

**121.74 With mirror:**

This subclass is indented under subclass 121.73. Subject matter wherein mirrors are used to focus the coherent light beam.

**121.75 With lens:**

This subclass is indented under subclass 121.73. Subject matter wherein lenses are used to focus the coherent light beam.

**121.76 Multiple beams:**

This subclass is indented under subclass 121.60. Subject matter having plural coherent light beams.

**121.77 With single source:**

This subclass is indented under subclass 121.76. Subject matter having plural beams using a beam splitter.

## SEE OR SEARCH CLASS:

359, Optical: Systems and Elements, subclasses 618+ for beam deflection or splitting.

**121.78 Beam position control:**

This subclass is indented under subclass 121.60. Subject matter wherein the coherent light beam is positioned on a workpiece by relative movement of the beam (e.g., X-Y table movement reflector movement, rotary discs).

**121.79 Path adjustment:**

This subclass is indented under subclass 121.78. Subject matter relating to changing the location of the light beam by changing the path.

- (1) Note. The beam path can be changed by telescopic movement, fiber optics movement, robotic movement.

## SEE OR SEARCH CLASS:

901, Robots, subclass 42 for welding devices.

**121.8 Swept or scanned:**

This subclass is indented under subclass 121.78. Subject matter including oscillating or reciprocating the coherent light beam.

## SEE OR SEARCH CLASS:

359, Optical: Systems and Elements, subclasses 212.1 through 215.1 and 223.1 through 226.1 for light deflection using a reflective element.

**121.81 Condition responsive:**

This subclass is indented under subclass 121.78. Subject matter wherein the coherent light beam is positioned in response to a detected condition.

- (1) Note. For example, a feed back signal from reflected light is used to control an XY movement. Position sensors are used for computer control of digital deflector and XY movement.

**121.82 Workpiece position control:**

This subclass is indented under subclass 121.60. Subject matter including control of the movement of a workpiece in an XY or XYZ position.

**121.83 With monitoring:**

This subclass is indented under subclass 121.60. Subject matter including observation of the position of the coherent light beam on the workpiece (e.g., by microscope, C.R.T., etc.).

**121.84 With fluid supply:**

This subclass is indented under subclass 121.60. Subject matter including fluid supply means for cooling or cleaning the laser apparatus or workpiece.

- (1) Note. A working fluid is one which gives an exothermic reaction with the operation of the applied beam. A cooling fluid is used to cool some part (mirror, etc.) of the light beam apparatus and a cleaning fluid is used to clean a particular element of the apparatus such as the lens.

## SEE OR SEARCH CLASS:

372, Coherent Light Generators, subclass 35 for liquid coolant.

**121.85 Method:**

This subclass is indented under subclass 121.60. Subject matter including processes applying a coherent light beam to a workpiece (e.g., welding, cutting, perforating, etching, etc.).

**121.86 Chamber:**

This subclass is indented under subclass 121.60. Subject matter wherein the workpiece is in a hermetically sealed enclosure.

**122 Control of arc direction:**

This subclass is indented under subclass 121. Subject matter in which the path of the arc through space is controlled.

- (1) Note. The arc, for example, between stationary electrodes may be deflected, so as to impinge against the work, by means of a gas blast.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 69+, for this subject matter utilized for metal cutting or disintegrating.  
73, for the feeding of slag to an electric metal heating arc.  
74+, for this subject matter.

**123 Magnetic:**

This subclass is indented under subclass 122. Subject matter in which the means for controlling the course of the arc is a magnetic means.

SEE OR SEARCH CLASS:

- 313, Electric Lamp and Discharge Devices, subclasses 153+ for this subject matter, not utilized for metal heating, and consult the search notes thereto for related art.

**124.01 With ignition by retraction:**

This subclass is indented under subclass 121. Subject matter wherein the arc heating means is initiated by a drawn arc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 130.4, for arc ignition and stabilization arrangements with arc-power supplies.

**124.02 With gap control:**

This subclass is indented under subclass 121. Subject matter wherein the arc torch is regulated by sensor means responsive to an arc current or voltage characteristic occurring in the gap between the arc torch and the work.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 69, for gap spacing control in cutting or disintegrating electric heating.  
130.01, for circuits for monitoring arc parameters.  
130.21+, for automatic output control of arc-power supplies.

**124.03 By arc voltage:**

This subclass is indented under subclass 124.02. Subject matter having sensor means responsive to the voltage occurring in the gap between the arc torch and the work.

**124.1 With automatic positioning of arc:**

This subclass is indented under subclass 121. Subject matter wherein sensor means in response to a sensed condition controls automatic control means to position the arc.

SEE OR SEARCH CLASS:

- 901, Robots, subcollection 10 for a robot arm in which an sensor physically contacts and follows the work contour to control the arm movement and subcollection 42 for an art collection of welding robots.

**124.21 Including work cutting:**

This subclass is indented under subclass 124.1. Subject matter including means to sever work during or after the welding process.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 78.15, for resistance welding with work cutting means.

**124.22 In response to work shape:**

This subclass is indented under subclass 124.1. Subject matter wherein the sensor responds to the form of the work to be welded.

**124.31 Having carriage supported by work:**

This subclass is indented under subclass 124.22. Subject matter wherein the arc torch support is provided by the work during the welding operation.

**124.32 Having variable welding head travel rate (e.g., gravity feed):**

This subclass is indented under subclass 124.22. Subject matter wherein the arc torch moves at different speeds over the weld area of the work.

**124.33 Having electrode angle control:**

This subclass is indented under subclass 124.22. Subject matter including means for regulating the orientation between the arc torch and the work.

**124.34 By using probe means:**

This subclass is indented under subclass 124.22. Subject matter including mechanical, optical, or magnetic work shape sensor means.

- (1) Note. This subclass includes feedback circuit for control.

**124.4 In response to work position:**

This subclass is indented under subclass 124.1. Subject matter wherein sensed changes in the work orientation regulate movement of the arc torch.

**124.5 In response to the transfer rate of the weld metal:**

This subclass is indented under subclass 124.1. Subject matter wherein sensor means respond to the weld metal deposit rate to control the arc torch position.

**125.1 With predetermined welding operation:**

This subclass is indented under subclass 121. Subject matter wherein the welding process is performed in accordance with a preset schedule of operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

86.7, for predetermining welding operation of adjustable electrode support, spot bonding means.

SEE OR SEARCH CLASS:

901, Robots, subcollection 10 for a robot arm in which a sensor physically contacts and follows the work contour to control the arm movement and subcollection 42 for an art collection of welding robots.

**125.11 For closed path welding (e.g., circumferential welding):**

This subclass is indented under subclass 125.1. Subject matter wherein during a continuous welding operation, the welder returns at least once to a point in the previously welded path.

SEE OR SEARCH THIS CLASS, SUBCLASS:

60.2, for annular arc butt welding of heat exchange tubes to a perforated plate.

**125.12 For oscillating electrode welding:**

This subclass is indented under subclass 125.1. Subject matter wherein the arc torch welds across the width of the work seam with a reciprocal motion.

**126 Vertical work (e.g., horizontal seam in vertical wall):**

This subclass is indented under subclass 125.1. Subject matter in which the work is vertical.

- (1) Note. The bonding operation may take place, for example, at a horizontal or a vertical seam of a vertical wall of a metal tank.

**127 Spot arc bonding (e.g., arc riveting):**

This subclass is indented under subclass 121. Subject matter in which the arc is not moved continuously with respect to the work but touches it only at isolated points and in which the heat of the arc is used for bonding.

- (1) Note. This is sometimes known as arc riveting or plug welding.

SEE OR SEARCH THIS CLASS, SUBCLASS:

87, for similar subject matter in resistance welding.

**128 With working of bonding metal (e.g., by peening):**

This subclass is indented under subclass 121. Subject matter in which the metal heated by the arc is worked after being deposited.

- (1) Note. A deposited weld bead, for example, may be peened while it is cooling.

**129 Brazing or soldering:**

This subclass is indented under subclass 121. Subject matter relating to brazing or soldering.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 69, for spark producing.
- 85.1, for similar subject matter utilizing pressure.
- 121, for initiating plasma arc.
- 136, for similar subject matter utilized for welding.

SEE OR SEARCH CLASS:

- 315, Electric Lamp and Discharge Devices: Systems, for spark producing circuits.

**130.01 Including circuits for monitoring arc parameters:**

This subclass is indented under subclass 121. Subject matter including circuit means for sensing and indicating arc conditions.

- (1) Note. The monitoring does not include a control function.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 109, for resistance welding indicating.

SEE OR SEARCH CLASS:

- 324, Electricity: Measuring and Testing, appropriate subclasses for circuits for measuring and testing electricity.

**130.1 Including arc-power supplies:**

This subclass is indented under subclass 121. Subject matter including circuit means for providing electrical energy for arc welding.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 69+, for electric arc machining.
- 108+, for resistance welding power supplies.

**130.21 With automatic output control (e.g., short circuit, infrared):**

This subclass is indented under subclass 130.1. Subject matter including circuit means for regulating the output in response to a sensed condition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 110, resistance welding with control in response to current, voltage, or temperature.
- 124.02, for gap control in arc welding.

SEE OR SEARCH CLASS:

- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for automatic output control.

**130.31 Responsive to arc voltage only:**

This subclass is indented under subclass 130.21. Subject matter wherein the sensed condition pertains to the arc voltage

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 124.03, for gap control by arc voltage in arc welding.

**130.32 Responsive to arc current only:**

This subclass is indented under subclass 130.21. Subject matter wherein the sensed condition pertains to the arc current.

**130.33 Responsive to both arc voltage and arc current:**

This subclass is indented under subclass 130.21. Subject matter wherein the sensed condition pertains to arc voltage and arc current.

**130.4 With arc ignition and stabilization arrangements:**

This subclass is indented under subclass 130.1. Subject matter including circuit means to initiate and maintain an electric welding arc.

**130.5 With predetermined time variation of arc voltage or current (e.g., programmed):**

This subclass is indented under subclass 130.1. Subject matter including circuit means to constrain the arc voltage or current to follow a pre-established temporal pattern.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 125.1, for predetermined arc welding operation.

**130.51 Pulsating or periodic output:**

This subclass is indented under subclass 130.5. Subject matter wherein the preestablished temporal pattern exhibits a nonsinusoidal repeating waveform.

- (1) Note. This subject matter will include square waves or rectified sinusoids.

**132 Remote control:**

This subclass is indented under subclass 130.1. Subject matter having remote control.

- (1) Note. A weld rod holder, for example, may be provided with means to remotely start a motor-generator set which supplies the current for the arc.

SEE OR SEARCH CLASS:

- 323, Electricity: Power Supply or Regulation Systems, subclass 201 for miscellaneous motor-generator systems.  
340, Communications: Electrical, subclasses 1.1 through 16.1 for miscellaneous remote control systems.

**133 With generator (e.g., gas engine driven):**

This subclass is indented under subclass 130.1. Subject matter having a generator for generating the current used in the electric arc.

- (1) Note. The generator, for example, may be driven by a prime mover.

SEE OR SEARCH CLASS:

- 290, Prime-Mover Dynamo Plants, appropriate subclasses for engine driven generator systems.

**134 Electric motor driven:**

This subclass is indented under subclass 133. Subject matter in which the generator is driven by an electric motor.

SEE OR SEARCH CLASS:

- 323, Electricity: Power Supply or Regulation Systems, subclasses 10+ for miscellaneous motor-generator systems.

**136 Welding:**

This subclass is indented under subclass 121. Subject matter relating to welding.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 129, for similar subject matter utilized for soldering.

SEE OR SEARCH CLASS:

- 428, Stock Material or Miscellaneous Articles, subclasses 615+ for composite metallic stock comprising welded joints characterized by the composition of the parts joined and/or the filler metal.

**137 Process:**

This subclass is indented under subclass 136. Processes.

**137.2 With consumable electrode device:**

This subclass is indented under subclass 121. Subject matter including means having current carrying, fusible weld material as a welding electrode.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 72+, for consumable electrode welding with nonatmospheric environment at hot spot.  
75, for nonconsumable electrode devices.  
124.32, for gravity feed consumable electrode arc welding.

**137.31 Gun:**

This subclass is indented under subclass 137.2. Subject matter including means for projecting the weld material or necessary weld environmental elements to the weld site.

**137.41 Having fume extractor:**

This subclass is indented under subclass 137.31. Subject matter including means for the removal of gaseous material from the arc weld site.

**137.42 Having gas flow limiting shape (e.g., gas diffuser):**

This subclass is indented under subclass 137.31. Subject matter wherein the nozzle is of a form which restricts the travel of gas toward the weld site.

**137.43 Having spatter shield:**

This subclass is indented under subclass 137.31. Subject matter including means to protect nozzle elements from weld splash back.

**137.44 Having integral electrode guide:**

This subclass is indented under subclass 137.31. Subject matter including means to direct an electrode through the welding gun.

**137.51 With flexibility:**

This subclass is indented under subclass 137.44. Subject matter wherein the guide is capable of being bent.

**137.52 With wear resistant liner:**

This subclass is indented under subclass 137.44. Subject matter including durable insert means for protection against deterioration of the guide means.

**137.61 Having filler electrical contact structure:**

This subclass is indented under subclass 137.31. Subject matter including structural means to ensure electrical connection between a traveling filler and an electrically conductive component of the nozzle.

**137.62 Having cooling means:**

This subclass is indented under subclass 137.31. Subject matter including means to maintain or lower the temperature of the welding gun.

SEE OR SEARCH THIS CLASS, SUBCLASS:

61.7, for cylinder resistance welding with cooling means.

76.11, for deposition welding with cooling means.

**137.63 Having supply connection means (e.g., quick disconnect):**

This subclass is indented under subclass 137.31. Subject matter including means to attach the nozzle to source of weld current or materials.

**137.7 Rate control:**

This subclass is indented under subclass 137.2. Subject matter including means to regulate the feed speed of the filler material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

130.21+, for automatic output control for arc-power supplies.

SEE OR SEARCH CLASS:

314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclasses 40+ for oscillating or rotating, nonconsumable electrodes with interconnected feed mechanisms.

**137.71 Circuits:**

This subclass is indented under subclass 137.7. Subject matter including electrical circuits for controlling the rate of feeding consumable filler to the welding arc.

**137.8 Including filler wire deforming:**

This subclass is indented under subclass 137.2. Subject matter including means to bend filler wire prior to passage to the welding torch.

**137.9 Supply cables (e.g., for current, shielding gas, coolant):**

This subclass is indented under subclass 137.2. Subject matter including conduit means for providing weld current or materials.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, subclass 15.7 for welding cables.

**138 Electrode holder (e.g., spring biased tong):**

This subclass is indented under subclass 121. Subject matter relating to arc electrode holders.

SEE OR SEARCH CLASS:

439, Electrical Connectors, appropriate subclasses for the subject matter when not disclosed as useful in electric arc heating of metal. Note especially subclasses 241+.

**139 Plural adjustable electrodes (e.g., hand torch):**

This subclass is indented under subclass 138. Subject matter having means for holding plural electrodes in adjustable relation.

## SEE OR SEARCH CLASS:

- 313, Electric Lamp and Discharge Devices, subclass 147 for similar subject matter not used for metal heating.
- 314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclass 134 for analogous structure in arc lamps.

**140 Spring jaw (e.g., sprung by electrode):**

This subclass is indented under subclass 138. Subject matter in which the electrode is held in a spring jaw.

- (1) Note. The electrode rod, for example, may be used to spring resilient jaws sufficiently far apart so that it may be inserted between them.

**141 With separate actuator:**

This subclass is indented under subclass 140. Subject matter having means, separate from the spring jaws, for actuating the spring jaws.

**142 Plunger jaw (e.g., screw actuated):**

This subclass is indented under subclass 138. Subject matter having a jaw which moves longitudinally of the axis of the electrode holder.

**143 Spring biased:**

This subclass is indented under subclass 142. Subject matter in which the longitudinally moving jaw is spring biased.

**144 Positive grip:**

This subclass is indented under subclass 138. Subject matter in which means are provided for positively gripping the electrode.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 142, for this subject matter where the electrode jaw moves longitudinally of the axis of the electrode holder.

**145.1 Weld rod structure:**

This subclass is indented under subclass 121. Subject matter including physical organization of the electrode or filler used in arc welding.

## SEE OR SEARCH CLASS:

- 427, Coating Processes, subclasses 58+ for processes of forming weld rods by coating.
- 428, Stock Material or Miscellaneous Articles, subclasses 379+ for a rod which is merely coated and may be utilized as an arc welding electrode and is not classified elsewhere.

**145.21 Nonconsumable:**

This subclass is indented under subclass 145.1. Subject matter wherein the weld rod electrode is of a nonfiller material.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 146.21, for subject matter related to composition.

## SEE OR SEARCH CLASS:

- 313, Electric Lamp and Discharge Devices, subclasses 231.03+ for similar electrodes not for welding.

**145.22 Flux cored:**

This subclass is indented under subclass 145.1. Subject matter wherein a granular arc shielding material is encased by a sheath of filler metal.

- (1) Note. Weld rods defined merely as cored rods are not classified herein.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 146.3+, for composition of flux.

**145.23 Flux coated:**

This subclass is indented under subclass 145.1. Subject matter wherein a granular arc shielding material covers the outer surface of filler metal.

- (1) Note. A weld rod defined merely as a flux-coated rod is not classified herein.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 146.3+, for composition of flux.

**145.31 Partially:**

This subclass is indented under subclass 145.23. Subject matter wherein only part of filler metal outer surface is covered.

**145.32 With wire wrap:**

This subclass is indented under subclass 145.23. Subject matter including a metal strand wound around the filler metal.

**145.41 Nonmetal cover:**

This subclass is indented under subclass 145.1. Subject matter including a sheath of a material other than metal.

**146.1 Weld rod composition:**

This subclass is indented under subclass 121. Subject matter relating to the chemical makeup of the arc electrode or filler.

- (1) Note. Weld rods defined merely as alloy rods are not classified herein.

**SEE OR SEARCH CLASS:**

420, Alloys or Metallic Compositions, subclasses 122.1+ for arc electrode or filler alloys, per se.

**146.21 Nonconsumable:**

This subclass is indented under subclass 146.1. Subject matter wherein the material of the arc electrode is of a nonfiller material.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

145.1, for structure of nonconsumable electrodes.

**146.22 Nonferrous:**

This subclass is indented under subclass 146.1. Subject matter relating to weld rods containing metal other than iron as primary constituent.

**146.23 Containing nickel, chromium, and iron:**

This subclass is indented under subclass 146.1. Subject matter wherein the electrode contains at least some quantity of each of nickel, chromium, and iron.

**146.24 Metal deoxidizer or denitrogenizer:**

This subclass is indented under subclass 146.1. Subject matter including a scavenger of oxygen or nitrogen of a metallic material within the filler.

**146.30 Particulate:**

This subclass is indented under subclass 146.24. Subject matter wherein a scavenger material is included within a granular material.

**146.31 Particulate:**

This subclass is indented under subclass 146.1. Subject matter including a granular material.

**146.32 Alloying:**

This subclass is indented under subclass 146.31. Subject matter wherein at least a part of the granular material is to be added to the weld deposit.

**146.41 Nickel or chromium:**

This subclass is indented under subclass 146.32. Subject matter wherein the material to be added to the weld deposit includes nickel or chromium.

**146.51 Containing carbide:**

This subclass is indented under subclass 146.31. Subject matter wherein at least part of the granular material is a carbide.

**146.52 Shielding:**

This subclass is indented under subclass 146.31. Subject matter including materials which decompose to provide protection to the weld site from atmospheric contamination.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

73.2, for this subject matter.

**SEE OR SEARCH CLASS:**

148, Metal Treatment, subclasses 23+ for fluxing compositions, per se.  
252, Compositions, subclasses 500+ for arc shielding compositions.  
501, Compositions: Ceramic, subclass 28 for glass batch forming compositions containing slag.

**147 With eye shield:**

This subclass is indented under subclass 121. Subject matter having means for protecting the eyes of the operator from the effects of the arc.

- (1) Note. The eye shield may, for example, have a shutter which is caused to automatically shut when arc current is drawn.

- SEE OR SEARCH CLASS:  
 2, Apparel, subclass 432 for goggles having an antiglare lens.  
 351, Optics: Eye Examining, Vision Testing and Correcting, subclasses 44+ for eyeglasses with light reducing means.  
 359, Optical: Systems and Elements, subclasses 885+ for visual filters.
- 148 Bonding:**  
 This subclass is indented under subclass 50. Subject matter related to the bonding of metal by the heat developed by an electric current.
- (1) Note. This subclass relates, for example, to miscellaneous bonding accessories, not above provided for, such as grounding clamps.
- 149 With forging or shaping (e.g., of powder):**  
 This subclass is indented under subclass 50. Subject matter combined with forging or shaping of the workpiece.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
 51+, for this subject matter where the workpiece is chain.  
 56+, for this subject matter where the workpiece is wire, rod or bar.  
 59.1+, for this subject matter where the workpiece is a tube.  
 68+, for this subject matter where the shaping is cutting.  
 78.01+, for this subject matter where the workpiece is bonded to another by application of pressure while heated.
- SEE OR SEARCH CLASS:  
 72, Metal Deforming, appropriate subclasses for plastic metal shaping not involving significant electric heating.
- 150 Upsetting:**  
 This subclass is indented under subclass 149. Subject matter in which the forging or shaping is upsetting.
- 151 Anvil electrode:**  
 This subclass is indented under subclass 150. Subject matter in which one of the electrodes utilized to apply electric current to the work-
- piece also acts as an anvil for upsetting the work.
- 152 Simultaneous with heating:**  
 This subclass is indented under subclass 150. Subject matter in which the upsetting takes place simultaneously with the heating.
- (1) Note. Either heating or upsetting may also, in addition to the defined mode, occur by itself.
- 153 Bending or twisting:**  
 This subclass is indented under subclass 149. Subject matter in which the forging or shaping is bending or twisting.
- 154 Subsequent to heating:**  
 This subclass is indented under subclass 149. Subject matter in which the forging or shaping takes place after the electric heating.
- 155 Endless strip:**  
 This subclass is indented under subclass 50. Subject matter in which the metal heated is an endless strip.
- SEE OR SEARCH CLASS:  
 226, Advancing Material of Indeterminate Length, appropriate subclasses for methods of, and apparatus for, feeding material without utilizing the leading or trailing ends to effect movement of the material.  
 242, Winding, Tensioning, or Guiding, appropriate subclasses for winding, tensioning, or guiding elongated material in general which may include endless material.
- 156 Rods and bars:**  
 This subclass is indented under subclass 50. Subject matter in which the metal heated is a rod or bar.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
 56+, for similar subject matter.
- SEE OR SEARCH CLASS:  
 226, Advancing Material of Indeterminate Length, appropriate subclasses for methods of, and apparatus for, feeding material without utilizing the leading

or trailing ends to effect movement of the material.

**157 Rivets:**

This subclass is indented under subclass 50. Subject matter in which the metal heated is a rivet.

**158 Work holders:**

This subclass is indented under subclass 50. Subject matter relating to workpiece holders.

**SEE OR SEARCH CLASS:**

269, Work Holders, for unheated devices.

**159 Rotating supports:**

This subclass is indented under subclass 158. Subject matter having a rotating support for the workpiece.

**160 Mandrels (e.g., anvil):**

This subclass is indented under subclass 158. Subject matter having a mandrel.

**161 Clamp:**

This subclass is indented under subclass 158. Subject matter having clamping means.

**162 Methods:**

This subclass is indented under subclass 50. Methods.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

58, for wire, rod or bar electric heating methods.

83, for electric pressure bonding methods utilizing roller electrodes.

91.1+, for miscellaneous spot pressure electric bonding methods.

96, for percussive electric bonding methods.

99, 100, for flash electric bonding methods.

104+, for butt electric bonding methods.

117.1+, for miscellaneous pressure electric bonding methods.

137, for arc welding methods.

603+, for induction heating.

**200 HEATING DEVICES:**

This subclass is indented under the class definition. Subject matter which includes significant structural details of miscellaneous devices of

general utility whereby electrical energy is converted to thermal energy and in which thermal energy is utilized to raise the temperature of some material or object from a first value to a second higher value and not otherwise classifiable above in this class or other art class. In order to be classifiable in this class the claimed subject matter should include only means for utilizing the thermal energy generated in general terms.

(1) Note. The patents in this and the indented subclasses include only those devices in which the claimed subject matter includes specific details of electrical heating means whereby thermal energy is generated and transmitted to a space or an object (load) with no significant structural details of the load recited.

(2) Note. The heating devices to be found herein include specifically recited electrical heating devices combined with material to be heated in which the claimed combination does not constitute a part of a system or apparatus properly classified in another art class and sub-combinations or elements of such heating devices which do not of themselves comprise subject matter classifiable elsewhere.

(3) Note. Patents in which the claimed subject matter is restricted to methods of heating and in which no apparatus claims appear will not ordinarily be classified in this or the indented subclasses, except in cases where an apparatus of the type, which if claimed, would be classifiable in this class, is shown and disclosed and there is no other appropriate class for the method alone.

(4) Note. Patents claiming the combination of particular art device structure with electric heater structure are, in general, classified with the particular art device.

(5) Note. Patents in which the claimed subject matter includes means to effect a change of physical state or of chemical composition of a material, and which may include electric heating means, will not be found in this class, but in the

appropriate physical or chemical change class to which it appertains. The only exceptions provided for in this class are electric water heaters which may in the process of heating the water, generate steam or vapor and wherein no specific use of the steam or vapor aside from assisting in the heating function is claimed and electrically heated vessels and crucibles which may be utilized for melting material at low melting temperatures.

- (6) Note. Patents in which the claimed subject matter includes both heating and cooling of a material in sequence will not ordinarily be found in this class. Class 165 is the generic class relating to the transfer of heat from one material to another and includes all means for modifying temperature not found in other classes. Subclass 58 of Class 165, e.g., provides for selectively or simultaneously heating and cooling external material. For other classes and subclasses utilizing heat exchange, see "SEARCH CLASS" under the class definition of Class 165.
- (7) Note. See "SEARCH CLASS" under Paragraph II in the class definition above and see SEARCH CLASS notes below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 50+, for electrical metal heating apparatus or methods.  
 600+, for inductive heating.  
 678+, for microwave heating.  
 764+, for capacitive dielectric heating.

SEE OR SEARCH CLASS:

- 15, Brushing, Scrubbing, and General Cleaning, subclasses 250.05+ for window cleaning attachments combined with heating means (including electrical heaters). (See (7) Note, above.)  
 36, Boots, Shoes, and Leggings, subclass 2.6 for those with heaters. (See (7) Note, above.)  
 53, Package Making, subclass 373.7, and see the "Notes" thereto for heat seaming combined with a packaging operations. (See (7) Note, above.)

- 99, Foods and Beverages: Apparatus, subclasses 324+ for cooking apparatus, especially subclass 358 for electrode type of cooking apparatus that heats food by running electricity through it.  
 100, Presses, subclasses 92+ for a press including means of treating material by heating, cooling, or drying.  
 126, Stoves and Furnaces, subclasses 204+ for body warmers having nonelectrical heating means. (See (7) Note, above.)  
 165, Heat Exchange, see (6) Note above.  
 196, Mineral Oils: Apparatus, subclass 121, for electrically heated mineral oil apparatus. (See (7) Note, above.)  
 201, Distillation: Processes, Thermolytic, subclass 19 for a thermolytic distillation process in which the distilland is heated by electrical energy. (See (7) Note, above.)  
 204, Chemistry: Electrical and Wave Energy, for chemical processes and apparatus for utilizing electrical energy for purposes other than mere heating. (See (7) Note, above.)  
 250, Radiant Energy, subclass 324 for methods and apparatus to irradiate objects by corona irradiations, subclasses 428+ for methods and apparatus to contain, support or transport fluent material with or without irradiating the material, subclasses 453.11+ for methods and apparatus to support an object with or without an irradiating source and subclasses 492.1+ for methods and apparatus to irradiate objects or material. (See (7) Note, above.)  
 313, Electric Lamp and Discharge Devices, subclass 337 for indirectly heated cathodes for electric space discharge devices which consist of a heater and a separate cathode surface which is to be heated thereby. (See (7) Note, above.)  
 338, Electrical Resistors, appropriate subclasses, for electrical resistors commonly called heaters but not characterized by some feature especially adapting the unit for use as a heater. See also the reference to Class

- 338 under the class definition above, and also see the class definition of Class 338. (See (7) Note, above.)
- 374, Thermal Measuring and Testing, subclass 182 for a thermocouple thermometer having reference junction temperature control. (See (7) Note, above.)
- 383, Flexible Bags, subclass 901 for non-electrical heating bag. (See (7) Note, above.)
- 604, Surgery, subclass 114 for electrical means for heating or cooling the body device, or the treating material introduced or removed from the body. (See (7) Note, above.)
- 607, Surgery: Light, Thermal, and Electrical Application, subclass 96 for devices for modifying the temperature of the body limited by claimed structure to therapeutic use. (See (7) Note, above.)

**201 Combined with diverse-type art device:**

This subclass is indented under subclass 200. Subject matter wherein the heating device is combined with other devices or mechanical structure having an added purpose or utility independent of the heating device and in which the utility of the other art device is not destroyed by the removal of or deactivation of the heating device and which claimed combination does not include sufficient specific structure of the other art device as to be classified either with the other art device, per se, or elsewhere.

- (1) Note. See the appropriate other art class in the Manual of Classification for specific other art devices which are combined with heating means.

**202 Vehicle or vehicle component:**

This subclass is indented under subclass 201. Subject matter wherein the diverse type art device comprises a vehicle or component thereof. The component may be a device which aside from and taken separately from the combination with a vehicle may have attained a separate status in the art; for instance, carburetor, radiator, etc.

**SEE OR SEARCH CLASS:**

- 105, Railway Rolling Stock, subclass 451 for heating devices for rolling stock.
- 123, Internal-Combustion Engines, subclasses 543+ for carburetors with heating, subclasses 41.01+ for cooling systems, subclasses 145+ for incandescent igniters, and subclass 142.5 for heating means.
- 180, Motor Vehicles, appropriate subclasses for a motor vehicle, generally, and for a motor vehicle having a component of a kind which is specifically provided for therein.
- 237, Heating Systems, subclasses 5+ for automatic air heaters, subclasses 12.4+ for heat and power plants for cars and subclasses 28+ for vehicle heaters in general.
- 244, Aeronautics and Astronautics, subclass 134 for ice prevention devices for air craft.
- 296, Land Vehicles: Bodies and Tops, subclasses 84.1+ for windshields.

**203 Windshield or window:**

This subclass is indented under subclass 202. Subject matter wherein the diverse type art device comprises a windshield or other transparent surface of a vehicle provided for the purpose of admission of light or air or viewing the area exterior to the vehicle.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 522, for wherein a housing or casing may perform plural functions (e.g., heated transparent housing).

**SEE OR SEARCH CLASS:**

- 244, Aeronautics and Astronautics, subclass 121 for shields and other protective devices, and subclass 134 for ice prevention devices.
- 296, Land Vehicles: Bodies and Tops, subclasses 84.1+ for windshields.

**204 Steering device:**

This subclass is indented under subclass 202. Subject matter wherein the other art device comprises the steering wheel or other steering device for a vehicle.

## SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclass 552 for hand steering wheels.  
 180, Motor Vehicles, subclasses 400+ for motor vehicle steering gear.

**205 Motor or engine:**

This subclass is indented under subclass 202. Subject matter wherein the diverse type art device comprises the motor or a component thereof of a vehicle.

## SEE OR SEARCH CLASS:

- 123, Internal-Combustion Engines, subclass 142.5 for internal combustion engines with external heating means and subclasses 145+ for engines with incandescent igniters.

**206 Manifold:**

This subclass is indented under subclass 205. Subject matter wherein the other art device comprises the manifold of an internal combustion engine.

## SEE OR SEARCH CLASS:

- 123, Internal-Combustion Engines, subclass 142.5 for internal combustion engines with external heating means for heating some part or adjunct thereof.

**207 Carburetor:**

This subclass is indented under subclass 205. Subject matter wherein the other art device comprises carburetor means.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 271+, for heating devices with vaporizing means.

## SEE OR SEARCH CLASS:

- 123, Internal-Combustion Engines, subclass 26 for carburetors providing additional air supply, and subclasses 434+ for charge forming devices for internal combustion engines.  
 261, Gas and Liquid Contact Apparatus, subclasses 127+ for devices combined with external supply or removal of heat, particularly indented subclasses

139 and 142 for such devices with electric heaters.

**208 Radiator or cooling system:**

This subclass is indented under subclass 205. Subject matter wherein the other art device comprises the radiator or other part of the cooling system of an automobile.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 296+, for liquid heaters having forced circulation means, subclasses 379+ for fluid heaters in general utilizing forced circulation, and subclasses 375, 404, 434, 443, 466, 530, and 540 for heaters with heat storage or transfer means.

## SEE OR SEARCH CLASS:

- 123, Internal-Combustion Engines, subclasses 41.04+ for cooling system structure, and subclass 142.5 for the combination of an internal combustion engine with external means for heating the radiator.  
 137, Fluid Handling, subclass 341 for means for heating or cooling fluid handling systems combined with electrical heating means for the system.  
 165, Heat Exchange, subclasses 41+ for heat exchange devices combined with vehicle feature.  
 180, Motor Vehicles, subclasses 68.4+ for a motor vehicle having means for mounting a radiator for the vehicles motor.

**209 Electrical devices:**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises a device which is electrically operated or whose operative function is to control the condition of an electrical circuit, such as a motor or switch.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 511, for thermally responsive circuit actuating means with auxiliary heating means.

## SEE OR SEARCH CLASS:

- 310, Electrical Generator or Motor Structure, subclasses 341+ for piezoelectric crystals combined with temperature control means, subclass 16 for reciprocating dynamoelectric devices with temperature modification means and subclass 110 for clutches or brakes with means to dissipate induced energy in an external impedance.
- 313, Electric Lamp and Discharge Devices, subclasses 15+ for discharge devices with electric heater temperature modifying means.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 32+ for systems with load device temperature modifying means and electrical circuit device, particularly subclasses 46+ and 49+.
- 322, Electricity: Single Generator Systems, subclass 81 for thermally varied resistance impedance circuit control means.
- 329, Demodulators, subclass 202 for detectors wherein the signals effect a thermal charge in an impedance.
- 331, Oscillators, subclass 70 for oscillators with a temperature modifier and, subclass 78 for electrical noise or random wave generators of a gaseous type with heating coil means.
- 332, Modulators, appropriate subclasses for thermal modulators.
- 336, Inductor Devices, subclasses 55+ for inductor devices with temperature modification means.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 75, 102+, 120, 141, and 377 for specific type electrothermal and thermal responsive actuating means.
- 338, Electrical Resistors, subclass 7 for temperature compensated resistive value of a resistor, and subclass 23 for an indirectly heated thermistor.
- 340, Communications: Electrical, subclass 387.1 for an audible signaling device with weatherproofing (e.g., means to melt sleet off of a signal device, etc.).
- 343, Communications: Radio Wave Antennas, subclass 704 for antennas with ice clearer or prevention means.

**210 Crystal or other vibratory device:**

This subclass is indented under subclass 209. Subject matter wherein the other art device comprises a piezo crystal or other vibratory device.

## SEE OR SEARCH CLASS:

- 310, Electrical Generator or Motor Structure, subclasses 341+ for piezoelectric crystals with temperature control means, and subclass 16 for reciprocating or vibratory motors with temperature modification.

**211 Apparel:**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises a garment or other article of wearing apparel, usually having means whereby the apparel may be attached to or supported by the human body.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 527, for heating unit adapted to be body supported.

## SEE OR SEARCH CLASS:

- 2, Apparel, appropriate subclasses for particular structure of devices of wearing apparel for the body which may be combined with heating means.
- 36, Boots, Shoes, and Leggings, subclass 2.6 for boots and shoes combined with electric heating means.
- 126, Stoves and Furnaces, subclasses 204+ for body warmers consisting of a garment combined with nonelectric heating means.
- 607, Surgery: Light, Thermal, and Electrical Application, subclass 1.5 for electrically heated garments combined with means for setting up an electric field for the treatment of the body, subclass 96 for light, thermal, or electrical applicators adapted to be worn on the body for therapeutic reasons, and subclass 143 for body member enclosing thermal applicator.

**212 Bed covering (e.g., blanket):**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises a blanket or other bed covering.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 529, for flexible heating unit structure utilizing cloth or other fabric.
- 549, for heating element with support of flexible material.

SEE OR SEARCH CLASS:

- 5, Beds, subclasses 421+ for a bed, bed clothing, or a bed accessory combined with heating means.
- 607, Surgery: Light, Thermal, and Electrical Application, subclass 1 for beds with thermal or electrical energy applicators, and subclass 96 for thermal applicators in general.

**213 Static structure (e.g., building pavement, etc.):**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises an element of a building, road, pavement or other permanently fixed static structure.

SEE OR SEARCH CLASS:

- 104, Railways, subclass 279 for electric rail heaters.
- 119, Animal Husbandry, subclasses 302+ for brooder houses with heating means, and subclass 73 for stock watering troughs with temperature control.
- 165, Heat Exchange, subclass 49 for radiant building panels.
- 191, Electricity: Transmission to Vehicles, subclass 27 for heated conductors of the third rail type.
- 246, Railway Switches and Signals, subclass 428 for heated switches.
- 392, Electric Resistance Heating Devices, subclasses 453+ for panel-type radiant heating devices adapted to form a part of or be attached to a building structure.
- 405, Hydraulic and Earth Engineering, subclass 131 for radiant panels used for thawing the earth.

**214 Vending, dispensing, or display device:**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises a vending, dispensing or display device.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 267, for igniters of the cigar or cigarette lighter type which may be disclosed as combined with a particular housing such as a display or dispensing means.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclasses 88 and 237 for dryers combined with display, inspection or illuminating means.
- 40, Card, Picture, or Sign Exhibiting, subclass 461 for cigar lighters combined with a changeable exhibitor.
- 99, Foods and Beverages: Apparatus, appropriate subclasses for beverage or food preparation devices with dispensing or display means.
- 141, Fluent Material Handling, With Receiver or Receiver Coacting Means, subclass 82 for fluent material handling apparatus with material heating or cooling means.
- 221, Article Dispensing, appropriate subclasses for article dispensing devices which may be combined with igniting (subclasses 143+) or temperature, (subclass 150) control devices such as cigarette dispensers.
- 222, Dispensing, appropriate subclasses, especially subclass 146 for dispensing devices combined with heating or cooling means.
- 312, Supports: Cabinet Structure, appropriate subclasses, especially subclass 114 for cabinets of the display case type which may be combined with heating means, and subclass 236 for cabinets in general with heating means.

**215 Shoe machinery:**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises mechanisms specifically designed

for the manufacture and repair of foot coverings.

**SEE OR SEARCH CLASS:**

12, Boot and Shoe Making, appropriate subclasses for shoe machinery combined with adhesive material heating or melting, thread warming or wax melting devices.

**216 Printing or reproduction device:**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises a printing or other type of reproduction device.

(1) Note. Thermal print heads and similar devices which use a plurality of heaters to form a character to be printed are classified in Class 347, subclasses 171+.

**SEE OR SEARCH CLASS:**

101, Printing, subclasses 8, 9, 21, 25, 27, and 31 for embossing devices utilizing heated dies.

346, Recorders, subclass 76.1 for phenomenal recording using heat.

347, Incremental Printing of Symbolic Information, subclasses 171+ for thermal print head and similar devices which use a plurality of heaters to form symbolic information.

355, Photocopying, subclasses 100 and 106+ for devices for successively printing portions of a sensitized surface which may employ heating means.

399, Electrophotography, subclasses 328+, 330+, and 335+ for devices for fixing or fusing a toner image surface which use heating means.

430, Radiation Imagery Chemistry: Process, Composition, or Product Thereof, subclass 203 for transferring image using heat; and subclass 336 for heat developing.

**217 Chair, bed, or other body-supporting means:**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises a chair, seat, bed or other support means for the human body.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

528+, for flexible or resilient housing structure adapted for use with electrical heating devices under the class (219) definition.

**SEE OR SEARCH CLASS:**

4, Baths, Closets, Sinks, and Spittoons, subclasses 237+ for toilet seats and covers.

5, Beds, subclass 284 for beds with heating or cooling devices, and subclasses 421+ for heated mattresses.

297, Chairs and Seats, subclasses 180.1+ for chairs or seats combined with heat exchange means.

607, Surgery: Light, Thermal, and Electrical Application, subclass 1 for couches, beds, chairs and seats adapted for thermal application or therapeutic treatment.

**218 Table or cabinet:**

This subclass is indented under subclass 201. Subject matter wherein the other art device comprises an article of furniture consisting of (1) a smooth flat slab, board or the like supported on legs or (2) a cabinet type enclosure means for storage of articles.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

213, for heaters associated with buildings, roads, pavements and the like.

214, for heaters associated with dispensing cabinets.

443+, for heating devices combined with a horizontal or planar heating surface which may be supported on a working counter, heating cabinet, stove top or other table like surface.

**SEE OR SEARCH CLASS:**

62, Refrigeration, subclasses 275+ for electric refrigerator cabinets with electrically heated defrosters.

108, Horizontally Supported Planar Surfaces, appropriate subclasses for specific table structure.

312, Supports: Cabinet Structure, appropriate subclasses especially subclass 236 for cabinet structures with heating, cooling or heat exchange means.

**219 Mirror:**

This subclass is indented under subclass 201. Subject matter wherein the diverse type art device comprises a mirror.

(1) Note. Mirror devices with electrical heating means are ordinarily classified here, provided that the mirror structure is claimed broadly or in name only. For heated mirror structure combined with significant optical features the search will be in Class 359, Optical: Systems and Elements, subclasses 507+.

**SEE OR SEARCH CLASS:**

376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 100+ for plasma heating, laser heating, or electron or ion beam heating of a material or a plasma to obtain a nuclear fusion reaction.

**220 Light means:**

This subclass is indented under subclass 201. Apparatus wherein the other art device comprises illumination means, broadly with significant electrical heating means.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

230, for heated-tip hand tool with illumination means.

**SEE OR SEARCH CLASS:**

250, Radiant Energy, subclass 495.1 for plural radiant energy sources including heat generator.

313, Electric Lamp and Discharge Devices, subclass 15 for electric lamp or discharge device with electric heating means.

362, Illumination, subclasses 92+ for the combination of specific light means with other structure which may be a heating device.

**221 Tool or instrument:**

This subclass is indented under subclass 200. Subject matter wherein an electrical means heats a tool or instrument which is not otherwise classified.

(1) Note. Included in this and the indented subclasses are patents in which the claimed subject matter includes the combination of a tool or instrument with a stand or support when the tool or instrument is not a hand held or manipulative tool or instrument.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

201+, for electric heaters combined with a diverse type art device.

**SEE OR SEARCH CLASS:**

30, Cutlery, subclass 140 for cutting tools with heater.

126, Stoves and Furnaces, subclasses 226+ for tool heaters of the nonelectric type and subclasses 401+ for a self-heated tool utilizing liquid or gaseous fuel.

**222 Hair heaters:**

This subclass is indented under subclass 221. Subject matter wherein the tools or instruments under the definition of ... are for hair heating, treating or curling purposes, are formed into systems which utilize a plurality of tools or instruments for heating, treating or curling the hair with or without voltage or current control of the system, or wherein the tools, instruments or the system have manual or automatic connection and/or disconnection devices.

(1) Note. If in the claim the hair is included in the electrical circuit of the tool, instrument or the system, or the hair somehow is held or contained by the tool or instrument, the claim is properly classified in Class 132, Toilet. See Class 132, subclass 7 for all hair treating methods involving the hair on the scalp and subclasses 31+ for crimpers or curlers having crimping jaws, winding forms or mandrels which include rotating means and hair clamping jaws.

- (2) Note. Included in this subclass are instruments to produce a vapor which will contact the hair for hair treating purposes.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 156, for means for electrically heating metal rods or bars.
- 271+, for vaporizer means where the vapor is not used specifically for heat transfer or for hair heating, treating or curling purposes.
- 284+, for electrolytic liquid heaters where the liquid to be heated forms part of the electric heating circuit.
- 520+, for housings, casing, and support means for heating units which include means to hold or support the material to be heated, flexible casings, housings specially formed or adapted to fit the material to be heated, and hinged or separable compartments.

**SEE OR SEARCH CLASS:**

- 15, Brushing, Scrubbing, and General Cleaning, subclasses 160 and 504 for brushes with heating means.
- 30, Cutlery, for hand held cutlery implements for cutting hair, particularly subclasses 195+ for hair shears and thinners. See the notes under subclass 223 of this class.
- 34, Drying and Gas or Vapor Contact With Solids, subclass 283, for processes for drying human hair while on the head and subclasses 96+ for apparatus for drying the hair on the head which includes structure to adapt the apparatus to the head of a person.
- 132, Toilet, subclass 7 for methods of treating the hair on the scalp which includes cutting, softening or straightening and subclass 118 for heated combs or combs combined with additional features.
- 604, Surgery, subclass 23 for applying gas to the body; and subclass 291 for heating or cooling material applied to or removed from the skin.

- 607, Surgery: Light, Thermal, and Electrical Application, subclass 79 for brushes and combs for thermal applications.

**223 Singeing apparatus:**

This subclass is indented under subclass 222. Subject matter wherein the structure includes electrical heating means adapted to contact the hair or to be used with additional structure to transmit its heat to the hair for the purpose of hair singeing.

- (1) Note. Since the singeing instruments could be used for cutting, a search should also be made in Class 30, Cutlery. See subclasses 32+ for electrically heated hot wire type hand held razors for fixed or moving hot wire cutters and subclass 140 for cutters in general combined with heater. A claim to a hand held apparatus for cutting hair by an electrically heated wire would be classified in Class 30, Cutlery.
- (2) Note. Class 606, Surgery, subclasses 27+, for heat applying surgical instruments, subclasses 32+, for heated surgical instruments which include cauterizers for cutting, sterilizing and coagulation of a wound. These instruments are structurally similar to those instruments found in this subclass and those listed in the search class notes of this subclass.
- (3) Note. Class 132, Toilet, subclass 7 will take methods for cutting or singeing the hair on the scalp but this class will not take any instruments which are not specifically adapted for use on the head of a person. See subclass 9 for hair singers specifically adapted for use on a person's head and subclass 118 for hair singers combined with combs.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 233+, 236+ or 260+, for similar hand held instruments which utilize a heated wire or other type of electrically heated tip to cauterize, mark, burn or ignite material, or to heat material for soldering purposes. Note the cauter-

izers in this class are similar to those found in Class 128.

**SEE OR SEARCH CLASS:**

- 26, Textiles: Cloth Finishing, subclasses 3+ for cloth singers.
- 28, Textiles: Manufacturing, subclasses 174 and 239 for singeing apparatus for warp and thread.
- 30, Cutlery, see the (1) Note to this subclass and (4) Note under the class definitions of Class 30.
- 56, Harvesters, subclass 229 for an electrically heated hot wire mower of crops.
- 83, Cutting, particularly subclass 171 and other appropriate subclasses for electrically heated nonhand held machine type cutters of the hot wire type, which include those for making ice cubes and cutting plastics where there is no shaping or forming other than that caused by the cutting.
- 118, Coating Apparatus, subclass 47 for means for burning off of coating ingredient.
- 128, Surgery, see the (2) Note to this subclass.
- 132, Toilet, see the (3) Note to this subclass.
- 452, Butchering, subclass 73 for hot wire singers for hog or fowl.

**224 Electrolytic:**

This subclass is indented under subclass 222. Subject matter wherein there are hair heaters of the type which utilize an electrolyte which when placed in an appropriate electrical circuit will produce anions and cations, the movements of these anions and cations cause the heat which is used for hair heating and/or treating purposes.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 271+, for vaporizers with the specific use of the vapor other than heat transfer.
- 284+, for liquid heaters which have the liquid to be heated in the electrical heating circuit.
- 360, for convection type fluid heaters with ionizing or ozonizer means.

**SEE OR SEARCH CLASS:**

- 205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, for electrolysis, in general, which is employed for a purpose other than merely for heating.
- 361, Electricity: Electrical Systems and Devices, subclasses 500+ for electrolytic devices (capacitors, rectifiers, active elements, e.g.), and systems therefor.

**225 With heated clamp means (e.g., hand-held):**

This subclass is indented under subclass 222. Subject matter wherein the structure comprises clamping devices which encompass strands of hair usually wound on winding forms or mandrels.

- (1) Note. Included in this subclass are all patents to hand held scissors type electrically heated curling irons in which the claims or specification do not recite that the iron is used for curling human hair.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 524+, for housing, casings, or supports comprising hinged or separable compartments with or without a plurality of heating unit means not restricted to any special use.
- 536+, for housings, casings, or supports with significant heating unit mounting or attaching means.

**SEE OR SEARCH CLASS:**

- 126, Stoves and Furnaces, subclass 400 for heat accumulator structures whose material composition is such that it may be utilized for hair heating clamps.
- 132, Toilet, subclasses 32, 34 and 37 wherein the art includes structure whereby the hair on the scalp is clamped between electrically heated members to form the wave, the hair on the scalp is clamped by a hand held jaw and wound about on the clamped jaw to form the wave, or the hair is wound on a form or mandrel, clamped

and held in place by an electrically heated member.

**226 With heated casing:**

This subclass is indented under subclass 222. Subject matter wherein the structure includes electrically heated casings which encompass strands of hair usually wound on winding forms or mandrels.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 460, for heaters with means to adjust heating unit to shape of material heated.
- 524+, for significant housing or casings which comprise hinged or separable compartments with or without a plurality of heating units not restricted to any special use.
- 534, for rigid tubular housings or casings which include an electrical heating device.
- 535, for casings or housings specially formed or adapted to fit the material to be heated.

SEE OR SEARCH CLASS:

- 132, Toilet, subclasses 36+ for hair winding forms or mandrels with surrounding electrical heaters and heat protectors or tubes and wrappers.

**227 Hand-manipulative:**

This subclass is indented under subclass 221. Subject matter wherein the tool or instrument includes structure adapted to manually hold or manipulate the tool or instrument while in use.

- (1) Note. Included in this subclass are branding irons which have fixed characters or indicia but not those irons which can be used for other purposes. See subclasses 229+ for these irons. If the claim states the branding unit is in the form of letters or numerals, classification will be in Class 101, Printing, appropriate subclass.
- (2) Note. Included in this subclass are tools to partially delaminate the plastic liner or multiple ply glass sheets.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 222+, for hand held or manipulatable tools or instruments for heating, treating or curling the hair on the head of a person.
- 245+, for hand manipulatable tools or instruments involving the use of pressure such as laundry irons.
- 346, for transportable radiant type fluid heaters.
- 386+, for portable heater containers with material support.
- 533, for portable (with handle, e.g.,) heater structures in general.

SEE OR SEARCH CLASS:

- 7, Compound Tools, appropriate subclasses for miscellaneous hand held compound tools which are not classified elsewhere.
- 15, Brushing, Scrubbing, and General Cleaning, particularly subclass 160 for brushes which may be electrically heated.
- 16, Miscellaneous Hardware (e.g., Bushing, Carpet Fastener, Caster, Door Closer, Panel Hanger, Attachable or Adjunct Handle, Hinge, Window Sash Balance, etc.), subclasses 110.1+ for handles in general.
- 26, Textiles: Cloth Finishing, subclass 6 for electrically heated singeing elements which may be hand held.
- 28, Textiles: Manufacturing, subclasses 174 and 239 for electrically heated singers for preparing the warp or finishing thread which may be hand held.
- 30, Cutlery, particularly subclasses 32+ and 140 for hand held tools electrically heated which include heated blade type razors, cutting shears and hole forming devices where no molding takes place in the forming of the hole.
- 69, Leather Manufactures, particularly subclass 20 for hand held electrically heated wires or blades to remove hair from hides and tools for combing and glazing fur.
- 81, Tools, for hand held and bench type electrically heated wire strippers and

- appropriate subclasses for nonheated hand held tools not specifically provided for elsewhere.
- 83, Cutting, subclass 171 for a cutting tool which is heated.
- 101, Printing, subclasses 3.1+ for hand held electrically heated instruments that burn, emboss, or penetrate the material to produce characters or designs and subclass 371 for mail cancelling stamps.
- 126, Stoves and Furnaces, subclasses 220+ for heaters for tools and subclasses 401+ for a self-heated tool.
- 138, Pipes and Tubular Conduits, subclasses 33 and 35 for electric heaters which may be hand manipulable for thawing or preventing the freezing of fluid pipes.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, for methods and apparatus for making laminar material, particularly subclass 579 for hand manipulative devices having structure particularly adapted for bonding laminar material including plastic.
- 174, Electricity: Conductors and Insulators, subclass 46 for handles in general relating to electrical conduits, cables, and conductors.
- 294, Handling: Hand and Hoist-Line Implements, subclasses 49+ for hand forks or shovels which may include electrically heated ice cream scoops or dippers.
- 401, Coating Implements With Material Supply, subclasses 1+ for a hand-manipulated coating implement including means to heat the coating material (e.g., sealing wax applicators).
- 416, Fluid Reaction Surfaces (i.e., Impellers), subclass 71 for hand manipulatable impellers which may be electrically heated.
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 12 for a hand manipulable tool including a shaping surface disclosed for product repair; subclasses 276+ for a shaping means of the ice cream scoop type; and subclasses 318+ for a hand manipulable shaping couple.
- 452, Butchering, subclass 73 for fowl and hog singers which may be electrically heated and hand held or manipulated.
- 606, Surgery, subclasses 32+ for electrical applicators which include hand held electrically heated needles for cutting and coagulation which are structurally similar to the corresponding instruments found in this subclass.
- 228 With heat distribution means (i.e., heat applied to extended area):**  
This subclass is indented under subclass 227. Subject matter wherein electrical heating means is contained within or on an extended housing, casing or support designed to form a hand manipulative tool or instrument for distributing heat over a substantial surface area.
- (1) Note. This subclass includes, by way of example, means for heating a substantial area of a painted surface combined with a scraper for scraping off the heated paint.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 245+, for hand held pressure application means such as laundry irons which heat a substantial surface area.
- 443.1+, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.).
- SEE OR SEARCH CLASS:
- 15, Brushing, Scrubbing, and General Cleaning, subclasses 235.4+ for mason's trowels and floats and subclasses 236.01 for scrapers having a blade like edge used for cleaning and which trowels or scrapers may be electrically heated.
- 30, Cutlery, subclass 140 for hand held electrically heated scrapers, and subclasses 169+ for hand held scrapers, per se. See (1) Note to this class relative to the combination of a surface heater and a paint scraper.
- 81, Tools, subclass 3.5 for hand held or work-bench supported, electrically heated truncated mandrels for expanding spectacles frames.

**229 With heated tip or other heat concentration means (i.e., heat applied to localized area):**

This subclass is indented under subclass 227. Subject matter wherein the hand held tools or instruments have electrically heated tips rather than heated expansive areas forming the working area of the tool or instrument.

- (1) Note. Class 113 will take soldering tips, per se, which are heated as a result of heat transfer from some heating means, including electrical, where the tip is not stated as being in an electrical circuit or a tip of the soldering gun type.
- (2) Note. Hand held electrically heated burning in tools for filling in dents or scratches in furniture in general are placed here. However, Class 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 12 provides for such tools which will fill or mold to a predetermined depth or dimension.
- (3) Note. The subcombination of a tip and its heater of a tip-type hand held or manipulated tool or instrument is classified in the subclass containing the complete tool or instrument.

**SEE OR SEARCH CLASS:**

- 30, Cutlery, subclass 140 for hand held electrically heated cutting knives including honey uncapping knives and other sharpened-edge type tools or instruments, including tire treading and detreading and scrapers for defrosting windshields.

**230 With tip cooling, clamping, or lighting means:**

This subclass is indented under subclass 229. Subject matter wherein cooling, clamping or lighting means is combined with a hand held or manipulative tool or instrument.

- (1) Note. Included in this subclass are adjustable tips and solder and flux feeding means combined with a hand held soldering iron which include the tip, solder, and/or flux in an electrical circuit with the work.

- (2) Note. The line between Class 113 and Class 219 for the combination of an electrically heated, hand held soldering iron with solder feeding is: Class 113 will take the combination of solder and/or flux feeding with a hand held soldering iron when the tip, solder and or flux fed is not part of an electric circuit completed through the work which latter combination is provided for in Class 219. See (1) Note above.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 120, 129 and 158+, for the cooling of electrodes used in bonding under pressure, arc heating, electrodes which are adjustable, and workpiece holders used with the electrical heating of metal.
- 220, for a light combined with an electrically heated device which is not a hand tool or instrument.
- 421, for an electrically heated container which holds meltable material, i.e., melting pot.
- 521, for an electrical heating device combined with a housing, casing, or support which includes holding or support means for material to be heated.
- 531, for the combination of a housing, casing or support and cooling means with an electrical heating device.
- 540, for a significant heating unit with heat storage or transfer means.

**SEE OR SEARCH CLASS:**

- 228, Metal Fusion Bonding, subclasses 212+ for processes of soldering, brazing or welding employing clamps.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 498 and 538+ for cooling of the work and means to clamp laminae in assembled relationship.
- 165, Heat Exchange, appropriate subclasses for the cooling of heated tools or instruments.
- 269, Work Holders, appropriate subclasses for the generic class for structure to hold a workpiece.

- 313, Electric Lamp and Discharge Devices, subclasses 11+ and 146+ for temperature modifying devices and movable electrodes used with lamp or discharge devices respectively.
- 314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclass 134 for adjustable electrode supports.
- 362, Illumination, subclass 92 for a portable combination of a device with an illuminator.

**231 Convertible:**

This subclass is indented under subclass 229. Subject matter wherein the tool or instrument is so constructed that the adjustment, addition, removal or reassembly of one or more parts to or of the tool or instrument, causes the iron to be capable of performing some other function.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 249, below, for hand manipulable tools or instruments with pressure application means which are convertible to other forms or devices capable of performing a different function.
- 340, for fluid heaters of the radiant type convertible to another heater or nonheating device.
- 361, for convection heaters convertible to another type of heater or nonheating device.
- 416, for deep well type heaters convertible to another type of heater.
- 452.13, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a frame, casing or housing for a heating unit (e.g., range top, stove top, countertop, etc.) that is convertible.
- 472, for devices for performing plural functions simultaneously (e.g., heating and illumination) or convertible to another type heater or noncoating device.

**232 Internal arc-type heating unit:**

This subclass is indented under subclass 229. Subject matter wherein the tool or instrument utilizes an electric arc for the source of heat for the tip of the tool or instrument.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 121.11+, particularly subclass 129 for arc type heaters where the arc is drawn between the metal to be heated and an electrode or the arc is contiguous to the metal rather than internally of a tool or instrument. See also subclasses 54, 60+ and 69+ where an arc heater is utilized in the heating, cutting, or disintegration of metals.
- 383+, for electric arc heaters wherein the arc influences or passes through nonmetallic material to be heated.

SEE OR SEARCH CLASS:

- 313, Electric Lamp and Discharge Devices, appropriate subclasses for space discharge devices, per se.
- 314, Electric Lamp and Discharge Devices: Consumable Electrodes, appropriate subclasses for arc lamp, per se, of the consumable electrode type.
- 315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for systems for supplying electrical energy to discharge apparatus. See the Class 315 "Search Class" note to Class 219 for the line between Class 219 and Class 315.

**233 Tip in electrical circuit:**

This subclass is indented under subclass 229. Subject matter wherein the heated tip is in an electrical circuit and the tip itself or the tip and a highly resistive element part of the same circuit form the electrical heater of the tool or instrument.

- (1) Note. Included herein is the subcombination of the hand held or manipulative tool or instrument which is the "gun" type tip, per se, with or without electrical terminals which is also the electrical heater of the tool or instrument.
- (2) Note. The patents in this and the indented subclasses may use a granular, solid, loop or coiled wire type heater. Where the novelty resides in this type of heater, a search must be made in the appropriate subclasses of this class.

- (3) Note. Cloth markers utilizing tip heaters which are part of the electrical circuit will be placed in this group of subclasses.
- (4) Note. Included in this group of subclasses are needles, caponizers, cauterizing, coagulating, and cutting instruments of the same type found in the appropriate subclasses of Class 606, Surgery, subclasses 32+ for example.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 129+, for electrodes which are in the circuit for soldering or brazing purposes but use an arc heater rather than resistance heating of the tip and/or some high resistance material in the tool or instrument itself.

**SEE OR SEARCH CLASS:**

- 30, Cutlery, subclass 140 for hand held electrically heated wires used as cutters which go beyond mere heating of the material such as the forming of ice cubes from a block of ice, dairy products cutters, and hot wire type razors.
- 56, Harvesters, subclass 229 for a hand held electrically heated hot wire mower.
- 83, Cutting, for machine type cutters employing hot wire cutters and the cutting of plastic material where no molding or shaping takes place in addition to the cutting.
- 175, Boring or Penetrating the Earth, subclass 16 for hot wire cutting of natural ice formations.
- 606, Surgery, see (4) Note to this subclass.

**234 Work in circuit:**

This subclass is indented under subclass 233. Subject matter wherein the tip is composed of one or more electrodes which comprise the heater, per se, or the heater may be formed of one or more highly resistive elements contiguous to or adjacent the tip which heater completes its electrical circuit through means, usually the work, not part of the tool or instrument and its electrical circuitry to its power source.

- (1) Note. If the claimed combination includes the solder or brazing material in addition to the hand tool or instrument the patent should be placed in subclass 230 and cross referenced in this subclass.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 137.2+, for metal heating apparatus for producing a heating arc between the work and an electrode.
- 230, for clamping means combined with a heated tip tool where the clamping means is not part of the heating circuit.
- 284+, for heaters wherein the liquid heated is in the electrical circuit.

**SEE OR SEARCH CLASS:**

- 65, Glass Manufacturing, subclass 40 and 135.6+ for processes of heating glass by passing an electric current there-through; subclass 511 for means to heat a fiber or filament utilizing electric or electromagnetic heat.
- 81, Tools, subclass 9.22 for an implement with electrical circuitry to simultaneously mark on and perforate the surface (e.g., pen, tattooing device).
- 148, Metal Treatment, particularly subclasses 520, 525, and 565 for processes of significant heat treatment of metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal wherein electrical heating is utilized. See the Class Definition of Class 148 to determine what constitutes significant heat treatment.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclass 275 for methods of surface bonding wherein the work constitutes a conductor in an electrical circuit.
- 373, Industrial Electric Heating Furnaces, subclasses 120+ for furnaces wherein the charge may be in circuit.

**235 With transformer secondary:**

This subclass is indented under subclass 233. Subject matter wherein the electrical circuitry includes a transformer whose secondary usually is in circuit with the tip.

- (1) Note. Hand manipulative tools such as soldering brazing, burning, writing and surgical tools or instruments, which utilize inductive electrostatic or electromagnetic means to heat these tools, are excluded from subclasses 6.5+ of Class 219.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 234, for the tip and work coupled to a transformer forming part of the power supply.
- 240, for significant power supplies or voltage or current controls which may include a transformer in its circuitry.
- 618+, for closed transformer secondaries with or without a high resistive element in the circuit forming a heat exchange arrangement with the material to be heated.

SEE OR SEARCH CLASS:

- 30, Cutlery, subclass 140 for heated cutting blades which could utilize a soldering "gun" type heating means.

**236 Coil or loop-type heating element:**

This subclass is indented under subclass 229. Subject matter wherein the electrical heater of the hand held tool or instrument comprises a coiled or looped wire resistance heater.

- (1) Note. Included in this subclass are plural heating elements forming a heating unit which includes a switching arrangement to control the current to the heating unit or heating elements of diverse resistance characteristics and which automatically controls the current through the heating elements.
- (2) Note. Included herein is the subcombination of a hand held electrically heated tool or instrument which includes the heating unit and the tip but not the heating unit, per se, or the tip, per se.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 222+, for hair treating, heating or curling instruments which are hand manipulatable and which utilize coil or loop

type heating means in a similar manner.

- 254+, for sole plate pressure application means which may use coil or loop type heating means.

- 520+, for significant housing casing or support means, particularly subclass 530 for a heating unit which includes heat storage or transfer means.

- 538+, for significant heating unit structure, particularly subclass 540 which includes heat storage or transfer means.

- 552+, for heating elements, per se.

SEE OR SEARCH CLASS:

- 338, Electrical Resistors, appropriate subclasses for a resistor which is not stated as being an electrical heater.

**237 Integral with tip:**

This subclass is indented under subclass 236. Subject matter wherein the tool or instrument comprises a subcombination of elements which comprise an integral heater and tip or a heater plus tip unit, significantly adapted for use with the tool or instrument.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 544, for heating unit structure wherein the heating elements are embedded within or completely surrounded by a core, sheath, or support means.

**238 Detachable tip:**

This subclass is indented under subclass 236. Subject matter wherein means are provided for enabling the tip and the heater to be readily attached to or separated from each other.

SEE OR SEARCH CLASS:

- 279, Chucks or Sockets, for means for making a readily releasable connection between a holder and a body.

- 285, Pipe Joints or Couplings, appropriate subclasses, for pipe joint type couplings in general.

- 403, Joints and Connections, appropriate subclasses for joints and connections in general.

**239 Threaded:**

This subclass is indented under subclass 238. Subject matter wherein the means for effecting the separation or attachment of the tip and heater unit comprises a threaded connection.

**240 With power supply, voltage or current control, or connection and/or disconnection means:**

This subclass is indented under subclass 227. Subject matter wherein the structure includes details of means to supply current to the electrical heating means of the tool or instrument, or voltage or current control means responsive to the condition within or externally of the tool or instrument, or connection and/or disconnection means in the electrical circuit of the heating means of the tool or instruments.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

108+, for systems of current supply for resistance welding apparatus.

130.1+, for systems of current supply for arc welding apparatus.

222+, for systems utilizing hair treating, heating and/or curling which include power supplies, current or voltage control and connection and/or disconnection means.

250+, for significant power supplies and voltage or current control means used with hand held sole plate type pressure application means.

482+, for power supplies, voltage or current regulation or control means not associated with any particular type of electrically heated tool, instrument or device.

507+, for significant current connection and/or disconnection means not associated with any particular type of electrically heated tool or instrument or device set forth in this class.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclasses 51+ for the combination of a Class 439 quick make and break connector with or acting as a Class 200 circuit maker and breaker in an integral unit, subclasses 332.1+ for mechanical quick make and break

switches including those mounted on handles.

218, High-Voltage Switches With Arc Preventing or Extinguishing Devices, subclasses 1+ for arc preventing and extinguishing combined with switches.

307, Electrical Transmission or Interconnection Systems, appropriate subclasses for plural supply and/or plural load circuits for controlling the current or load circuits.

323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for current or load regulation, transformer, impedance and phase control systems involving a single source of power and a solitary load device where no particular art devices are involved.

361, Electricity: Electrical Systems and Devices, subclasses 139+ for electromagnetic device control circuit.

**241 With thermal control means:**

This subclass is indented under subclass 240. Subject matter including thermally expandable bars, bimetallic elements, expandable fluids, thermomagnetic elements, thermocouples or other thermal devices which are responsive to the temperature of the tool or instrument to control the voltage or current to the electrical heating means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

251+, for thermally responsive current control means for heaters used in sole plate type pressure application means.

494+, for thermally responsive voltage or current regulation or control systems which are more complex or comprehensive than a thermally operated switch, per se.

510+, for thermally responsive switches which include expandable solids, fluids and fusible elements.

SEE OR SEARCH CLASS:

337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for thermal current actu-

ated or thermally responsive switches of the same type found in Class 219, subclasses 510+ but not in combination with an electric heating load.

**242 Supports:**

This subclass is indented under subclass 227. Subject matter including support means for hand held electrically heated metallic tip type tools or instruments and which means are more than mere stands or brackets and which include electrical circuitry to transmit and/or control the electrical energy supplied to electrical heating means on the support and/or the tool or instrument and which support may include heat exchange means to the tool or instrument.

- (1) Note. Included in this subclass are electrically heated supports with or without current control for heating hand held or manipulative tools or instruments which include curling irons and clamps which do not have a self-contained heater and supports including electrical circuitry for transmitting power to self-contained heater type hand held or manipulative tools or instruments not otherwise provided for.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 246+, for stands for hand held flatirons or the like with electrical circuitry.  
259, for supporting devices for electric flatirons, for example.  
267, for support for electrical igniters.  
429+, for electrically heated vessels and stands therefor.

**SEE OR SEARCH CLASS:**

- 165, Heat Exchange, subclasses 80.1+ for retainers for removable articles where a heat exchange is involved.  
248, Supports, appropriate subclasses for supports for hand held or manipulable tools or instruments where a stand or support does no more than support the tool or instrument. See particularly subclasses 51+, 127+, 511+.

**243 Combined with pressure application means:**

This subclass is indented under subclass 200. Apparatus including heating devices combined with pressure application means cooperating

with the heating device in such a manner that pressure is applied to an object to be heated simultaneously with the heating operation and such apparatus not being provided for in another art class.

**SEE OR SEARCH CLASS:**

- 8, Bleaching and Dyeing; Fluid Treatment and Chemical Modification of Textiles and Fibers, subclasses 137+ for general laundry processes which may include ironing.  
12, Boot and Shoe Making, subclass 57.1 for shoe making machinery involving the upper part of the shoe where a seam is turned and the seam is pressed by any type of structure.  
38, Textiles: Ironing or Smoothing, for the generic class for devices and processes for producing a smooth appearance on a surface of a textile article or fabric, particularly subclasses 1+ for smoothing machines including platen pressers under subclasses 17+ and roller pressers under subclasses 44+, subclass 99 for stationary nonplanar pressing surfaces including electrically heated pressing irons, subclass 100 for smoothing implements consisting of a roller or rollers, subclasses 103+ for ironing tables including electric heaters and vaporizers, subclass 141 for miscellaneous devices necessary to ironing and subclass 144 for processes relating to the smoothing and ironing of fabrics not otherwise provided for.  
53, Package Making, appropriate subclasses for package making apparatus which may utilize physical pressure and electric heating simultaneously.  
69, Leather Manufacturers, particularly subclass 7 for seam pressing machines for leather goods, subclass 27 for fur smoothing and subclasses 37 to 48 which may include a surface to iron or smooth the leather goods.  
72, Metal Deforming, subclasses 200+ for a method or apparatus for heating or cooling metal in conjunction with deforming it between rollers.  
100, Presses, for the generic class for apparatus for subjecting material to compressive force by causing solid

- surfaces to approach one another while the material is between them, particularly subclasses 92+ for presses combined with heating, cooling or drying means.
- 126, Stoves and Furnaces, particularly subclasses 227+ for nonelectrical stoves or furnaces and attachments for the stoves or furnaces specially designed for heating of sadirons and subclass 230 for the heating of sadirons by nonelectrical stoves or furnaces using gaseous or liquid fuel.
- 131, Tobacco, subclasses 315+ and 324+ for tobacco treatment including the smoothing of tobacco leaves by pressing with stemming and booking which could include heating of the leaves for the purpose of smoothing.
- 144, Woodworking, subclasses 254+ for heating of wood and bending it to conform to a desired shape which may utilize electrically heated means.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclass 499 for separate nonpress heating means for work, subclass 579 for handle or hand grip heated tools for heat bonding laminar plastic sheet, subclass 580 for presses which include heated presses not of general application specific to the forming of laminar material.
- 223, Apparel Apparatus, subclasses 35+ which includes combined sad and fluting irons and hand irons housing teeth intermeshing with a bed and subclasses 52+ for collar, cuff and neckband ironers.
- 244 Rotatable:**  
This subclass is indented under subclass 243. Subject matter wherein the pressure application means comprises rotatable cylinder or other means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 388, for the combination of an electrically heated container for enclosure with a conveyor which may be of the roller type to transport material through the enclosure.
- 469, for the combination of an electrically heated roller whereby material may be heated while passing over or around the roller or roller means.
- SEE OR SEARCH CLASS:
- 38, Textiles: Ironing or Smoothing, subclasses 44+ for ironing machines including one or more rollers associated with heat for the purpose of pressing textile fabrics, subclass 76 for a roller pressing element combined with a hand held flatiron, and subclasses 100+ for hand held smoothing elements consisting of a roller or rollers for the purpose of ironing.
- 100, Presses, for the generic class for apparatus for the subjecting of material to compressive force by causing solid surfaces to approach each other while the material is between them. subclasses 92+ includes the heating of material in addition to pressing the material and subclasses 155+ where rolls are used for the concurrent pressing and conveying of the material where the rolls may be heated.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 583.1+ heated presses or press platens which could involve a heated roll for presses which are not of general utility or are combined with means to assemble or bring workpieces into association with each other.
- 241, Solid Material Comminution or Disintegration, subclasses 23 and 65+ for processes and apparatus which may include a heated roll or rolls.
- 492, Roll or Roller, for a roll, per se, not elsewhere provided for, and see the notes thereunder.
- 245 Sole plate-type pressure application means (e.g., flatiron):**  
This subclass is indented under subclass 243. Subject matter wherein the structure comprises pressure application means consisting of a manually held sole plate which generally includes hand held laundry irons.

- (1) Note. Irons electrically heated by induction, electrostatics, radiation including infrared, the flow of anions and cations in a conducting medium such as impure water are classified herein.
- (2) Note. Hand held irons of the electrostatic and electromagnetic type will be found herein (subclasses 245+) rather than in subclasses 6.5-10.73 supra.
- (3) Note. The line between Class 38, Textiles: Ironing or Smoothing and Class 219 Electric Heating with regard to machine and hand held smoothing implements is: A claim including details of the pressure application means or smoothing surface with a detailed or in name only electrical heating means shall be classified in Class 38. A claim including a broad smoothing surface and a detailed electrical heating unit shall be classified in Class 219. A claim which includes a nondetailed heating unit and a nondetailed smoothing surface shall be classified in Class 38.
- (4) Note. Claims dealing with safety features such as means to have the soleplate assume a raised position off the ironing surface when not in use, means to increase the ironing pressure of the soleplate, sole surfaces, travel irons and attachments for flatirons shall be classified in Class 38 rather than Class 219.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 227+, for electrically heated hand manipulative tools or instruments where the heated surfaces do not involve pressure application in addition to heat transfer to the material being treated. See subclass 228 for heat applied to extensive areas by radiation, and subclasses 229+ for heat applied to localized areas.
- 443.1+, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.).

SEE OR SEARCH CLASS:

- 38, Textiles: Ironing or Smoothing, subclasses 74+ for hand held heated flatirons including electrically heated flatirons combined with structure for performing some other function in subclasses 75+, including a roller in the plane of the pressing surface, all electrically heated steam irons in subclasses 77.1+, subclass 82 for means including electricity for heating a flatiron internally, subclasses 88+ for structure relating to the general shape or form of materials which form the flatiron including heat insulation to hinder radiation of heat from the body of the iron, subclass 90 for handle structure of a flatiron, subclass 93 for the structure of the plate which forms the ironing surface, subclass 94 for attachments for flatirons not otherwise provided for and subclasses 100+ for smoothing implements consisting of a roller or rollers. See also (3) Note and (4) Note above for the line between Class 38 and Class 219.
- 126, Stoves and Furnaces, subclasses 227+ for stoves or furnaces designed to be used alone or in connection with a flatiron structure and subclasses 411+ for a hand held flatiron that utilizes a liquid or gaseous fuel burner integral with the iron.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclass 579 for hand held or manipulative electrically heated bonding tools or instruments which are specifically devices for use in the adhesive bonding of material.
- 223, Apparel Apparatus, subclasses 21+ for machines and hand irons for making and ironing hats, subclasses 35+ for hand held fluting irons including combined sad and fluting irons, and subclasses 52+ for special ironers for collars, cuffs, neckbands and edge irons for those items which may be hand held and electrically heated.

**246 Combined with stand:**

This subclass is indented under subclass 245. Subject matter including stand means combined with electrically heated irons of the sole-plate type where the stand may or may not include electrical circuitry connecting an electrical power source, directly or indirectly, such as by induction, to the iron, or the stand has cam means including thermal means cooperating with electrical circuitry such as switches and disconnect devices in the heater circuit of the iron.

- (1) Note. Included in the circuitry may be indicators, electrical switches and disconnect devices or any means which may control or convey directly or indirectly the electrical current to the iron from the power source.
- (2) Note. The devices to be found here generally include means whereby the external electrical circuit terminates in the iron itself.
- (3) Note. See subclass 259 for the same stands or supporting devices claimed alone rather than in combination with a hand held electrically heated iron.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 222+, for the combination of a self-heated hair heating means combined with a support or stand which forms part of the electrical power supply to the heating means.
- 231, for the combination of an electrically heated tip type hand tool or instrument with stands which are more than a mere support for a hand held tool and generally would include electrical circuitry in circuit with the iron.
- 242, for supports or stands, per se, for hand held or manipulative tools or instruments which have integral electrical heaters or for hand manipulative or hand held tools or instruments which are heated by heat transfer on and from electrically heated stands.

**SEE OR SEARCH CLASS:**

- 38, Textiles: Ironing or Smoothing, subclass 79 for supports which are formed integral with the flat irons, subclass 97 for a support for the flat-iron in the form of an attachment, and subclass 107 for the combination of a flat iron with an ironing table.
- 223, Apparel Apparatus, subclass 120 for supports, bases and stands claimed in connection with apparatus of this class.
- 248, Supports, subclasses 51+ for supports for a pipe or cable which support a conductor chord or tube of an electrically or gas energized tool and hold the conductor chord or tube away from the work and subclasses 117.1+ for supports for a sadiron which include stands, clamps, or hold-down means.
- 312, Supports: Cabinet Structure, for supports in the form of cabinets or enclosures, and particularly subclass 242 for such structures mounted in an aperture or recess in a wall, floor, ceiling or panel and subclass 245 for such structures having mounting means associated with a wall, ceiling, vertical panel, underside of a horizontal panel, or a pair of spaced vertical panels.

**247 With complementary electrical connector means to external circuit terminating in stand:**

This subclass is indented under subclass 246. Subject matter wherein the stand and iron each have contiguous complementary electrical circuit connections or the iron has a complementary contiguous electrical connector which connector forms a direct or contiguous complementary circuit connection with the electrical connection on the stand.

- (1) Note. The devices found here include means whereby the external electrical circuit terminates in the stand rather than the iron itself as found in subclass 246 above.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

541, for heater unit, per se, with terminal or connector.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, particularly subclasses 51+ for the combination of a Class 439 connection device and an electrical switch or disconnection device where the combination is an integral unit.

337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses especially 113, 187+ and 380 for thermal current or thermally actuated switches with a Class 439 connector coupling.

439, Electrical Connectors, subclass 45 for quick make and break connections with plug ejecting or coupling separating means, subclass 147 for quick make and break connectors combined with other art devices where the combination is more than in name only, and sockets, receptacles and plugs, per se, in subclasses 176+.

**248 With condition-responsive indicator:**

This subclass is indented under subclass 245. Subject matter and which includes electrical, audible, visual or mechanical type indicator means which is responsive to some internal condition of the iron.

(1) Note. A scale associated with an adjustable member to control the position at which a thermally actuated switch operator will operate its switch contacts or on-off, high-low switch position indicia is considered to be a setting position marker rather than a qualitative or quantitative indicator for this subclass.

(2) Note. A thermometer combined with the electrical heater to show the temperature of the iron is considered to be a perfecting feature of the iron rather than a separate art device.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

109, for a current supply indicator (e.g., a recorder, etc.) to a pressure bonding (e.g., resistance welding, etc.) metal heating (e.g., resistance heating, etc.) apparatus.

445.1, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) with an indicator.

487, for indicator means for a power supply, voltage or current regulation or control means for controlling or regulating plural separate distinct resistance elements selectively and/or alternately.

506, for signal or indicating means for automatic power supply, voltage or current regulation or control means, for heating means in general under the class definition.

SEE OR SEARCH CLASS:

116, Signals and Indicators, subclasses 200+ for nonelectric signals and indicators, particularly subclasses 327+ for pointers and indicator arms, and subclasses 101+ and 216+ for thermostatically operated signals or signals giving only a qualitative indication of temperature.

200, Electricity: Circuit Makers and Breakers, subclass 56 for circuit controllers arranged to cooperate with a pointer of an indicating instrument or for a common operator for a pointer and the circuit controller.

236, Automatic Temperature and Humidity Regulation, particularly subclass 94 for thermostatically controlled devices combined with temperature indicating means.

250, Radiant Energy, subclasses 338.1+ for methods and apparatus including invisible energy responsive electric signalling devices for detecting and measuring infrared radiation.

324, Electricity: Measuring and Testing, for measuring qualitatively and quantitatively electrical conditions and nonelectric properties in terms of electrical properties.

- 337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses especially subclasses 79, 206, 241+, 265, 332, 376, and 417 for particular types of electrothermal and thermally actuated switches with condition indicating means.
- 340, Communications: Electrical, subclasses 384.1+ for an audible signaling device, subclasses 577+ for flame condition responsive system, subclasses 584+ for a thermal condition responsive system, subclass 600 for radiant energy condition responsive system, subclasses 635+ for electrical apparatus condition responsive system, especially subclass 640 for a heater element condition responsive system, subclass 655 for a condition responsive system indicating heating circuit energization, or subclasses 815.4+ for visual indication systems.
- 374, Thermal Measuring and Testing, subclass 141 for a nominally claimed iron combined with a thermometer.
- 439, Electrical Connectors, subclass 113 for quick make and break connectors associated with means providing an indication of a condition, nature or position of an indicator.

**249 Convertible:**

This subclass is indented under subclass 245. Subject matter including means by which the adjustment, addition, removal, or reassembly of one or more parts to or of the hand held, pressure application means causes the pressure application means to be capable of performing some other function other than heating and pressing.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 231, for hand held, heated tip devices convertible to another structural arrangement to perform a different function.
- 340, for radiant heaters convertible to a nonheating device or to a different type heater.
- 361, for convection type fluid heaters convertible to another type heater or to a nonheater.
- 416, for deep well heaters convertible to another type of heater.

452.13, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a frame, casing, or housing for a heating unit (e.g., range top, stove top, countertop, etc.) that is convertible.

472+, for electric heaters in general convertible to another type heater or to nonheaters.

SEE OR SEARCH CLASS:

38, Textiles: Ironing or Smoothing, subclasses 75+ for flatirons combined with other structures for performing some other function than ironing.

**250 With power supply, voltage or current-control means:**

This subclass is indented under subclass 245. Subject matter including detailed means either self-contained or external of the sole plate pressure application means whereby power is supplied to the electrical heating unit of the iron, means to effect voltage or current control, or current regulation means responsive to conditions within or externally of the iron.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 222+, for power supplies and voltage or current control or regulation means which are utilized with hair treating or heating instruments or systems utilizing such instruments.
- 240, for significant power supply voltage or current control or connections and/or disconnection means for hand manipulative tools or instruments.
- 482+, for power supplies, voltage or current regulation or control means which include manual or automatic control for heating devices combined with enclosure, container or support.
- 507+, for significant current connection and disconnection means combined with electrical heating devices in general.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclasses 51+ for the combination of a Class 439 connector with a switch integrally formed, subclass 61.85 for switches associated with manipulating, operating or carrying

- handles, and subclasses 144+ for arc preventing and extinguishing means for circuit makers and breakers.
- 307, Electrical Transmission or Interconnection Systems, subclasses 112+ for switching systems not claimed with any particular art device and subclasses 149+ for miscellaneous systems including power packs and conversion systems.
- 320, Electricity: Battery or Capacitor Charging or Discharging, appropriate subclass for a method or apparatus to charge a battery used in a portable power system.
- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for current or voltage regulation systems including impedance systems when the regulation or control is not claimed with a specific art device.
- 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 530+ for miscellaneous circuits with specific source of supply or bias voltage.
- 361, Electricity: Electrical Systems and Devices, subclasses 139+ for control circuits for relays and electromagnets when they are not claimed with any particular art device.
- 363, Electric Power Conversion Systems, for systems involving the conversion of direct current to alternating current and/or alternating current to direct current.

**251 Thermally responsive:**

This subclass is indented under subclass 250. Subject matter including at least one thermal operator with means for controlling a connection and/or disconnection means, or the voltage or current, in an electrical circuit to the heating unit or units of an iron.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 222+, for electrical hair heating or treating instruments or systems utilizing these instruments which could utilize thermal control of the individual heaters or of the system.

- 241, for thermal control means of electrically heated hand manipulative tools or instruments.
- 494+, for a thermally controlled power supply, or voltage or current regulation or control means of electrical heating means in general where more than a thermal switch or disconnect device is utilized.
- 510+, for thermally responsive current connection and/or disconnection means for electrical heating devices in general.

SEE OR SEARCH CLASS:

- 116, Signals and Indicators, subclasses 101+ and 216+ for qualitative thermostatically operated, mechanically actuated signals or indicators.
- 200, Electricity: Circuit Makers and Breakers, subclass 56 for switches of special application and having indicating means and subclass 167 for indicators, per se.
- 236, Automatic Temperature and Humidity Regulation, particularly subclass 7 for thermally motivated operators combined with pressure application surfaces of sadirons.
- 307, Electrical Transmission or Interconnection Systems, subclass 117 for thermally responsive electrical switching systems.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for thermally actuated switches adapted to control the connection or disconnection of an electrical circuit to the heating unit of an iron.
- 361, Electricity: Electrical Systems and Devices, subclasses 161+ for relay operating circuits which are thermally responsive.
- 374, Thermal Measuring and Testing, subclass 141 for a nominally claimed iron combined with a thermometer.

**252 Adjustable:**

This subclass is indented under subclass 251. Subject matter including a thermal responsive means, usually a bimetallic device, having means whereby the predetermined temperature

at which it operates may be adjusted or preset by an operator.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

515, for adjustable thermally responsive switches for controlling an electrical heating means.

SEE OR SEARCH CLASS:

38, Textiles: Ironing or Smoothing, subclass 77.7 for electrically heated hand held steam irons which generally have an adjustable thermal control for the heating element, and subclasses 82+ for hand held laundry irons which have claimed detailed sole plate structure and detailed or in name only electrical heating means combined with an adjustable thermally controlled switch to control the electrical heating means.

223, Apparel Apparatus, appropriate subclasses for irons which may have adjustable, thermally controlled electrically heated units.

337, Electricity: Electrothermally or Thermally Actuated Switches, subclass 141 for electrothermally actuated switches which may be adjustable and subclasses 298+ for thermally actuated switches with adjusting means.

**253 Comprising fusible metal, expansible liquid, or bar means:**

This subclass is indented under subclass 251. Subject matter wherein the thermal responsive means comprises a fusible solid, an expansible liquid, or expansible bar.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

512, for current connection and/or disconnection means for electric heaters which have thermally responsive linear expansible metal operators for the connection and/or disconnection means.

513, for current connection and/or disconnection means for electric heaters which have a thermally responsive expansible fluid operator for the connection and/or disconnection means.

517, for current connection and/or disconnection means for electric heaters which are thermally responsive fusible links.

SEE OR SEARCH CLASS:

236, Automatic Temperature and Humidity Regulation, subclasses 99+ and 101+ for thermally responsive solid or fluid elements which act as operators to perform some regulatory act.

337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for electrothermally or thermally actuated switches with actuating means comprising an expansible, liquid or bar or a fusible, combustible or explosive means.

374, Thermal Measuring and Testing, subclasses 106 and 160 for measuring the temperature by means of fusible elements, subclasses 187+ for expanding solid type elements responsive to heat for measuring quantitatively the temperature, and subclasses 201+ for devices which measure the temperature as a function of the contraction or expansion of a confined fluid.

**254 With heating unit structure:**

This subclass is indented under subclass 245. Subject matter including significant details of the heating unit structure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

520+, for an electrical heating unit structure in general combined with a significant housing, casing or support means.

538+, for significant heating unit structure, per se.

SEE OR SEARCH CLASS:

38, Textiles: Ironing and Smoothing, subclasses 82+ for means to heat the flatiron including electrical means, hot solid and fluid substances and solid fuels.

223, Apparel Apparatus, subclasses 21, 36 and 52.5+ for irons which may have detailed electrical heating units alone or combined with apparel making apparatus.

338, Electrical Resistors, appropriate sub-classes for electrical resistors, per se.

**255 Plural heating units:**

This subclass is indented under subclass 254. Subject matter wherein the heating unit structure comprises at least two or more separate heating units. The separate units may be adapted to operate singly or simultaneously, either in series or parallel arrangement, by way of example.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

476+, for plural heating devices, particularly subclass 478 for unitary housings, support or casing means and subclass 480 for selectively activated plural heating devices,

483+, for the regulation or control of plural resistance elements including subclass 486 for selectively and/or alternatively activated plural resistance elements.

520+, for significant housings, casings, or support means particularly subclass 537 for plural heating units combined with significant mounting means on a single support, housings or casing,

539, for plural resistive elements forming significant heating unit structure and

552, for heating elements having plural sections.

**256 With electrical circuit completion or terminal structure:**

This subclass is indented under subclass 245. Subject matter including significant details of the terminal block, electrical connections within or on the hand held pressure application means, or connection and/or disconnection devices whereby the heating means may be electrically connected to or disconnected from an external source of power.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

240, for hand held, heated tip type tools or instruments combined with connection and/or disconnection devices.

507, for significant current connection and/or disconnection devices combined with electrical heating means in general.

541, for heater unit, per se, with terminal or connector means.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, particularly subclass 46 for handles which are associated with conductors or insulators of electricity, and subclasses 84+ for conductor joints which are not of the quick make and break type found in Class 439.

200, Electricity: Circuit Makers and Breakers, subclasses 51+ for a Class 439 connection and/or disconnection device with an integral Class 200 switch or a Class 439 connector acting as a switch, and the appropriate subclasses for the various types of switches including subclass 152 for liquid contact switches, subclass 332.2 for handgrip type switches, and subclass 520 for pushbutton switches.

307, Electrical Transmission or Interconnection Systems, subclasses 139+ for switching systems having means for actuating a switch.

361, Electricity: Electrical Systems and Devices, subclasses 139+ for electrical circuits for relays and electromagnets.

439, Electrical Connectors, subclasses 6+ for conducting joints for relatively movable conductor parts combined with a connector, subclass 58 for electrical tool or appliance handle mounted quick make and break connections, subclasses 75+ for locking means for coupled connectors, subclass 101 for flexible or pivoted guards or supports for the line cord or conductor combined with a quick make and break connection, subclasses 103+ for strain relieving means for a conductor attached to a terminal joint, subclass 108 for connectors combined with a detachable part or having a portion specifically shaped to facilitate the handling of the connector, subclasses 119+ for mounting or supporting means for a complete coupling or a coupling part, and subclasses 176+ for quick make and break sockets, receptacles, and plugs.

**257 Automatically operated:**

This subclass is indented under subclass 256. Subject matter including means whereby the completion or interruption of an electric current to an external source of current at the beginning or end of the use of the iron is accomplished automatically.

- (1) Note. The term “automatic” is construed to include the operation of a switch in the circuit of the electrical heating means by a switch operator which is motivated by the grasping of the handle and the guiding of the soleplate type iron in the normal manner of using the iron.
- (2) Note. The line between Class 200, Electricity: Circuit Makers and Breakers and this class is: where an electric iron is claimed by name only with no inclusion of a specific electric heater and just enough structure of the iron to support the switch, the patent shall be classified in Class 200, appropriate subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 250+, for voltage or current control means for the iron responsive to variations in the voltage or current delivered to the heating means or thermal conditions of the iron which may involve connection and/or disconnection of the heater from a source while in use.
- 489, for combined manual and automatic regulating or control means for the current to an electric heater in general.
- 490+, for automatic control means of the voltage or current to an electrical heater in general.
- 509+, for automatically operated switches for connecting and/or disconnecting electrical heating means in general from a power supply.

SEE OR SEARCH CLASS:

- 200, Electricity: Circuit Makers and Breakers, appropriate subclasses for condition operated switch structures, particularly subclass 61.42 for a switch operator responsive to impingement against an object or motion of a feeler support, subclasses

61.45+ for switch closures responsive to the motion of or the change of inclination of an object including conducting fluid and tilt responsive switches, and subclass 61.85 for switches operable by the volitional use of guiding, lifting or actuating members used in the normal or intended manner.

**258 With heat storage, exchange, or reflector means:**

This subclass is indented under subclass 245. Subject matter including significant means whereby heat energy is stored for transmission at a later time, or is transmitted to a sole plate by conduction or reflection.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 347+, for radiant type fluid heaters with reflector means.
- 405, for oven type devices with heat energy directing or reflecting means.
- 461, for planar type heaters with heat energy reflecting or directing means.
- 530, for the combination of an electrical heating unit combined with housing, casing, or support structure in general and which includes means whereby heat energy is stored or is transmitted to a material or object to be heated. For a list of other electric heaters in this class provided with heat exchange or storage means consult “Search This Class, Subclass” under subclass 530.
- 540, for the combination of an electric heating unit structure in general and significant heat transfer or storage means.

SEE OR SEARCH CLASS:

- 38, Textiles: Ironing or Smoothing, subclass 89 for structure to heat insulate the body of the iron to hinder the radiation of heat from the soleplate and storage means of the iron to the non-working surfaces of the iron such as the handle.
- 165, Heat Exchange, appropriate subclasses for heating and cooling systems with the heat generator and heat transfer structure when claimed without the means forming the heat source.

**259 Supporting devices:**

This subclass is indented under subclass 245. Subject matter including significant details of a stand or support apparatus which, while not comprising a complete iron, nevertheless is so specifically adapted for use with an iron as to be peculiar to the art classifiable in this class.

- (1) Note. Included in this subclass are structures which are more than mere stands or supports for hand held or manipulative sole plate type pressure application means and include electrical circuitry which includes electric switches, thermal and otherwise, disconnection devices of the Class 439 type and indicators alone or in combination, to connect the pressure application means to a suitable power source.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 242, for supports for hand held heated tip instruments.  
246+, for sole plate pressure device combined with a stand.

**260 Resistive element: igniter type:**

This subclass is indented under subclass 200. Subject matter relating to devices including electrical resistive means adapted, when heated to incandescence, to be brought into intimate contact with a material or object whereby the material or object is caused to be ignited, at least in part, or wholly consumed and which devices are not elsewhere classifiable.

SEE OR SEARCH CLASS:

- 110, Furnaces, subclass 250 for refuse burners which may employ electrical heating means.  
122, Liquid Heaters and Vaporizers, subclass 2 for garbage burners.  
221, Article Dispensing, subclasses 143+ for dispensing means with electrical igniting means.  
361, Electricity: Electrical Systems and Devices, subclasses 247+ for igniters which utilize the electric spark; particularly subclasses 264+ for incandescent feature.

- 431, Combustion, subclasses 258+ for an electrical igniter combined with a fuel burner.

**261 With blower, suction, or other ignition facilitating means:**

This subclass is indented under subclass 260. Subject matter including means whereby a draft of air is circulated through or around the object or article to be ignited whereby ignition thereof is expedited or accelerated.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 296, for liquid heaters with forced circulation means.  
369, for convection type fluid heaters with forced fluid circulating means.  
380, for fluid heaters with fluid impeller to control the fluid pressure.

SEE OR SEARCH CLASS:

- 221, Article Dispensing, subclasses 144+ for dispensing devices having electrical igniter means combined with vacuum or draft producing means.

**262 With current control or external circuit connection or disconnection means:**

This subclass is indented under subclass 260. Subject matter including means whereby the current traversing the ignition unit of the device is controlled either automatically or at the will of an operator or whereby the ignition unit is connected to or disconnected from an external source of electricity.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 482+, for power supply, current regulation or control means for heating devices in general under the class definition.  
507+, for heating devices in general with electric current connection and/or disconnection means.

**263 Automatic:**

This subclass is indented under subclass 262. Subject matter wherein the current control or external circuit connecting or disconnecting means is automatically responsive to some predetermined condition of the igniter device.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

490+, for automatically actuated power supply, voltage or current regulation or control means, and subclasses 509+ for automatically actuated current connection or disconnection means for heating devices in general under the class definition.

**264 Thermally responsive:**

This subclass is indented under subclass 263. Subject matter wherein the current control or external circuit connection or disconnection means is thermally responsive to the condition of the ignition unit.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

494+, and 510+, for thermally responsive current control or external circuit connection means for heaters in general under the class definition.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 117 for thermally responsive switching systems.

337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for electrothermally and thermally actuated switches.

361, Electricity: Electrical Systems and Devices, subclasses 161+ for thermally actuated relay circuits.

**265 Bimetallic or other flexible means:**

This subclass is indented under subclass 264. Subject matter wherein the significant circuit connection means includes at least one or more bimetallic or other elements capable of flexing when heated.

SEE OR SEARCH CLASS:

337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 333+ for bimetallic and subclasses 382+ for longitudinally expansible solid actuated thermal switches.

**266 Resilient means:**

This subclass is indented under subclass 262. Subject matter wherein the significant external electric circuit connection or disconnection means claimed comprises resilient spring material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

109, for a current supply indicator (e.g., a recorder, etc.) to a pressure bonding (e.g., resistance welding, etc.) metal heating (e.g., resistance heating, etc.) apparatus.

445.1, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) with an indicator.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclasses 61.58+ for switches actuated concurrently with the operation or use of an art device, especially subclasses 61.76+ for spring actuated switches and subclasses 402+, for spring actuated snap switches.

**267 With housing casing or support means for igniter unit:**

This subclass is indented under subclass 260. Subject matter including significant details of the housing, casing or support device within or upon which the igniter unit is mounted. The structure to be found here will be generally restricted to the igniter plug or removable part of the device but may include details of the fixed receptacle which act to cooperate with features of the igniter in a manner to complete an electrical circuit, lock the two against displacement etc.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

270, for structure of resistance igniter element, per se.

520+, for significant housing or casing structure for heating devices in general under the class definition.

## SEE OR SEARCH CLASS:

221, Article Dispensing, subclasses 143+ for article dispensing devices combined with electrical igniter means.

**268 With source of power or current:**

This subclass is indented under subclass 260. Subject matter including significant details of means comprising a source of current or power for utilization in providing heating current in the resistive element heating means.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

482+, for power supplies for heating devices in general under the class definition.

**269 With indicating means:**

This subclass is indented under subclass 260. Subject matter including means whereby some predetermined condition of the resistive element is communicated to the user by audible or other means.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

248, for electric irons with indicators.  
487, for selectively controlled plural resistance elements with indicator means.  
506, for power supply, current or voltage regulation or control means for heating devices in general under the class definition and having signal or indicating means.

## SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclass 167 for switches with indicators.  
340, Communications: Electrical, subclasses 384.1+ for an audible signaling device or subclass 640 for a heater element condition responsive system.

**270 With igniter unit structure:**

This subclass is indented under subclass 260. Subject matter including significant details of the resistance heating unit.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

267, for the resistance heating structure associated with additional housing or support means.  
538+, for significant heating unit structure useful in heating devices in general under the class definition.

## SEE OR SEARCH CLASS:

338, Electrical Resistors, appropriate subclasses for resistor element structure, per se.

**383 Electric arc-type devices:**

This subclass is indented under subclass 200. Apparatus including at least two spaced apart electrodes associated with a voltage generating means whereby when voltage is applied from the generating means to the electrodes an electrical discharge is established between the electrodes. The subject matter classified herein includes devices wherein the electrical discharge takes place directly through a nonmetallic material to be heated as well as apparatus where the electrical arc occurs through air or other gases with the material to be heated confined within the influence of the arc.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

121.11+, for miscellaneous heating of metal by an electrical arc produced between opposed electrodes or between an electrode and the metal.  
232, for hand held heated tip devices utilizing an internal arc heater unit.  
234, for hand held heated tip devices with tip and work in circuit.  
284, for liquid heaters with liquid in circuit.

## SEE OR SEARCH CLASS:

250, Radiant Energy, subclasses 542+ for electrical arc means specialized for carrying out chemical reactions wherein the electrical energy is more than a mere heating means.  
313, Electric Lamp and Discharge Devices, appropriate subclasses for the structure for electric space discharge devices designed to produce an electric arc.

- 314, Electric Lamp and Discharge Devices: Consumable Electrodes, appropriate subclasses for electric space discharge devices, including arc discharge devices of the consumable electrode type and the circuits for supplying electric current thereto.
- 315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses, for systems for supplying electric current to arc discharge devices.
- 373, Industrial Electric Heating Furnaces, subclasses 61+ for furnaces in which a charge is heated by means of an electric arc produced between opposed electrodes.

**384 With perforating or disintegrating means:**  
This subclass is indented under subclass 383. Subject matter including means whereby a nonmetallic material is positioned between the electrodes of the device in such a position that, upon application of a voltage to the electrodes, the material within the influence of the electrodes is caused to be disintegrated thereby causing a permanent void or perforation therein.

**SEE OR SEARCH CLASS:**

- 83, Cutting, subclass 16 for processes utilizing means for heating material at a localized area such as a line of separation and subclass 170 for heat apparatus for heating the work.
- 283, Printed Matter, subclasses 72+ for fraud prevention devices utilizing perforating or other material marking devices which are of the electric arc type.
- 346, Recorders, particularly subclass 150.2 for phenomenal electric recorders in general wherein an electric arc penetrates the recording medium.
- 347, Incremental Printing of Symbolic Information, subclasses 159+ for generic electric recorder wherein an electric arc penetrates the recording medium.
- 428, Stock Material or Miscellaneous Articles, subclass 596 for metallic stock material which has apertures that may be the result of a metal heating process.

**385 Combined with container, enclosure, or support for material to be heated:**

This subclass is indented under subclass 200. Apparatus including significant details of at least one heating device combined with a container, enclosure or support means for the material to be heated and wherein the combination claimed is not specifically provided for above or in another art class.

- (1) Note. Class 219 is the generic class for electric heating. Class 373 is specific to the electric furnace structures or method for electrically melting or fusing refractory materials, usually granular in nature (ores, oxides, sulphides, etc.), the materials having a melting point of lead or above. Class 373 also provides for the electrically stirring of such high temperature melts. Class 373 also provides for electrical furnaces for melting or treating glass or silica (subclasses 27+) and for treating carbon (subclasses 109+). Subclasses 17 and 139 of Class 373 provides also for miscellaneous electric furnaces, such as the zone refining or melting type (e.g. semiconductor materials) and wherein electric furnace structure is claimed. See, also, the definition of Class 373 and the reference to Class 373 under Search Class in the class definitions of Class 219.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 520+, for the structure of the heater unit and housing, casing and support therefor.

**SEE OR SEARCH CLASS:**

- 34, Drying and Gas or Vapor Contact With Solids, subclass 201 for drying apparatus combined with kilns or containers.
- 99, Foods and Beverages: Apparatus, subclasses 324+ for cooking apparatus.
- 119, Animal Husbandry, subclass 301 for brooders and incubators, subclasses 302+ for brooders, and subclasses 318+ for incubators utilizing electrical energy.
- 126, Stoves and Furnaces, subclass 33 for steam tables, subclass 55 for com-

- bined base and hot closet, subclass 224 for domestic refuse burners, and subclasses 273+ for ovens.
- 138, Pipes and Tubular Conduits, subclass 32 for tubular conduits with heater means.
- 310, Electrical Generator or Motor Structure, subclasses 341+ for crystal ovens.
- 366, Agitating, subclasses 7 and 22 for process and apparatus of heated mortar mixing, and subclasses 144+ for heated mixers of general utility.
- 373, Industrial Electric Heating Furnaces, see (1) Note, above.
- 432, Heating, subclasses 227+ for a residual heat generator with an associated work support or heat delivery structure.
- 607, Surgery: Light, Thermal, and Electrical Application, subclasses 81+ for cabinets for enclosing the human body during application of heat.
- 386 Portable or mobile:**  
This subclass is indented under subclass 385. Subject matter including means whereby the special container may be lifted and carried bodily from place to place by hand or is provided with wheels or casters whereby it may be transported from one location to another.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
227, for electrically heated hand tools or instruments.  
346, for transportable fluid heaters.  
533, for portable heater unit with housing, casing or support means.
- SEE OR SEARCH CLASS:  
126, Stoves and Furnaces, subclass 11 for portable magazine stoves, subclass 268 for heated lunch wagon devices, and subclass 276 for wagon ovens.  
206, Special Receptacle or Package, appropriate subclasses for a container particularly configured to hold a specific article or material including an article(s) or material(s) put up as a mercantile unit.  
600, Surgery, subclass 22 for incubators.
- 387 Food conveying type (e.g., lunch box):**  
This subclass is indented under subclass 386. Subject matter wherein the significant container comprises a device specifically adapted for the heating or maintaining the temperature of foodstuffs such as a lunch box.
- SEE OR SEARCH CLASS:  
99, Foods and Beverages: Apparatus, appropriate subclasses for containers specifically adapted for the treatment, cooking or storing of foods which may be and generally are portable.  
126, Stoves and Furnaces, subclasses 261+ for lunch heaters, particularly subclasses 262 and 266+.  
296, Land Vehicles: Bodies and Tops, subclass 22 for lunch wagons.
- 388 With means whereby material to be heated may be passed continuously through heated area (e.g., conveyor):**  
This subclass is indented under subclass 385. Subject matter including means whereby material to be heated is continuously passed through a container or enclosure while being subjected to the effects of a heating device or devices, usually by means of conveyor means.
- SEE OR SEARCH CLASS:  
34, Drying and Gas or Vapor Contact With Solids, subclasses 201+, especially subclasses 203+ for houses, kilns and containers combined with conveyor means.  
53, Package Making, subclass 127 for apparatus including heating or cooling the material contents of packages while being conveyed past a station.  
118, Coating Apparatus, subclasses 641+ for coating apparatus combined with radiant heating devices in which the coated work may be passed through the heating area, see particularly subclasses 65, 67 and 68.  
425, Plastic Article or Earthenware Shaping or Treating: Apparatus, for an injection type molding machine having distinct means for heating or cooling to enhance feeding of the work, and subclasses 378.1+ for an extrusion shaping apparatus including heat-

ing or cooling means for the material being shaped.

**389 Revolving enclosure:**

This subclass is indented under subclass 385. Subject matter including means whereby the container or enclosure is adapted to be rotated about an axis. The container along with the heated material may be made to rotate about or around a fixed heating means or the heating means may be so fixed to the rotating container as to rotate therewith as a unit.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclasses 108+ for rotary drums or receptacles combined with drying means.
- 366, Agitating, subclasses 7 and 22+ for process and apparatus for heating and mixing mortar, and subclass 146 for nominal electric heating with an agitator of general utility.
- 494, Imperforate Bowl: Centrifugal Separators, subclasses 13+ for a separator of that class provided with heat exchange means.

**390 Muffle-type enclosure:**

This subclass is indented under subclass 385. Subject matter wherein the container or enclosure structure comprises an inner compartment for holding the material to be heated, the compartment wall, or walls, preventing direct transmission of heat energy derived from the heating means to the material.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, particularly subclasses 19+ and 273+ for externally heated domestic ovens.
- 432, Heating, subclasses 212 and 319 for a residual muffle type furnace heated by nonelectric or merely nominally recited electrical heating means.

**391 Oven type:**

This subclass is indented under subclass 385. Subject matter wherein the special container or enclosure structure consists of a chamber designed for baking, heating or drying utilizing heated air and in which the material heated retains its original physical condition, shape or

form and which chamber usually constitutes a part of a stove.

- (1) Note. The subject matter classified here and in the indented subclasses differs from that to be found in subclasses 420+ below in that in the lower subclasses the device is constructed of very high refractory material adapted to withstand extremely high temperatures whereby the heated material may be melted or otherwise treated to alter its chemical composition, condition, form or shape.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclasses 201+ for houses, kilns and containers adapted for drying.
- 99, Foods and Beverages: Apparatus, subclasses 324+ for devices for the preparation of food combined with oven means.
- 110, Furnaces, appropriate subclasses for furnace structure combined with a container which is adapted for the burning of a particular material, particularly subclasses 230+ for solid fuel furnaces provided with coking means; and subclass 242 for a closed retort refuse incinerator.
- 118, Coating Apparatus, subclasses 58+ for coating apparatus combined with drying means for the coated material.
- 126, Stoves and Furnaces, subclasses 19+ for cooking ovens and subclasses 273+ for domestic ovens in general.
- 202, Distillation: Apparatus, appropriate subclasses for kilns and ovens.
- 362, Illumination, subclasses 92+ for oven structure combined with light means.
- 373, Industrial Electric Heating Furnaces, for high temperature furnaces, usually for melting highly refractory materials.

**392 Combined with additional material support:**

This subclass is indented under subclass 391. Subject matter wherein the structure includes an oven with an additional separate and distinct container, enclosure or support for material to be heated both of which are contained within or share a common housing, container or support

means and are adapted for simultaneous or selective use.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 283, for liquid heater combined with a non-liquid heater.
- 314, for liquid heaters with plural containers or compartments.
- 394, for plural ovens.
- 452.11+, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a frame, casing, or housing (e.g., range top, stove top, countertop, etc.) for a heating unit.
- 475, for heaters in general with plural heat utilization means.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclasses 1+ for cooking stove structure comprising oven means combined with other cooking or heating devices.

**393 Oven performs plural diverse functions:**

This subclass is indented under subclass 391. Subject matter including means whereby the oven structure in whole or in part is adapted to function both as an enclosure for material to be heated and for a diverse purpose; such as, a support for vessels; a support for a further heating device or as a working surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 283, for liquid heater combined with a non-liquid heater.
- 394, for plural ovens.
- 452.13, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a frame, casing, or housing for a heating unit (e.g., range top, stove top, countertop, etc.) that is convertible.
- 472+, for heaters in general that simultaneously perform plural diverse functions.
- 475, for single heater in general with plural heat utilization means.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclass 19 for convertible ovens and subclass 275

for portable ovens which may be utilized in plural manners.

**394 With plural ovens:**

This subclass is indented under subclass 391. Subject matter including a plurality of separate and distinct oven type enclosures. The enclosures may be separately supported each with its own individual heating means or may be collectively attached to a single unitary support with or without individual heating means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 314, for liquid heaters with plural containers or compartments.
- 428, for heaters in general associated with a plurality of separate and distinct enclosures.
- 475, for single heater in general with plural heat utilization means.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclasses 20.1+ for plural ovens heated by steam or hot water.

**395 With plurality of separate heating units:**

This subclass is indented under subclass 391. Subject matter wherein the heating device structure includes at least two or more separate and distinct heating units.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 417, for deep well heaters with plural separate heating units.
- 422, for crucible or furnace structures with plural separate heating units.
- 462.1, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having plural heating elements gapped from underside of the exposed horizontal support surface (e.g., ceramic plate, radiation type, etc.).
- 464.1, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having plural tubular heating units.
- 470, for cylindrical or roller support structures with plural heating units.
- 539, below for significant heating unit structure comprising plural resistive

elements, subclass 478 for plural heating devices under the class definition combined with a single housing support or casing for the heaters, and subclasses 483+ for significant power supply, voltage or current regulation or control means combined with plural separate and distinct resistance elements.

**396 Of diverse construction or functioning in diverse manners:**

This subclass is indented under subclass 395. Subject matter wherein each of the plurality of heating units is of a different mechanical construction or the heat energy produced thereby is utilized in a different manner, as for example by direct heat conduction and by radiation.

- (1) Note. To complete the search for this subject matter see search notes under subclass 479 below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 479, for plural separate electrical heating devices of diverse type.

**397 Of different resistive values:**

This subclass is indented under subclass 395. Subject matter wherein each of the plurality of heating units is of a different resistive value.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 484, for heater control system in general for plural resistance elements of diverse resistance characteristics.  
539, for heater unit structure comprising plural separate and distinct resistive elements.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclasses 325+ for cooking apparatus with automatic control which utilize a plurality of heating units separately activated.

**398 Selectively energized:**

This subclass is indented under subclass 395. Subject matter including means whereby the separate heating units are adapted to be selec-

tively energized in a predetermined manner or at will.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 457.1, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a direct manually actuated electrical switch.  
480, below for separate heating devices in general under the class definition combined with means whereby they are selectively activated and subclasses 483+ for plural separate resistance elements combined with control means.

**399 With heat energy transfer, distribution, or accumulator means:**

This subclass is indented under subclass 391. Subject matter including means whereby heat energy derived from the heating unit or units is transferred by means other than direct conduction to the oven to be heated, is distributed evenly to all parts of the heated oven type enclosure or is accumulated for later distribution to the heated oven.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 325+, for liquid heaters with heat storage or transfer means.  
347, for fluid heaters of the radiant type with heat storage or transfer means.  
365, for fluid heaters of the convection type with heat storage or transfer means.  
378, for fluid heaters in general with heat storage or transfer means.  
390, for muffle type heater.  
430, for vessel and stand with heat storage or transfer means.  
439, for vessel with heat storage and transfer means.  
530, for housing or casing in general with heat storage or transfer means.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclasses 389, 401, 433, and 447 for heat distributors associated with various types of cooking apparatus.  
126, Stoves and Furnaces, subclass 273.5 for domestic ovens with heat accumu-

lator means (e.g., fireless), and subclass 274 for Dutch ovens.

**400 By convection:**

This subclass is indented under subclass 399. Subject matter including means whereby heat energy transfer is accomplished by convection currents.

- (1) Note. Devices of a similar nature where the entire heating of a closed space is attained by convection currents will be classified above in subclasses 369+ according to the specific details of the heating means utilized with appropriate cross referencing to this subclass whenever the claimed subject matter includes oven structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

359+, for fluid heaters of the convection type, particularly subclass 375 for such heaters with heat storage or transfer means (see also (1) Note above).

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 467+ for subjecting food to an enclosed modified atmosphere that may be steam.

126, Stoves and Furnaces, subclass 274 for Dutch ovens heated by convection currents from an open fireplace or stove.

**401 With steam generating means:**

This subclass is indented under subclass 391. Subject matter including steam of vapor pressure generating means whereby the heating of an enclosed oven space is caused to take place at an elevated pressure above that of the external atmosphere.

SEE OR SEARCH THIS CLASS, SUBCLASS:

271+, for fluid heaters with vaporizer means.

362, for fluid heaters of the convection type with vaporizer means.

440, for a vessel with pressure generating or maintaining means (e.g., pressure cooker, etc.).

**402 With casing or support for heating unit or units:**

This subclass is indented under subclass 391. Subject matter including significant details of housing, casing or support means for the heating unit, or units, of the heating device.

- (1) Note. The housing, casing or support structure forming the subject matter to be found here is for the purpose of enclosing or supporting the heating unit, or units of the combination only and does not include the details of the oven or either container of the combination. Housing, casing or support means in combination with heaters in general under the class definition are classified below in subclasses 520+.

**403 Retractable or detachable (from heated enclosure):**

This subclass is indented under subclass 402. Subject matter including means whereby the heating unit, or units, may be supported within or readily inserted or removed from within the heated enclosure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

316+, for liquid container or tank with immersible heating unit.

381, for fluid heaters in general with immersion type heater.

437, for vessel and stand with immersible heating unit.

453.13+, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a support that allows a heating unit to move.

523, for heating devices in general under the class definition combined with a housing or casing means and which are adapted to be inserted as a unit with the housing or casing, into a space intended to be heated.

541, for heater unit, per se, with terminal or connector means.

**404 Hinged or adjustable (within the heated enclosure):**

This subclass is indented under subclass 402. Subject matter including means whereby the housing, casing or support including the heat-

ing unit or units are hingedly or adjustably supported within a heated enclosure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

453.11+, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) for a hinge support that allows a heating unit to tilt or pivot.

**405 Including heat energy reflecting or directing means:**

This subclass is indented under subclass 402. Subject matter wherein the housing, casing or support structure includes heat energy reflecting or directing means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

347+, for fluid heaters of the radiant type with heat energy reflector means.

455.12, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a pan or cup (e.g., a drip pan, etc.) reflecting support for a heating unit.

538, below for significant heating unit structure utilizable with heating devices under the class definition and including reflector or focusing means.

SEE OR SEARCH CLASS:

126, Stoves and Furnaces, subclass 274 for Dutch ovens utilizing reflector.

**406 With resistance heating means surrounding heating area:**

This subclass is indented under subclass 391. Subject matter including resistance means surrounding at least a major portion of the heating area of an oven type enclosure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

210, for heating devices combined with electrical devices of a vibrating type (e.g., piezoelectric crystals and employing ovens with an external heating winding).

300, for heaters wherein the liquid conveying tube is the heater.

301, for liquid heaters wherein the heater unit surrounds the liquid conveying tube.

424, for crucible or furnace with the heating element surrounding the wall of the crucible or furnace.

SEE OR SEARCH CLASS:

310, Electrical Generator or Motor Structure, subclasses 341+ for crystal ovens with electric heating means.

**407 Embedded within or between walls of container:**

This subclass is indented under subclass 406. Subject matter wherein the resistance heating means is described as embedded within or located between the inner and outer walls of the oven type enclosure means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

424, for crucible or furnace with resistance heating element embedded in the wall thereof.

438+, for electrically heated vessels having resistance elements embedded within or between the walls thereof.

**408 With resistance heating unit or units fixed enclosed by or located within heating area:**

This subclass is indented under subclass 391. Subject matter including significant fixed heating means enclosed by or permanently attached within the heating area of an oven type enclosure.

**409 With heating unit structure or composition:**

This subclass is indented under subclass 391. Subject matter including significant heating unit structural elements or composition whereby the heating unit means is particularly adapted for use in combination with an oven type enclosure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

538+, for significant heating unit structure of a general nature under the class definition.

**410 With plural section heating element:**

This subclass is indented under subclass 409. Subject matter comprising a single heating element having a plurality of sections which may be energized simultaneously to provide an element of one resistance value or selectively to provide variable resistance means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

539, for heating element structure in general under the class definition and comprising plural sections.

**411 With infrared generating means:**

This subclass is indented under subclass 409. Subject matter wherein the particular heating unit structure comprises infrared generating means particularly adapted for use with an oven type enclosure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

353, for radiant heaters with particular heating unit structure.

553, for infrared generators in general and adapted for use with the heating devices under the class definition.

SEE OR SEARCH CLASS:

34, Drying and Gas or Vapor Contact With Solids, subclasses 519+ for drying with radiant or conducting heating and subclasses 201+ for houses, kilns and containers combined with heating means which may be of the infrared generating means.

250, Radiant Energy, subclasses 493.1+ for radiant energy generators and sources.

607, Surgery: Light, Thermal, and Electrical Application, subclass 1 for thermal applicators which may utilize infrared sources, particularly subclasses 81+ for cabinets combined with such heat sources.

**412 With current or voltage control or regulating means:**

This subclass is indented under subclass 391. Subject matter including means whereby the current traversing the heating element or elements of the device is maintained between lev-

els or is applied at a predetermined time or for predetermined intervals of time by either electromechanical or electrical means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

482+, for power supply, voltage or current regulation or control means applicable to heating devices under the class definition.

**413 Automatically responsive to condition of heating area:**

This subclass is indented under subclass 412. Subject matter comprising means automatically responsive to the conditions prevailing within the heated area such as the degree of temperature at any given time.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

490+, below to complete the search for this subject matter.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 325+ for cooking apparatus with automatic control of the heater means.

126, Stoves and Furnaces, for general heat applying apparatus having other than electrical heating means, subclass 351.1 for a fluid fuel burner other than a top-accessible liquid heating vessel and a condition responsive feature or subclass 374.1 for an open-top liquid heating vessel that may include a lid and a condition responsive feature.

323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for voltage and current regulators in general.

338, Electrical Resistors, subclasses 13+ for electrical resistors whose resistance value is responsive to a condition, particularly subclasses 25+ for resistors responsive to ambient temperature.

**414 With switch or other external circuit completing means:**

This subclass is indented under subclass 391. Subject matter including significant details of means whereby a circuit is completed between

the heating unit or units of the device and an external current source.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

507+, below for heaters under the class definition combined with external circuit completion or disconnection means.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, appropriate subclasses for electric switch structure.

#### 415 **Deep well:**

This subclass is indented under subclass 385. Subject matter including a casing structure, usually cylindrical, extending vertically below a supporting plane or surface structure and having a vertical dimension greater than its horizontal dimension, and having an open end contiguous with an opening in the supporting surface whereby a vessel or container, adapted to contain material to be heated, may be inserted into the interior thereof and subjected to the influence of heat energy generated by an associated heating unit or units. The heating unit generally is attached to the outer casing in a position to surround the inner container or to contact or transfer heat energy to the bottom of the container in the manner of a hot plate.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

433+, for vessel and stand combinations with heating devices in which the stand may completely enclose the vessel somewhat similar to a deep well cooker.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 359+ for heated receptacles modified to contain jars or cans of food, and subclasses 403+ for heated vessels modified to contact a food material with a heated liquid contained therein.

126, Stoves and Furnaces, for general heat applying apparatus having other than electrical heating means, subclass 348 for a liquid heating steam generating and cooking kettle furnace.

422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 292+ for sterilizing devices similar in structure to Class 219 deep well devices and sterilizing apparatus using steam.

#### 416 **Convertible:**

This subclass is indented under subclass 415. Subject matter including means whereby the device may be adapted to function as a deep well type heater or a diverse type. Some examples of diverse types to which the deep well type heater may be converted are hot plate (surface cooker) and broiler type.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

452.13, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a frame, casing, or housing for a heating unit (e.g., range top, stove top, countertop, etc.) that is convertible.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclass 340 for convertible cooking devices.

#### 417 **With plurality of separate heating units:**

This subclass is indented under subclass 415. Subject matter including at least two or more separate heating units.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

476+, for plural separate heater devices in general.

#### 418 **With adjustable position heating unit or units:**

This subclass is indented under subclass 415. Subject matter including means whereby at least one heating unit of the device may be adjusted in position relative to the well structure.

#### 419 **With current control or external circuit opening or closing means:**

This subclass is indented under subclass 415. Subject matter including means whereby the current traversing the heating element, or elements of the device, is regulated or maintained

between predetermined limits, or applied to or withdrawn from the device thereby assuring that the temperature of the heating space is maintained at a predetermined value or between predetermined limits.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

482+, below for heating devices in general under the class definition combined with power supply, voltage or current regulation or current control means.

**SEE OR SEARCH CLASS:**

99, Foods and Beverages: Apparatus, subclasses 331+ for cooking devices with automatic control of the heat or heater.  
126, Stoves and Furnaces, subclass 374 for water heating vessels with automatic control.

**420 Crucible or furnace type (i.e., adapted to hold meltable material):**

This subclass is indented under subclass 385. Subject matter wherein the special container or enclosure structure includes: (1) a vessel or melting pot of some very refractory substance, such as clay, graphite, porcelain, or a relatively infusible metal, used for melting solid substances which require a high degree of heat or (2) an enclosed structure comprised of a very highly refractory substance whereby a very high degree of heat may be transferred to a solid material contained therein.

- (1) Note. The patents in this and the indented subclasses are directed to subject matter similar in nature to the subject matter classified in Class 373, subclasses 109+, the difference being that herein significant details of the electric heating means are claimed with the furnace being either broadly claimed or recited only as an environment for a specific heating device. Class 219 is the generic class of electrical heating and generally takes only those patents which do not claim (or in some cases disclose) sufficient structure to be classified in a specific art class. In order to complete the search for the subject matter classified in this and indented subclasses, the

appropriate subject matter in Class 13 should be considered.

**SEE OR SEARCH CLASS:**

65, Glass Manufacturing, subclass 347 for melting pot or furnace structure adapted for the manufacture of glass.  
126, Stoves and Furnaces, subclass 284 for devices primarily designed for the melting of glue and analogous substances (the pots are usually water or steam jacketed), subclass 343.5 for heaters especially adapted for melting substances by the application of heat to a receptacle, conduit or support for the material to be melted and other appropriate subclasses for significant furnace structure.  
164, Metal Founding, subclasses 335+ for metal casting apparatus including a ladle or crucible type metal receptacle.  
266, Metallurgical Apparatus, subclasses 171+ and 220+ for furnaces adapted for the treatment of metals and metal bearing ores.  
432, Heating, subclasses 156+ for a residual nonelectric furnace or one having a merely nominal electrical heater particularly adapted to heat material in a crucible; and subclasses 262+ for a residual crucible, per se.

**421 Melting pot:**

This subclass is indented under subclass 420. Subject matter including container means comprising a vessel, usually constructed of a highly refractive material, peculiarly adapted for the heating of some material which constitutes a solid at room temperature and assumes a liquid state at some higher temperature. The patents to be found in this subclass for the most part specifically state in the claims that the device is for the purpose of melting some solid to a molten state; however where the claims do not so specifically state, but contain structure which would restrict the device to use as a melting pot and in which the ranges of temperatures disclosed or claimed are not such as to classify the patent elsewhere in some other art class the patent is classified here.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 415+, for deep well heaters.
- 429+, for vessel with stand with heater.
- 438+, for vessel with heater.

SEE OR SEARCH CLASS:

- 65, Glass Manufacturing, subclass 347 for glass melting pot or furnace with fining or delivery zone.
- 126, Stoves and Furnaces, subclass 284 for glue pots and subclass 343.5 for melting furnaces.
- 266, Metallurgical Apparatus, subclasses 200+ for melting furnaces.

**422 With plural separate heating units:**

This subclass is indented under subclass 420. Subject matter including at least two or more separate and distinct heating units.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 476+, for a plurality of heating devices, under the class definition, especially subclass 478 for such a plurality combined with a unitary housing or support.

**423 With protection means for heating unit or switch:**

This subclass is indented under subclass 420. Subject matter including means whereby the heating unit or units are protected from damage, deterioration, or destruction either from causes arising from normal usage, such as burn out due to excessive current, or from external forces.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 481, for heating devices in general under the class definition combined with protective means.

SEE OR SEARCH CLASS:

- 361, Electricity: Electrical Systems and Devices, subclasses 1+ for electrical power systems or devices combined with safety or protection means.

**424 With resistance heating element surrounding or embedded within walls of container:**

This subclass is indented under subclass 420. Subject matter including resistance heating element means surrounding or permanently embedded within the walls of a crucible or furnace type container.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 406, for heating means combined with and surrounding an oven type container and subclass 407 for heating means embedded within or between the walls of an oven.

SEE OR SEARCH CLASS:

- 373, Industrial Electric Heating Furnaces, subclass 119 for resistance heater type furnaces with the resistance heater in the walls.

**425 With current or voltage control means:**

This subclass is indented under subclass 420. Subject matter wherein the structure claimed includes means whereby the voltage or current applied to the heating unit or units of the apparatus can be varied at will, maintained between preselected limits or cut off completely. The controlling means may be either manual, automatic or a combination of the two.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 482+, below for heating devices under the class definition combined with power supply, voltage or current regulation or current control means.

SEE OR SEARCH CLASS:

- 323, Electricity: Power Supply or Regulation Systems, for pertinent subclass(es) as determined by schedule review.
- 373, Industrial Electric Heating Furnaces, subclasses 135+ for electric furnaces combined with control systems.

**426 With significant heating unit structure or composition:**

This subclass is indented under subclass 420. Subject matter wherein the structural combination includes significant details of at least one

heating unit in heat exchange relationship with a container of the crucible or furnace type.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

538+, for significant heating unit structure applicable to heating devices in general under the class definition.

SEE OR SEARCH CLASS:

373, Industrial Electric Heating Furnaces, subclasses 94+ for electrode holders and adjustment means for arc furnaces and subclasses 128+ for significant resistance elements and mountings for resistance furnaces.

**427 Container comprises resistance heating element:**

This subclass is indented under subclass 426. Subject matter wherein the heating element of the device is comprised of at least a portion of the container walls or structure.

(1) Note. The heating effect in this subclass is caused by the  $^2R$  loss in the resistive wall and should be differentiated from the arc type furnace where the furnace wall may constitute one electrode of the heating means or those resistance furnaces where the charge constitutes the electrical resistance.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

300, for circulatory water heating devices where the liquid conveying conduit comprises the resistance element.

436, for heaters wherein the vessel wall may comprise the heating element.

**428 Plural containers:**

This subclass is indented under subclass 385. Subject matter wherein the enclosure or container structure comprises a plurality of separate and distinct enclosures. The enclosures may be separately supported, each with its own heating device, or may be collectively attached to a single unitary support with or without individual heating means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

314, for liquid heaters with plural containers or compartments.

394, for plural oven type heater apparatus.

475, for single heater in general associated with plural heat utilization means.

476+, for plural heating devices under the class definition.

SEE OR SEARCH CLASS:

34, Drying and Gas or Vapor Contact With Solids, subclasses 127+ for plurality of rotary containers with drying means, subclass 180 for plural stationary receptacles or tubes with agitator or conveyor means, subclass 190 for plural elevator type and subclasses 209+ for plural housings, kilns or containers.

126, Stoves and Furnaces, subclasses 20.1+ for a plurality of cooking ovens of the steam or hot water type.

202, Distillation: Apparatus, subclasses 113+ for plural retorts, subclasses 172+ for plural still type enclosures and subclass 242 for closures under the Class 202 definition.

**429 With vessel and stand:**

This subclass is indented under subclass 385. Subject matter wherein the enclosure for the material to be heated comprises a hollow or concave utensil such as is normally used in a kitchen or dairy as, for example, for the heating of foodstuffs, boiling of water etc., and which is usually portable, combined with significant stand or support structure for the utensil.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

415+, for deep well heaters with utensil immersible therein.

421, for furnace or crucible type melting pot with heater.

438+, for vessel and heater, per se.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 324+ for apparatus adapted to support food articles or materials while subjecting the food to a heat treatment; i.e., cooking. See (2) Note

- under the Class 99, subclass 324, definitions for the line between this class (219) and Class 99, subclasses 324+.
- 126, Stoves and Furnaces, for general heat applying apparatus having other than electrical heating means, subclasses 373.1 through 390.1 for a liquid heater having an open-top vessel that may include a lid.
- 202, Distillation: Apparatus, subclasses 105+ for retorts adapted for the holding of material to be distilled or decomposed by heat.
- 430 With heat storage or transfer means:**  
This subclass is indented under subclass 429. Subject matter including means whereby heat energy generated by an electric heating device is transmitted to the contents of a vessel via a conducting or other medium, the vessel to be heated not being in direct heat transfer contact with the generating means, or whereby the generated heat energy is stored for use at a future time.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 439, for vessels and heaters, per se, with heat storage or transfer means.
- 540, for significant heating unit structure under the class definition including heat storage or transfer means.
- SEE OR SEARCH CLASS:
- 99, Foods and Beverages: Apparatus, subclasses 389, 401, 433, and 447 for cooking apparatus combined with means to direct heat or heated vapors to various portions of the food.
- 126, Stoves and Furnaces, subclass 400 for heat accumulator structures.
- 431 With pressure generating or maintaining means:**  
This subclass is indented under subclass 429. Subject matter including means whereby a pressure; greater than normal atmospheric pressure, is generated or maintained within a vessel.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 280, for fluids heaters in general.
- 401, for ovens having steam generating means.
- 440, for electrically heated vessels, per se, of the pressure maintaining type.
- SEE OR SEARCH CLASS:
- 99, Foods and Beverages: Apparatus, subclasses 323.4+ for cereal puffing apparatus utilizing means for producing sudden changes in pressure, subclasses 324+ for pressure cooking apparatus, and subclasses 467+ for apparatus subjecting food to an electric field or current discharge.
- 122, Liquid Heaters and Vaporizers, appropriate subclasses for high pressure steam generators.
- 126, Stoves and Furnaces, subclass 20 for steam or hot water heated ovens.
- 220, Receptacles, appropriate subclass for metallic receptacles to be used as pressure cookers.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 292+ for sterilizing devices similar in structure to Class 219 deep well devices and sterilizing apparatus using steam.
- 432 Vessel separable from stand:**  
This subclass is indented under subclass 429. Subject matter including means whereby the vessel may be readily attached to or separated from the stand.
- SEE OR SEARCH CLASS:
- 99, Foods and Beverages: Apparatus, subclasses 279+ for infusers (e.g. coffee makers) and appropriate subclasses under subclass 324 for cooking devices, such as subclasses 372+ (waffle irons subclasses 385+ (toasters) or subclasses 403+ (boiler or deep fat fryer) for vessels which are adapted for cooking and which may be separable from the stand.
- 433 With heating unit unitary with or attached to the stand:**  
This subclass is indented under subclass 429. Subject matter comprising heating unit means unitary with or otherwise attached to the stand or base structure.

## SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclass 221 for sterilization and pasteurization means utilizing an electric field, current or discharge, subclasses 279+ for infusors which may utilize electric heating means in the stand, subclasses 324+ for cooking apparatus with electric heating means, and subclasses 358 and 451 for subjecting food to an electric field or current discharge.

**434 Adjustable relative to vessel or stand:**

This subclass is indented under subclass 433. Subject matter including means whereby the heating unit, or units, may be adjusted relative to the vessel to be heated or to the stand.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

310+, for vessels utilized or claimed strictly as water heaters, particularly subclasses 328 and 331 for heating units readily detachable, removable or replaceable.

**435 With external electrical circuit connection or disconnection means:**

This subclass is indented under subclass 429. Subject matter including significant details of means whereby the electrical circuit between the heating device and an external source of electrical current may be completed or interrupted either automatically or at the will of an operator.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

507+, for heating devices in general under the class definition combined with significant current connection or disconnection means.

## SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 331+ for vessels adapted for cooking use combined with automatic control means for the heat or heater.

338, Electrical Resistors, subclass 215 for resistors, per se, combined with switch means.

**436 With heating unit attaching or support means:**

This subclass is indented under subclass 429. Apparatus including significant details of structure whereby the heating unit or units are attached to or supported relative to the vessel which is to be heated. Included are heated vessels wherein the walls, or a wall, of the vessel itself comprise the resistive heating unit.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

336, for liquid heaters combined with particular mounting or attachment means for the heating unit or units.

427, for crucibles or furnaces wherein the container constitutes the heating element.

451.1+, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a support for a heating unit.

536+, for particular means for attaching heating unit means, of a general nature under the class definition, to a housing, casing or support.

541, for heating unit, per se, with terminal or connector means.

**437 Immersible:**

This subclass is indented under subclass 436. Subject matter wherein the heating unit is specifically claimed as immersible in the material to be heated within a vessel.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

316+, for liquid heaters of the tank type with immersible heating means.

381, for fluid heaters in general with immersible heating unit.

523, for heating devices under the class definition combined with a housing or casing which is immersible within a material or space to be heated.

**438 With vessel:**

This subclass is indented under subclass 385. Subject matter comprising only a vessel and associated heater.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
429+, for vessel combined with significant stand structure.
- 439 With heat storage or transfer means:**  
This subclass is indented under subclass 438. Subject matter including means whereby the interior of the vessel or material contained therein is indirectly heated from an electrical source of heat energy by means of a heat transmission medium other than air, such as metallic or liquid heat transfer means.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
430, for similar subject matter combined with a vessel and stand.  
530, for heating devices under the class definition combined with particular housing means including heat storage or transfer means.  
540, for significant heating unit structure including heat storage or transfer means.
- 440 With pressure generating or maintaining means (e.g., pressure cooker):**  
This subclass is indented under subclass 438. Subject matter including means whereby the internal pressure within the vessel is maintained between predetermined limits or whereby a pressure in excess of normal atmospheric pressure is generated as a result of the action of the heating unit or units.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
431, for combined vessel and stand wherein the vessel is of the pressure maintaining type.
- SEE OR SEARCH CLASS:  
122, Liquid Heaters and Vaporizers, appropriate subclasses for high pressure steam generators.  
126, Stoves and Furnaces, for general heat applying apparatus having other than electrical heating means, subclass 348 for a liquid heating steam generating and cooking kettle furnace.
- 441 With temperature or current control means:**  
This subclass is indented under subclass 438. Subject matter including means whereby the amount of current traversing the heating unit, or units, of the device is controlled between predetermined limits, current is completely cut off from the device or the temperature of the material to be heated is controlled between predetermined limits.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
482+, for heating devices of a general nature under the class definition combined with power supply, voltage or current regulation or current control means.
- SEE OR SEARCH CLASS:  
99, Foods and Beverages: Apparatus, subclasses 325+ for cooking apparatus combined with automatic temperature control means.
- 442 Adjustable:**  
This subclass is indented under subclass 441. Subject matter including significant apparatus whereby the temperature control means may be adjusted between predetermined limits.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
494+, for automatic heater control means in general of the thermally responsive type.
- 443.1 Exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.)**  
This subclass is indented under subclass 385. Subject matter wherein the heating device has a laterally extending flat exterior surface to support the material to be heated.
- (1) Note. "Material" encompasses any tangible substance that can be placed upon the "exposed horizontal planar support surface"; however for this and indented subclasses the term "material" is usually a cooking vessel.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 228, for hand-manipulative tool or instrument having heat distribution means (i.e., heat applied to extended area).  
 245+, for a heating device combined with sole plate-type pressure application means (e.g., flat irons, etc.).

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 288 for a beverage infuser combined with a food heating or cooking apparatus.  
 100, Presses, subclasses 92+ for a press having an additional heating, cooling, or drying means to treat material.  
 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 379.6+ for a means to apply wave energy or electrical energy directly to work.  
 392, Electric Resistance Heating Devices, subclass 309 for a hot plate combined with other than electric heating means (e.g., gas, etc.) or subclass 467 for a continuous flow type fluid heater including a hot plate.  
 432, Heating, a residual class for apparatus and related methods for the generation of heat and its application to materials, and subclasses 227+ for a heat generator with an associated work support or heat delivery structure.

**444.1 Material is an electronic semiconductor device:**

This subclass is indented under subclass 443.1. Subject matter wherein the exposed horizontal planar support surface is intended to support, for heating, apparatus formed of a substance whose electrical conductivity at normal temperature is between that of a conductor and an insulator to control electron flow.

**445.1 With indicator:**

This subclass is indented under subclass 443.1. Subject matter combined with means to display a condition of the heating device or material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 109, for a current supply indicator (e.g., a recorder, etc.) to a pressure bonding (e.g., resistance welding, etc.) metal heating (e.g., resistance heating, etc.) apparatus.  
 248, for a heating device combined with a sole plate-type pressure application means (e.g., a flatiron, etc.) including a condition-responsive indicator.  
 266, for an igniter-type resistive element using resilient means for current control or external circuit connection or disconnection means.  
 487, for a heating device having a power supply and voltage or current regulation or current control means to control or regulate plural separate distinct heating resistance elements (i.e., one control system for all elements, etc.) selectively, sequentially, or alternately including indicator means.  
 506, for a heating device having automatic regulating or control means of power supply and voltage including signal or indicator means.

SEE OR SEARCH CLASS:

- 116, Signals and Indicators, subclasses 67+ for an alarm, especially subclasses 101+ for a thermal alarm, or subclasses 200+ for an indicator, especially subclasses 216+ for an indicator having a temperature responsive or compensating means.  
 200, Electricity: Circuit Makers and Breakers, for generic circuit maker and breaker structure, and subclasses 308+ for an electrical switch having indicator means.  
 340, Communications: Electrical, subclasses 577+ for flame condition responsive system, subclasses 584+ for a thermal condition responsive system, subclass 600 for radiant energy condition responsive system, subclasses 635+ for electrical apparatus condition responsive system, especially subclass 640 for a heater element condition responsive system or subclass 655 for a condition

responsive system indicating heating circuit energization.

responsive system indicating heating circuit energization.

**446.1 Having sensor:**

This subclass is indented under subclass 443.1. Subject matter including means to detect a condition of the heating device or material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

490+, for a heating device having automatic regulation or control of a power supply's voltage or current.

509+, for a heating device having an automatically operated power current connection and/or disconnection means (e.g., switch, etc.).

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 325+ for a timing or condition-responsive control means for cooking apparatus.

200, Electricity: Circuit Makers and Breakers, for generic circuit maker and breaker structure.

307, Electrical Transmission or Interconnection Systems, subclasses 116+ for a condition-responsive residual switching system.

323, Electricity: Power Supply or Regulation Systems, for a generic class of electrical systems wherein a single electrical source is coupled to a single electrical load circuit and means are provided which control the magnitude or level of the current or voltage of either or both of said circuits, especially subclass 236 for other than an electrical zero switching output level condition responsive (e.g., heat, etc.) circuit.

340, Communications: Electrical, subclasses 577+ for flame condition-responsive system, subclasses 584+ for a thermal condition-responsive system, subclass 600 for radiant energy condition-responsive system, subclasses 635+ for electrical apparatus condition-responsive system, especially subclass 640 for a heater element condition-responsive system, or subclass 655 for a condition-

**447.1 Responsive to presence of material (e.g., food, a cooking vessel, etc.):**

This subclass is indented under subclass 446.1. Subject matter wherein the sensor detects the condition of the material which is present on the exposed horizontal planar support surface.

**448.11 Responsive to temperature:**

This subclass is indented under subclass 446.1. Subject matter wherein the sensor detects the condition of warmth or coldness of the heating device or material.

**448.12 Having microprocessor to control output of the heating device:**

This subclass is indented under subclass 448.11. Subject matter includes a computer processor contained on an integrated-circuit chip using input from the temperature sensor to regulate the thermal production of the heating device.

**448.13 Of material (e.g., food, a cooking vessel, etc.):**

This subclass is indented under subclass 448.11. Subject matter wherein the temperature sensor detects the temperature of the material.

**448.14 Using thermistor-type sensor:**

This subclass is indented under subclass 448.13. Subject matter wherein the temperature sensor utilizes a semiconductor whose electrical resistance varies sharply in a known manner with temperature to detect the temperature of the material.

**448.15 Using temperature expansible fluid-type sensor:**

This subclass is indented under subclass 448.13. Subject matter wherein the temperature sensor utilizes a liquid or gas that expands or contracts with a change in temperature to detect the temperature of the material.

**448.16 Using bimetallic member-type sensor:**

This subclass is indented under subclass 448.13. Subject matter wherein the temperature sensor employs a component comprising or consisting of two metals having different coefficients of heat expansion whereby the sen-

sor is deflected with a change in temperature to detect the temperature of the material.

**448.17 Of the exposed horizontal planar support surface:**

This subclass is indented under subclass 448.11. Subject matter wherein the temperature sensor detects the condition of the exposed horizontal planar support surface.

**448.18 Using bimetallic member-type sensor:**

This subclass is indented under subclass 448.17. Subject matter wherein the temperature sensor employs a component comprising or consisting of two metals having different coefficients of heat expansion whereby the sensor is deflected with a change in temperature to detect the temperature of the exposed horizontal planar support surface.

**448.19 By rod or wire in a tube (e.g., thermo-cutoff, probe, etc.):**

This subclass is indented under subclass 448.11. Subject matter wherein the temperature sensor consists of a pole or a flexible metallic thread in a hollow elongated cylinder having different coefficients of heat expansion whereby a change in temperature results in a relative change in length between the pole or the flexible metallic thread and the hollow elongated cylinder.

**449.1 Heating by convection:**

This subclass is indented under subclass 443.1. Subject matter including means to provide for fluid circulation to transfer heat between a heating element and the material or the exposed horizontal planar support surface.

SEE OR SEARCH CLASS:

392, Electric Resistance Heating Devices, subclass 382 for a concentrated heated air stream (i.e., blast) device including a support for an article.

**450.1 For direct contact with food (e.g., grill, griddle, etc.):**

This subclass is indented under subclass 443.1. Subject matter wherein the exposed horizontal planar support surface is intended for an applied touch of a foodstuff.

SEE OR SEARCH THIS CLASS, SUBCLASS:

524+, for a heater unit housing, casing or support means (e.g., a frame and a single sheet, etc.) comprising a hinged or separable compartment (e.g., waffle iron type, etc.) for other than a heater unit having an exposed planar support surface for material to be heated (e.g., hot plate, etc.).

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 372+ for an opposed heated mold or surface type (e.g., waffle iron, etc.), subclasses 385+ for a slice toaster or broiler (e.g., grid types, etc.), subclasses 422+ for imperforate sheet or griddle type, or subclass 450 for a foraminous support.  
126, Stoves and Furnaces, subclass 14 for a broiling attachment that is inseparable from a stove structure.

**451.1 Having support for a heating unit:**

This subclass is indented under subclass 443.1. Subject matter including means to bear up or hold up, or perform the function of a foundation or prop for means combined with a heating element to form a single integrated structure that supports or positions the heating element in an operative position.

SEE OR SEARCH THIS CLASS, SUBCLASS:

436+, for a vessel and stand heating device with heating unit attaching or support means.  
520+, for a heater unit housing, casing, or support means (e.g., a frame and a single sheet, etc.) for other than a heater unit having exposed planar support surface for material to be heated (e.g., hot plate, etc.).

SEE OR SEARCH CLASS:

392, Electric Resistance Heating Devices, subclass 382 for a heating device that uses a concentrated heated air stream (i.e., blast, etc.) with a support.

**452.11 Frame, casing, or housing (e.g., range top, stove top, countertop, etc.):**

This subclass is indented under subclass 451.1. Subject matter wherein the support is an enclosure, cover, or container to support the heating unit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 392, for an oven type container or enclosure combined with additional material support.
- 478, for plural separate heating devices with unitary housing, support, or casing means for other than a heater unit having exposed planar support surface for material to be heated (e.g., hot plate, etc.).
- 520+, for a heater unit housing, casing, or support means (e.g., a frame and a single sheet, etc.) for other than a heater unit having exposed planar support surface for material to be heated (e.g., hot plate, etc.).

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclasses 4+ for a cooking surface combined with a heating stove or subclasses 211+ for a stove lid or top.
- 312, Supports: Cabinet Structure, subclass 236 for a cabinet combined with heating or heat exchange means.

**452.12 Supporting an imperforate exposed horizontal planar surface to overlie the heating unit (e.g., cooktop, etc.):**

This subclass is indented under subclass 452.11. Subject matter including means to bear up or hold up, or perform the function of a foundation or prop for a laterally extending flat exterior surface lacking an opening or aperture, usually of a heat transmitting glass or ceramic material, to lie over or upon the heating unit.

**452.13 Convertible (e.g., to an oven, to storage, etc.):**

This subclass is indented under subclass 452.11. Subject matter including means to transform the frame, casing, or housing (e.g., range top, stove top, countertop, etc.) into a device having a utility other than the exposed

horizontal planar support surface for material to be heated (e.g., hot plate, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 231, for a heating device for a convertible hand manipulative tool or instrument having a heated tip or other heat concentration means (i.e., heat applied to localized area, etc.).
- 249, for a heating device combined with a convertible sole plate-type pressure application means (e.g., a flatiron, etc.).
- 393, for an oven-type heating device that performs plural diverse functions.
- 416, for a heating device combined with a convertible deep well for material to be heated.
- 472+, for a heating device having plural functions simultaneously or is convertible.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 340 for a convertible cooking apparatus.

**453.11 Allowing heating unit movement:**

This subclass is indented under subclass 451.1. Subject matter including means permitting the heating unit to move.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 403, for an oven heating device and a casing or support that allows a heating unit to be retracted or detached from the oven.

**453.12 Enabling the exposed horizontal planar surface to conform to material having other than a planar surface:**

This subclass is indented under subclass 453.11. Subject matter wherein the movable support permits the heating unit combined with the exposed horizontal planar surface to adapt to material having other than a flat surface.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 528+, for a heater unit housing, casing, or support means (e.g., a frame and a single sheet, etc.) that is flexible or

resilient (e.g., a warming pad, etc.) for other than a heater unit having exposed planar support surface for material to be heated (e.g., hot plate, etc.).

535, for a heater unit housing, casing, or support means (e.g., a frame and a single sheet, etc.) that is specially formed or adapted to fit material to be heated (e.g., a pipe, etc.) for other than a heater unit having exposed planar support surface for material to be heated (e.g., hot plate, etc.).

549, for a heating unit structure having a core, sheath, or support means for a heating element of flexible construction or material.

**SEE OR SEARCH CLASS:**

99, Foods and Beverages: Apparatus, subclasses 429+ for a cooking apparatus providing confining, conforming, or molding support for the food.

**453.13 Using hinge for tilting or pivoting:**

This subclass is indented under subclass 453.11. Subject matter wherein the means is a jointed device or flexible piece on which the heating unit turns or swings.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

404, for an oven heating device and a casing or support that is hinged or allows adjustment of a heating unit to the oven.

**453.14 Of pintle and gudgeon type:**

This subclass is indented under subclass 453.13. Subject matter wherein the hinge is a rodlike element and a socket for the rodlike element on which the heating unit tilts or pivots.

**453.15 Having an axis at an acute or obtuse angle to the exposed horizontal planar surface:**

This subclass is indented under subclass 453.14. Subject matter wherein the pintle and gudgeon of the hinge form a straight line about which the heating unit rotates at an inclination between 0 and 90 degrees or 90 and 180 degrees.

**454.11 Bracket having a hub and three or more angularly spaced horizontal projections (e.g., a spider, etc.):**

This subclass is indented under subclass 451.1. Subject matter wherein the support has a center uniting three or more lateral extending members separated at an angle from one another.

**454.12 Having means to secure to the heating unit or a surrounding support:**

This subclass is indented under subclass 454.11. Subject matter including means to fasten the bracket having a hub and three or more angularly spaced horizontal projections (e.g., a spider, etc.) to the heating unit or to a means that surrounds and bears up or holds up, or is a foundation or prop for the heating unit.

**455.11 Pan or cup (e.g., a drip pan, etc.):**

This subclass is indented under subclass 451.1. Subject matter wherein the support is a broad shallow open container or a broad deep open container.

(1) Note. Pan or cup may have an opening therein.

**455.12 Reflector-type:**

This subclass is indented under subclass 455.11. Subject matter including means to reflect heat radiation.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

405, for an oven having a casing or support for a heating unit including heat energy reflecting or directing means.

**SEE OR SEARCH CLASS:**

392, Electric Resistance Heating Devices, subclass 422 for a radiant heater including a reflector.

**456.1 Ring having a flange overlying hole in a surrounding support surface:**

This subclass is indented under subclass 451.1. Subject matter wherein the support is a band having a circumferential projection greater than an exterior opening in a means that surrounds and bears up or holds up, or is a foundation or prop for the band having a circumferential projection.

**457.1 Having direct manually actuated electrical switch:**

This subclass is indented under subclass 443.1. Subject matter including means operated by immediate personal physical contact by a human being, usually by hand, to turn the heating device on or off, or direct current within the heating device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

398, for an oven with a plurality of separate heating units selectively energized.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, for generic circuit maker and breaker structure.

307, Electrical Transmission or Interconnection Systems, subclasses 112+ for a residual switching system.

**458.1 Having electrical connection:**

This subclass is indented under subclass 443.1. Subject matter including a link between electrically conducting contacting means that allows relative movement of the link without coming apart or permits the link to be repeatedly made or broken.

SEE OR SEARCH THIS CLASS, SUBCLASS:

541, for a heating unit structure with terminal or connector means (e.g., to external circuit means).

542+, for a heating unit structure with resistive-element attaching, securing, or electrical insulation means.

**459.1 Receptacle (e.g., socket, an insulator block, a terminal block, etc.):**

This subclass is indented under subclass 458.1. Subject matter wherein the electrical connection is a female electrical fitting containing the electrically conducting contacting means intended for the electrically conducting contacting projection of a plug.

**460.1 Heating element gapped from underside of the exposed horizontal support surface (e.g., ceramic plate, radiation type, etc.):**

This subclass is indented under subclass 443.1. Subject matter wherein the means to convert electrical energy into radiant heat is spaced from a surface lying underneath the exposed horizontal planar support surface.

SEE OR SEARCH THIS CLASS, SUBCLASS:

538+, for a heating unit structure.

SEE OR SEARCH CLASS:

392, Electric Resistance Heating Devices, subclass 418 for a radiant heater including a workpiece support.

**461.1 Support for the heating element:**

This subclass is indented under subclass 460.1. Subject matter including means to bear up or hold up, or perform the function of a foundation or prop for the heating element.

SEE OR SEARCH CLASS:

338, Electrical Resistors, subclasses 306+ for a support base extending along the path of an electrical resistor or subclasses 315+ for an electrical resistor mounting or supporting means.

**462.1 Plural heating elements:**

This subclass is indented under subclass 460.1. Subject matter including two or more heating elements.

SEE OR SEARCH THIS CLASS, SUBCLASS:

395+, for an oven with a plurality of separate heating units.

SEE OR SEARCH CLASS:

338, Electrical Resistors, subclass 295 for plural resistance elements connected by a jumper or spacer where the heat produced is incidental or undesired.

**463.1 Formed by tubularly shaped heating unit:**

This subclass is indented under subclass 443.1. Subject matter wherein the exposed horizontal planar support surface is constructed by means supporting a heating element in an operative

position and fashioned into a tube-like configuration.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

544, for a heating unit structure with resistive-element embedded within or completely surrounded by core, sheath, or support means.

546+, for a heating unit structure having a core, sheath, or support means for the heating element.

SEE OR SEARCH CLASS:

338, Electrical Resistors, subclasses 226+ for an encased, embedded, or housed electrical resistor.

**464.1 Having plural tubular heating units:**

This subclass is indented under subclass 463.1. Subject matter including two or more tubular heating units.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

395+, for an oven with a plurality of separate heating units.

**465.1 Heating element contacting planar underside of the exposed horizontal planar support surface (e.g., sheet metal, etc.):**

This subclass is indented under subclass 443.1. Subject matter wherein the means to convert electrical energy into thermal energy is attached to a flat surface underneath the exposed horizontal planar support surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

538+, for a heating unit structure.

**466.1 Foil or film-type of heating element:**

This subclass is indented under subclass 465.1. Subject matter wherein the heating element is a very thin piece of material, covering, coating, or layer.

(1) Note. The foil or film can be sheet metal, lamina, plate, or scale.

**467.1 Support for the heating element:**

This subclass is indented under subclass 465.1. Subject matter including means to bear up or

hold up, or perform the function of a foundation or prop for the heating element.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

542+, for a heating unit structure with resistive-element attaching, securing, or electrical insulation means.

SEE OR SEARCH CLASS:

338, Electrical Resistors, subclasses 306+ for a support base extending along the path of an electrical resistor or subclasses 315+ for an electrical resistor mounting or supporting means.

**468.1 Heating element is embedded in the exposed horizontal planar support surface:**

This subclass is indented under subclass 443.1. Subject matter wherein the means to convert electrical energy into thermal energy is implanted within the exposed horizontal planar support surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

538+, for a heating unit structure.

SEE OR SEARCH CLASS:

338, Electrical Resistors, subclasses 226+ for an encased, embedded, or housed electrical resistor.

**468.2 Heating element is in a groove formed on underside of the exposed horizontal planar support surface (e.g., cast metal plate, etc.):**

This subclass is indented under subclass 443.1. Subject matter wherein the means to convert electrical energy into thermal energy is in a channel constructed in a surface underneath the exposed horizontal planar support surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

538+, for a heating unit structure.

SEE OR SEARCH CLASS:

338, Electrical Resistors, subclasses 315+ for an electrical resistor mounting or supporting means.

**469 Cylindrical or roller-type support for material to be heated:**

This subclass is indented under subclass 385. Apparatus comprising the combination of at least one heating device, under the class definition, combined with cylindrical or roller means whereby a material may be heated while passing over or around the roller means.

- (1) Note. Class 219 is the generic class for heating rolls combined with electric heating devices and whose function is strictly that of heating a material passing over or around the heated roll surface. Other heated rolls forming an element of a larger combination or machine specifically classified elsewhere in an other art class will be found in the other art class; for instance, heated rolls forming an element of a heating or drying assembly will be found in Class 34, Drying and Gas or Vapor Contact With Solids, and heated rolls utilized as ironing or pressing means are found in Class 38, Textiles: Ironing or Smoothing.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 244, for heaters combined with a rotary pressure application means.

SEE OR SEARCH CLASS:

- 38, Textiles: Ironing or Smoothing, subclasses 44+ for roller presser smoothing machines, and subclasses 100+ for roller pressers, per se. See also (1) Note, above.

**470 With plural heating units:**

This subclass is indented under subclass 469. Subject matter including at least a plurality of heating units. The heating units may be contained in or associated with a single roller or may be distributed among a plurality of rollers.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 476+, for plural separate and distinct heating devices under the class definition in general.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclasses 113+ for plural rolls in which the material to be dried is external of the roll structure.
- 38, Textiles: Ironing or Smoothing, subclasses 49+ for smoothing apparatus comprising plural cooperating rolls and subclass 101 for plural roller presser, per se.
- 72, Metal Deforming, subclasses 200+ for metal rolling apparatus with means for heating or cooling the rolls.
- 118, Coating Apparatus, subclass 60 for coating apparatus utilizing heated roll means for heat exchange and which may include plural rolls or plural heater.
- 165, Heat Exchange, subclasses 89+ for rotary drum heating surfaces.

**471 With external electrical circuit completion means:**

This subclass is indented under subclass 469. Subject matter including significant details of means whereby an electrical connection is completed between the heating element, or elements, of the device and an external source of current.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 507+, for heating devices of general utility under the class definition with significant external circuit completion or disconnection means.

SEE OR SEARCH CLASS:

- 200, Electricity: Circuit Makers and Breakers, appropriate subclasses for the structure of electric switches.
- 307, Electrical Transmission or Interconnection Systems, appropriate subclasses especially subclasses 112+ for switching systems.

**472 Plural functions simultaneously or convertible:**

This subclass is indented under subclass 200. Subject matter including a single heating device with means whereby the structure which comprises the heating device, as a whole or in part, is adapted to perform both a heating func-

tion and a nonheating function, to perform plural separate heating functions or to perform the heating function in a different mode. Some examples of the patents classified here are; heater-fan, heater-light, convection type radiant type or radiant-hot plate, to name a few.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 231, for convertible heated type hand held instruments.
- 249, for convertible soleplate type heater devices.
- 285, for fluid heaters operating in different modes.
- 350, for convertible radiant heaters.
- 371, for convertible convection heaters.
- 421, for heaters for deep well type enclosures adapted for conversion to hot plates.
- 452.13, for an exposed horizontal planar support surface for material to be heated (e.g., hot plate, etc.) having a frame, casing, or housing for a heating unit (e.g., range top, stove top, countertop, etc.) that is convertible.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 340 for convertible cooking devices and subclass 357 for a cooking device combined with means performing another function.
- 165, Heat Exchange, subclasses 58+ for apparatus adapted for both heating and cooling and subclass 137 for convertible heat exchange devices.

**473 To nonheating device:**

This subclass is indented under subclass 472. Subject matter including means whereby the heating device structure may be caused to function as a nonheating device. An example of the structure to be found in this subclass is a convection heater convertible to a fan.

SEE OR SEARCH CLASS:

- 165, Heat Exchange, subclass 137 for convertible heating and/or cooling devices.

**474 To diverse-type electric heating device:**

This subclass is indented under subclass 472. Subject matter including means whereby the heating device may be converted to or caused to function as a diverse type electrical heating device. One example of the structure classifiable here is a heating device which functions in one mode as a hot plate type heater and alternately as a convection heater.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 279, for an electric heater combined with a nonelectric heater.

**475 With plural heat utilization means (single heater):**

This subclass is indented under subclass 200. Subject matter including a single heating device of the kind falling within the subclass definition with means whereby the heat energy generated in the device may be applied to more than a single space or object. For example a range type device having both hot plate type and oven type article support means jointly heated by a single heating unit is exemplary of the type devices classified herein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 392, 394 and 395, for heating devices under the class definition with plural ovens, single oven with plural compartments or for ovens combined with other heat utilization means.
- 428, for heaters in general comprising plural enclosures.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 339 for cooking apparatus comprising diverse type cookers.

**476 Plural separate heating devices:**

This subclass is indented under subclass 200. Subject matter including or comprising at least two or more separate and distinct heating devices under the class definition, each of which comprises a complete heating device capable of performing its function if utilized alone and not specifically provided for above in this class or classifiable elsewhere in another art class.

- (1) Note. The heating devices may all be of the same type or each of a different type provided that each must fall within the class definition. For a heating device of the Class 219 type combined with diverse art type nonelectric (e.g. gas) heating means see subclass 283.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 282, for liquid heaters in general with plural separate heaters.  
 314, for plural interconnected container liquid heaters.  
 394, for plural ovens.  
 428, for plural separately heated enclosures.  
 474, for electric heater of one type convertible to another type, or simultaneously operable as at least two different types of heater.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 339 for cooking devices of diverse type which may utilize plural heaters.  
 126, Stoves and Furnaces, appropriate subclass 4 for cooking stove combined with heating means and subclasses 99+ for hot air furnaces combined with cooking stove, etc.

**477 With common power supply or current control means:**

This subclass is indented under subclass 476. Subject matter wherein the plurality of separate heating devices each depends, for its activation and current supply, upon a common source of power or wherein the current traversing each of the devices is regulated or controlled by a common means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 483+, for a plurality of heater resistance elements under the class definition deriving power from, or being controlled by, a single means and where the power supply or control means is claimed specifically and in detail with the resistance elements broadly claimed.

SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, subclasses 11+ for power supply or control system in general for supplying plural loads.

**478 With unitary housing, support, or casing means:**

This subclass is indented under subclass 476. Subject matter wherein the plural heating devices share a common housing, casing or support means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 537, for plural heating units combined with a single housing, casing or support.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclass 209 for drying apparatus comprising houses, kilns or containers combined with plural treating units or compartments.

**479 Diverse type (each electric):**

This subclass is indented under subclass 476. Subject matter wherein the plural heating devices comprise two or more diverse types as set out above in this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 283, for liquid heater and associated non-liquid heater.  
 474, for plural function or convertible heaters which may comprise plural diverse electric heating devices.  
 484, for power supply, voltage or current regulation or current control means controlling diverse heating elements under the class definition and each having different resistance characteristics.

**480 Selectively activated:**

This subclass is indented under subclass 476. Subject matter including means whereby the separate heating devices may be selectively activated either automatically or at the will of an operator.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

486+, for means for selectively or sequentially controlling plural heater resistance elements in general.

**481 With protective means for heater:**

This subclass is indented under subclass 200. Subject matter including structural details of heating devices under the class definition combined with protective means whereby the heating unit is prevented from overheating or is protected against damage due to external sources and wherein the heating device structure is not classifiable elsewhere above in the Class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

322, for liquid heaters with protective means for the heater.

363, for fluid heaters of the convection type with protective means for the heater.

423, for crucible or furnace type apparatus with protective means for the heating unit or switch.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclasses 326+ for systems having self-protective, safety or limit control features and subclasses 116+ for condition responsive switches.

313, Electric Lamp and Discharge Devices, subclasses 11+ for discharge devices combined with temperature modification means.

338, Electrical Resistors, appropriate subclasses for electrical resistors, per se, with cooling or other protective means.

361, Electricity: Electrical Systems and Devices, subclasses 1+ for power systems with safety and protection devices.

**482 With power supply and voltage or current regulation or current control means:**

This subclass is indented under subclass 200. Devices combined with an external source of power or current and wherein the significantly

recited subject matter includes structure whereby the heating current applied to the heating device or devices from the external source is controlled or regulated as to level or amplitude, length of time applied, sequence of time applied, voltage level at which applied or in proper phase.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

108+, 130.1+, 240+, 250+, 262+, 272, 327, 358, 379, 419, 448+, and 650, for other voltage or current regulation or control means applied to special heating devices under the class definition.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 325+ for electric cooking devices with automatic control means.

165, Heat Exchange, subclasses 200+ for automatic control systems combined with heating and cooling systems.

237, Heating Systems, subclasses 2+ for automatic control devices for heating systems.

307, Electrical Transmission or Interconnection Systems, appropriate subclasses, especially subclass 17 for transformer connections, 31+ for plural load circuits with control or current or power, 52+ for plural supply circuits or sources with load current control, 64+ for emergency or standby source and 149+ for miscellaneous systems.

310, Electrical Generator or Motor Structure, appropriate subclasses for the structure of electrical generators.

322, Electricity: Single Generator Systems, appropriate subclasses for dynamoelectric or nonmagnetic single generator systems.

323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for current, voltage or phase control systems in general.

338, Electrical Resistors, subclasses 68+ for electrical resistors, per se, with mechanical means for varying the resistance value.

361, Electricity: Electrical Systems and Devices, subclasses 139+ for electric circuits for relays and electromagnets.

- 363, Electric Power Conversion Systems, appropriate subclasses for current, phase or frequency conversion systems.
- 429, Chemistry: Electrical Current Producing Apparatus, Product, and Process, appropriate subclasses for battery construction.
- 483 Controlling or regulating plural separate distinct heating resistance elements (i.e., one control system for all elements):**  
This subclass is indented under subclass 482. Subject matter including means whereby a plurality of separate and distinct resistance heating units or elements, within or forming a subcombination of a single heating device, may be activated either as a unit or selectively, or whereby the current applied to each selectively or to the whole may be regulated between predetermined values or for predetermined intervals of time.
- SEE OR SEARCH CLASS:  
307, Electrical Transmission or Interconnection Systems, subclasses 11+ for systems of electrical supply to plural loads, especially subclasses 31+ and 38+ for control of current or power and for selectively connected or controlled loads, respectively.
- 484 Of diverse resistance characteristics or value:**  
This subclass is indented under subclass 483. Subject matter wherein the plural separate resistance elements have diverse resistance characteristics or values.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
539, for significant heating unit structure under the class definition and comprising plural distinct resistive heating elements, and subclass 552 for heating elements, per se, consisting of plural sections.
- 485 With total current or power limiting means:**  
This subclass is indented under subclass 483. Subject matter including means whereby the total current traversing the plurality of resistance elements at any time is maintained at or below a predetermined value or whereby the
- total power consumed by the plurality of heating elements is maintained constant.
- SEE OR SEARCH CLASS:  
307, Electrical Transmission or Interconnection Systems, subclasses 33+ for load current control systems for maintaining a constant load or current in plural loads.
- 486 Selectively, sequentially or alternately:**  
This subclass is indented under subclass 483. Subject matter comprising means whereby the plurality of resistance heating elements may be selectively activated alternately one at a time, in a predetermined group of two or more, or consecutively one after the other in an order determined by the internal conditions prevailing in the heating device of which they form a part.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
401, for ovens with plural selectively energizable heater units.  
446, for planar surface heaters with selectively activated heating units.  
480, for plural separate heating devices selectively activated.
- SEE OR SEARCH CLASS:  
307, Electrical Transmission or Interconnection Systems, subclasses 29 and 38+ for systems involving selectively connected or controlled load circuits.
- 487 With indicator means:**  
This subclass is indented under subclass 486. Subject matter including means whereby some condition of the heating device is indicated either visually or audibly.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
108, for pressure type electric metal welding systems with indicator.  
248, for electric flatiron type devices with condition responsive indicator.  
269, for resistive element igniters with indicating means.  
453, for planar surface heater with circuit condition indicator.

506, for automatically regulated heater systems in general with signal or indication means.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclass 167 for switch condition indicators.

337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for thermally actuated switches with indicator means.

340, Communications: Electrical, subclasses 500+ for electrical signals automatically responsive to a condition particularly subclass 523 for signalling means automatically responsive to the sequence of operation of plural devices.

**488 With voltage limitation, conversion, or adapting means:**

This subclass is indented under subclass 482. Subject matter including means whereby a supply voltage of a first value may be maintained within given limits, may be converted to a second different value or means whereby a heating device adapted to operate on an alternating voltage may be adapted to operate on a D.C. voltage or vice versa.

SEE OR SEARCH THIS CLASS, SUBCLASS:

490+, for automatic voltage or current regulating means for electric heaters in general.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for current or voltage limiters.

363, Electric Power Conversion Systems, appropriate subclass for electric power, voltage, phase or frequency conversion systems.

**489 Combined manual and automatic regulating or control means:**

This subclass is indented under subclass 482. Subject matter consisting of at least one means operative by hand at the will of an operator and one or more additional self-acting means operative upon the occurrence of a predetermined

condition or set of conditions within the heating device or heated material.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclasses 234 through 298 for output responsive regulators.

**490 Automatic regulating or control means:**

This subclass is indented under subclass 482. Subject matter consisting of self-actuating means responsive to one or more predetermined conditions or states occurring either within the heating device, the heated material or both.

SEE OR SEARCH THIS CLASS, SUBCLASS:

110, for pressure welding systems controlled in response to current, voltage or temperature.

509+, for automatically operated heater connection and disconnection means.

608, and 650, for induction heater systems with automatic control.

702+, for microwave heating system with automatic control.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 325+ for automatic control means for cooking devices.

165, Heat Exchange, subclasses 200+ for automatic control means for heating or cooling devices.

237, Heating Systems, subclasses 2+ for systems with automatic control means.

307, Electrical Transmission or Interconnection Systems, appropriate subclasses, especially subclasses 31+ and 52+.

323, Electricity: Power Supply or Regulation Systems, subclasses 234 through 298 for output responsive regulators.

363, Electric Power Conversion Systems, subclasses 74+ for current conversion systems with automatic voltage or current magnitude control.

**491 Combined (e.g., electromechanical and thermal):**

This subclass is indented under subclass 490. Subject matter wherein the automatic control structure includes at least two or more means each of which operates independently and on a different principle. An example of the devices to be found in this subclass comprises mechanical timing means and thermally responsive thermostatic means.

**SEE OR SEARCH CLASS:**

- 99, Foods and Beverages: Apparatus, subclasses 328 and 333 for automatic control of heating and cooking apparatus by time and heat responsive means.
- 323, Electricity: Power Supply or Regulation Systems, for pertinent subclass(es) as determined by schedule review.
- 338, Electrical Resistors, subclass 14 for resistors in general responsive to plural conditions.

**492 Comprising timing or cycling means:**

This subclass is indented under subclass 490. Subject matter comprising means whereby the heating element or elements of a heating device may be energized at a particular predetermined time, or for a given interval or time or may be cyclically energized and deenergized and at regular predetermined intervals.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 115, for synchronously switched resistance welding systems.
- 334, for liquid heaters with timing means for power supply or current control means.

**SEE OR SEARCH CLASS:**

- 99, Foods and Beverages: Apparatus, subclasses 327+ and 332+ for automatic control means for cooking devices comprising timing means.
- 307, Electrical Transmission or Interconnection Systems, involving make or break at a predetermined time in a cycle, and subclasses 141+ for electrically timed switching systems.

323, Electricity: Power Supply or Regulation Systems, for pertinent subclass(es) as determined by schedule review

361, Electricity: Electrical Systems and Devices, subclasses 195+ for relay circuits with time delay means.

**493 Electromechanical:**

This subclass is indented under subclass 492. Subject matter wherein the timing or cycling structure comprises electro-mechanical means.

**SEE OR SEARCH CLASS:**

- 200, Electricity: Circuit Makers and Breakers, subclass 90 for the structure of periodically operated electromagnetic switches.
- 307, Electrical Transmission or Interconnection Systems, subclass 97 for intermittent regulatory interruption of a system in response to a condition and subclass 132 for repetitive make and break switching systems.
- 323, Electricity: Power Supply or Regulation Systems, subclasses 201 through 204 for control systems utilizing dynamoelectric machines.

**494 Thermally responsive:**

This subclass is indented under subclass 490. Subject matter including at least one means which is responsive to the temperature of the heated material, the heating element itself, or the surrounding atmosphere, by means of which the amount of current traversing the heating element or elements is controlled.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 110, for resistance type metal welding control systems responsive to temperature.
- 241, for heated tip hand tools with thermal control means.
- 251+, for electric flatiron type heaters with thermally controlled current supply.
- 328+, for liquid heaters with thermally controlled current supply.
- 413, for ovens with current supply responsive to condition of heating area.
- 449+, for planar surface heaters with thermally controlled current supply.

- 505, for regulators utilizing nonlinear or negative temperature coefficient resistance means.
- 510+, for heaters in general with thermally controlled switching means.

## SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclasses 328, 329 and 333 for automatic control means for cooking devices employing thermal responsive means.
- 165, Heat Exchange, subclasses 281+; 287+ for heat exchange systems with temperature responsive automatic control devices.
- 323, Electricity: Power Supply or Regulation Systems, for pertinent subclass(es) as determined by schedule review

**495 Thermomagnetic:**

This subclass is indented under subclass 494. Subject matter comprising or including magnetic apparatus which is adapted to change its permeability, (magnetic characteristics with change of temperature).

## SEE OR SEARCH CLASS:

- 310, Electrical Generator or Motor Structure, subclass 306 for the structure of pyromagnetic devices in general.
- 335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 146 for electromagnetically actuated switches utilizing thermomagnetic devices.
- 361, Electricity: Electrical Systems and Devices, subclasses 161+ for electromagnetic control circuits including a thermal device, and subclass 211 includes control circuits for thermal relays.

**496 Pressure responsive:**

This subclass is indented under subclass 490. Subject matter including means responsive to the pressure within the space or material heated or within the control means itself, due to a change of condition therein, whereby the current supplied to the heating device is regulated, or controlled.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 287, for liquid in circuit heaters with resistance path automatically responsive to pressure.
- 332, for liquid heaters with current control means responsive to hydrostatic or vapor pressure.
- 333, for liquid heaters with current control responsive to liquid level.

## SEE OR SEARCH CLASS:

- 165, Heat Exchange, subclasses 281+ for pressure responsive control devices for heating or cooling systems.
- 200, Electricity: Circuit Makers and Breakers, subclasses 81+ for fluid pressure operated electric switch structures.
- 307, Electrical Transmission or Interconnection Systems, subclass 118 for fluid pressure controlled switching system and subclass 144 for fluid pressure actuated switches.

**497 Comprising voltage and/or current measuring and comparing or combining means:**

This subclass is indented under subclass 490. Subject matter including means for deriving at least one first voltage, the magnitude of which is dependent upon some variable of a heated space or material, means for producing a second reference voltage representative of a desirable condition, means for comparing or combining the two derived voltages and further means whereby the condition of a heating device is adjusted by application of the voltage resulting from the combination or comparison of the two or more derived voltages.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 494+, for heaters wherein the voltage or current combined or compared with the standard is derived from the temperature of the heater.
- 496, for heater control systems wherein the variable voltage or current compared or combined with the standard is derived from changes in pressure of the heated medium or structure.

## SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclasses 234 through 298, which regulators or systems may be controlled by comparing a change in the electrical condition controlled with some standard or pre-set voltage or current.

**498 Including follow-up servo means:**

This subclass is indented under subclass 497. Subject matter including follow-up or servomotor means whereby the current applied to the heating device is responsive to a reference voltage as derived by the means of that subclass.

## SEE OR SEARCH CLASS:

236, Automatic Temperature and Humidity Regulation, particularly subclasses 74+ for electric motor servo systems utilizing automatic temperature or humidity control systems.

318, Electricity: Motive Power Systems, subclasses 609+ for "Reset" position servomechanisms which may be used for temperature control, and subclass 641, for position servomechanisms in which the error detector is a temperature measuring instrument.

**499 Including bridge means:**

This subclass is indented under subclass 497. Subject matter wherein the voltage or current measuring or comparison structure includes or comprises resistance or capacitance bridge means.

## SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclasses 663+, position servomechanisms utilizing potentiometers as position measuring instruments, the potentiometers may take the form of a wheatstone bridge circuitry.

**500 Including electron or glow-discharge tube means:**

This subclass is indented under subclass 490. Subject matter wherein the condition responsive regulation means claimed includes electron or glow discharge tube means.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

501, for condition responsive regulators utilizing semiconductor means (e.g., transistors).

## SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclasses 149+ for gaseous space discharge devices responsive to or controlled by radiant energy.

323, Electricity: Power Supply or Regulation Systems, subclass 291 for automatic voltage control systems with electric space discharge devices.

361, Electricity: Electrical Systems and Devices, subclasses 139+ for control circuits for electromagnets and relays including tube means.

**501 Including semiconductor means (e.g., transistor):**

This subclass is indented under subclass 490. Subject matter wherein the regulating or control structure includes devices comprised of semiconductor material such as transistors.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

500, for heater regulators utilizing electron tubes or gaseous discharge tubes.

505, for heater regulator utilizing nonlinear or negative temperature coefficient resistance resistors.

## SEE OR SEARCH CLASS:

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 53 through 56, 108, 414, and 467-470 for such as temperature responsive devices, per se.

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous circuits utilizing a transistor.

**502 Utilizing light-sensitive and/or responsive means:**

This subclass is indented under subclass 490. Subject matter wherein the automatic regulating or control means includes photoelectric or other light responsive means.

**SEE OR SEARCH CLASS:**

- 250, Radiant Energy, subclass 336.1 for methods and apparatus involving the detection of invisible radiant energy by electric signalling means and subclass 472.1 for methods and apparatus to detect invisible radiant energy non-electric signalling devices and subclasses 200+ for photo-cell circuits and apparatus in general.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 149+ for gas tube or electric lamp systems controlled by radiant energy.
- 323, Electricity: Power Supply or Regulation Systems, subclass 221 for automatic control systems comprising photosensitive controlled electron tube systems.
- 338, Electrical Resistors, subclasses 15+ for resistance devices whose resistance value is responsive to light means.
- 361, Electricity: Electrical Systems and Devices, subclasses 173+ for electric circuits for relays and electromagnetic utilizing photo-sensitive devices.

**503 Inductive reactor means (e.g., auto transformer):**

This subclass is indented under subclass 490. Subject matter including apparatus whereby the power supply for, or the voltage or current applied to a heating device is controlled through the action of inductive reactance of an inductive reactor means (e.g., saturable reactor).

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 112+, for resistance welder current supply systems with stored energy discharge means, (e.g., inductor).
- 116, for resistance welder current supply systems with transformer.
- 495, for heaters in general with thermomagnetic means to automatically regulate the power, voltage or current in response to temperature.
- 514, for heaters in general with thermally controlled solenoid in the current supply switching circuit.

- 519, for heaters in general with automatically controlled electromagnetic relay means.

**SEE OR SEARCH CLASS:**

- 307, Electrical Transmission or Interconnection Systems, subclasses 401+ for nonlinear (saturable) reactor systems.
- 335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 209+ for work magnet and electromagnetic structure, per se.
- 336, Inductor Devices, appropriate subclasses for the structure self and/or mutual inductive devices in general.
- 361, Electricity: Electrical Systems and Devices, subclasses 139+ for control circuits for electromagnetic devices.

**504 Comprising variable resistance means:**

This subclass is indented under subclass 490. Subject matter wherein the automatic regulating or control means includes a resistance device, or devices, whose resistance value or characteristics change or are changed in some way with a change in the condition of the heater or its environment.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 483+, for heaters wherein the current or voltage is controlled by controlling or regulating plural distinct resistance heating elements.

**SEE OR SEARCH CLASS:**

- 338, Electrical Resistors, subclasses 13+ for resistors, per se, whose resistive value is responsive to a condition.

**505 Comprising nonlinear or negative temperature coefficient resistance means:**

This subclass is indented under subclass 504. Subject matter wherein the structure includes a nonlinear or negative temperature coefficient of resistance resistor device or devices.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 494, for heater control systems utilizing thermally responsive resistors, for example.

501, for heater control systems utilizing semiconductor means, e.g., transistor.

**SEE OR SEARCH CLASS:**

338, Electrical Resistors, subclasses 22+ for current or voltage responsive thermistors, per se, and subclasses 25+ for ambient temperature responsive or adjustable resistors.

361, Electricity: Electrical Systems and Devices, subclasses 161+ for control circuits for electromagnetic devices including a thermal device, e.g., thermistors.

**506 With signal or indicating means:**

This subclass is indented under subclass 490. Subject matter including a signaling or indicating means whereby the electrical condition of the power supply and voltage or current regulation or control apparatus or the amount of current traversing the controlled heating device is readily discernable and which is peculiarly adapted for use with heating devices under the class definition.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

109, for resistance welder systems with indicator.

248, for electric flatiron type devices with condition indicator.

269, for resistive igniters with indicating means.

453, for planar surface heaters with circuit condition indicator.

487, for selectively or sequentially controlled resistance heating elements with indicator.

**SEE OR SEARCH CLASS:**

99, Foods and Beverages: Apparatus, subclasses 342+ for cooking apparatus with signal, indicator or testing means.

116, Signals and Indicators, subclasses 216+ for thermal indicators or signals.

122, Liquid Heaters and Vaporizers, subclass 504.2 for safety devices comprising alarms or indicators.

126, Stoves and Furnaces, for general heat applying apparatus having other than electrical heating means, subclass 388.1 for a liquid heater having an open-top vessel that may include a lid and an indicator or signaler feature.

236, Automatic Temperature and Humidity Regulation, subclass 94 for thermostatic control devices with indicators or alarm means.

324, Electricity: Measuring and Testing, subclasses 76.11+ for devices for measuring, testing or sensing electricity, per se.

340, Communications: Electrical, subclasses 635+ for electrical apparatus condition responsive, signals and alarms in general.

**507 With current connection and/or disconnection means (e.g., switch):**

This subclass is indented under subclass 200. Devices including significant structure whereby the heating unit or units of a heating device, are adapted to be connected to or disconnected from an external source of electrical energy.

(1) Note. For heating devices, such as are classified in this class, combined with means for controlling the level or amplitude of heating current or voltage between certain limits or for a certain interval of time the search should be in subclasses 482+ above, or in the particular subclass relating to specific type heating devices elsewhere in the class.

(2) Note. Heating devices directed to particular types of heaters set out elsewhere in the schedule and including significant circuit connection or disconnection means are listed under "Search This Class, Subclass" below.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

111, for resistance welding systems with repeat or interrupted current systems.

115, for resistance welders with means for synchronously switching the current on or off.

240+, for hand held heating tools with current switching means.

- 250+, for electric flatiron type devices with current control means.
- 256+, for electric flatiron type devices with current switching means.
- 262+, for resistive element igniters with switching means.
- 272, for vaporizer with external circuit switching means.
- 295, for liquid in circuit heaters with switching means.
- 308+, for forced circulation liquid heaters with switching means.
- 327+, for liquid heaters with current control means.
- 337, for liquid heaters with external circuit switching means.
- 356, for radiant type fluid heaters with external circuit switching means.
- 364, for convection type fluid heaters with external circuit switching means.
- 379, for fluid heater with external circuit switching means.
- 419, for deepwell heaters with external circuit switching means.
- 451+, for planar surface heaters with external circuit switching means.
- 482+, see (1) Note, above.
- 541, for heater unit structure with connector means.

## SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, subclasses 112+ for switching systems in general.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses.
- 338, Electrical Resistors, for subclass 215 for resistance devices, per se, combined with a switch.
- 361, Electricity: Electrical Systems and Devices, subclasses 139+ for control circuits for electromagnetic devices.
- 439, Electrical Connectors, appropriate subclass for electrical quid detachable connector structure.

**508 Plural means intermittently or selectively operated:**

This subclass is indented under subclass 507. Subject matter comprising two or more circuit connecting and disconnecting means. The claimed means may consist of a single main switch relay, for example, which in turn is con-

trolled by the condition of a plurality of secondary means which operate in sequence periodically or selectively.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 398, for ovens with plural heating units which are selectively energizable.
- 446, for planar type surface heaters with plural selectively controlled heater units.
- 480, for plural separate heating devices which may be selectively activated.
- 486+, for selectively controlled system of plural resistance elements in general.

## SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, subclass 115 for switching systems utilizing plural selectively activated switches.

**509 Automatically operated:**

This subclass is indented under subclass 507. Subject matter wherein the current connection or disconnection function is automatically accomplished as a result of some existing condition within the heated medium or of the heating element itself.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 257, for automatically controlled electric flatiron type device.
- 263+, for automatically controlled resistive type igniter.
- 309, for forced flow liquid heater with flow responsive switching means.
- 332, for liquid heater with vapor pressure responsive current control means.
- 333, for liquid heater with liquid level current control means.
- 452, for planar surface heater with automatically operated switch means.
- 490+, for heaters in general with automatic current regulating means.

## SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, subclasses 116+ for condition responsive switching systems.

**510 Thermally responsive:**

This subclass is indented under subclass 509. Subject matter wherein the current connection or disconnection means is responsive to the internal temperature of the heating element, that prevailing within the heated medium or both.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 241, for hand held heated tool with thermal control means.
- 251+, for electric flatiron type device with thermally responsive control means.
- 264+, for resistive element igniter with thermally controlled switch.
- 328+, for liquid heaters with current control means responsive to liquid temperature.
- 413, for oven with current control responsive to oven condition (e.g., temperature).
- 494+, for heaters in general with current regulator responsive to thermal condition.

SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, subclass 117 for heat responsive electric switch systems.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 298+ for the structure of thermally actuated switches.
- 361, Electricity: Electrical Systems and Devices, subclasses 161+ for relay control circuits including a thermal device.

**511 With auxiliary heating means for thermal switch means:**

This subclass is indented under subclass 510. Subject matter including means responsive to the temperature of the heated medium with auxiliary means whereby additional heat is provided for at least one of the temperature responsive means. The auxiliary heating means does not constitute a part of the primary heat source of the heating device.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 209, above, for heating devices under the class definition combined with other electrical devices.

SEE OR SEARCH CLASS:

- 337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 14+ for thermal current actuated switches with external heater means.

**512 Comprising linearly expansible metal:**

This subclass is indented under subclass 510. Subject matter wherein the particular thermally responsive current connection or disconnection structure comprises or includes linearly expansible metal bar means whereby the expansion or contraction of the bar initiates or controls the opening or closing of a circuit to the heating element.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 253, for electric flatiron type device with thermally responsive expansible bar current control means.
- 265, for resistive element igniter with bimetallic thermally responsive current switching means.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 363+ for expanding solid type thermometers.
- 236, Automatic Temperature and Humidity Regulation, subclass 96 for flue attached thermostats of the expanding solid type, and subclasses 101+ for other expanding solid type.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 333+ and 382+ for thermally actuated switches employing expansible solid actuating means.

**513 Comprising expansible fluid (e.g., alcohol or mercury):**

This subclass is indented under subclass 510. Subject matter wherein the particular thermally responsive current connection or disconnection structure comprises expansible fluid whereby

the expansion or contraction of the fluid initiates or controls a switching action.

SEE OR SEARCH THIS CLASS, SUBCLASS:

253, for electric flatiron type device with current control responsive to thermally expansible liquid means.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 368+ for expanding fluid type thermometers.  
236, Automatic Temperature and Humidity Regulation, subclass 95 for flue attached thermostats which are of the expanding fluid type and subclasses 99+ for other expanding liquid type.  
337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 114+ and 306+ for switches utilizing a heat expansible fluid.

**514 With solenoid means:**

This subclass is indented under subclass 510. Subject matter wherein the current connection or disconnection means includes at least one solenoid winding, controlled or influenced by a thermal responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

495, for heaters in general with thermomagnetic current control or regulating means.  
519, for heaters with automatically operated electromagnetic relay means.

SEE OR SEARCH CLASS:

236, Automatic Temperature and Humidity Regulation, subclasses 91+ for thermostatic controls which may control solenoid means.  
361, Electricity: Electrical Systems and Devices, subclasses 161+ for relay control circuits including a thermal device.

**515 Adjustable means:**

This subclass is indented under subclass 510. Subject matter wherein the particular current connection or disconnection means includes structure whereby the thermally responsive ele-

ment may be adjusted to operate at different degrees of temperature.

SEE OR SEARCH THIS CLASS, SUBCLASS:

252, for electric flatiron type device with adjustable thermally responsive current control means.

**516 Insertable into or in direct contact with heated material:**

This subclass is indented under subclass 510. Subject matter wherein the particular current connection or disconnection means is adapted to be inserted into or attached in direct heat transfer contact with the material to be heated.

SEE OR SEARCH THIS CLASS, SUBCLASS:

450, above for hot plate type heating devices combined with thermostatic control devices in direct contact with a vessel or other cooking device to be heated.

**517 Fusible link:**

This subclass is indented under subclass 510. Subject matter wherein the thermally responsive means comprises fusible material. The material may be either directly in the electrical circuit so that upon fusing it opens the circuit directly or may comprise some securing device which upon fusing allows a circuit completion means to open or close.

SEE OR SEARCH THIS CLASS, SUBCLASS:

253, for electric flatiron type devices with thermally responsive fusible means in the power supply circuit.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclass 61.08 for circuit breakers of the frangible or destructible type.  
337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 142+ and 401+ for electrothermal and thermally actuated switches utilizing fusible material.

**518 Responsive to weight, position, or presence of body to be heated:**

This subclass is indented under subclass 509. Subject matter wherein the particular current connection or disconnection means includes switch means operative by the weight of or the placing, in a certain location, of a body to be heated.

**SEE OR SEARCH CLASS:**

200, Electricity: Circuit Makers and Breakers, subclasses 61.45+ for inertia and tilt type switches, especially subclass 61.59 for article inserted type and subclass 61.83 for gravity actuated switches. See also subclasses 85+ for weight actuated switches.

**519 Including electromagnetic relay means:**

This subclass is indented under subclass 509. Subject matter wherein the automatically operated current connection or disconnection structure includes electromagnetic relay means.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

514, for heaters with thermally controlled solenoid means in the switching circuit.

**SEE OR SEARCH CLASS:**

200, Electricity: Circuit Makers and Breakers, subclasses 87+ for the structure of electromagnetic switches.  
361, Electricity: Electrical Systems and Devices, subclasses 139+ for control circuits for relays and electromagnets.

**520 With heater-unit housing, casing, or support means (e.g., frame and single sheet):**

This subclass is indented under subclass 200. Subject matter comprising the combination of a resistance heater unit with a particular housing, casing or support means therefor.

- (1) Note. In order to be classified here the heating unit and housing, casing or support must comprise an operative whole independent of any art device with which it may be used. The heating unit may or may not be permanently attached to the housing or casing as long as the two are specifically adapted for use only

with each other. Either the heating unit or the housing may be adapted for diverse use aside from its primary purpose, for example the heating unit may be embedded in a glass or plastic which serves also as a windshield as long as the claimed subject matter does not comprise details of the windshield which makes the device primarily a part of a vehicle.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

385+, for the combination of at least one heating device or unit with a container, enclosure or support means for the material to be heated.

**SEE OR SEARCH CLASS:**

338, Electrical Resistors, subclasses 226+ for resistor means, per se, which is incased, embedded or housed and subclasses 315+ for electrical resistors, per se, combined with mounting or support means.

**521 Including or comprising holding or support means for material to be heated:**

This subclass is indented under subclass 520. Subject matter wherein the significant housing, casing or support structure includes broadly defined means whereby an object or material to be heated is supported in heat exchange relationship to a heating unit or units.

- (1) Note. Where the material support means is specifically defined classification is above, particularly subclasses 385+ for example, hot plate type heating devices are to be found in subclasses 462+. The significant housing, casing, or support means in subclasses 520+ has for its primary function the housing or support of a heating unit with the resulting combination being adapted for use with devices in general under the class definition.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

458+, for planar heating surfaces combined with housed heater units. See also (1) Note, above.

## SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, appropriate subclasses for heating means combined with a housing means specifically adapted for use in brewing of a beverage or the cooking of food.
- 338, Electrical Resistors, subclasses 226+ for electrical resistors incased, embedded or housed in which the housing may be adapted for supporting an article to be heated.

**522 Housing, casing, or support performs plural diverse functions (e.g., window):**

This subclass is indented under subclass 520. Subject matter wherein the particular housing, casing or support means includes structure whereby the housing, casing or support is adapted to perform a secondary function other than that of a support or enclosure for a heating unit or units.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 201+, for electric heating devices combined with diverse art type device.

**523 Housing, casing, or support insertable into material or space to be heated (e.g., immersion type):**

This subclass is indented under subclass 520. Subject matter wherein the particular housing, casing or support means includes particular structural features whereby the housing, casing or support means is adapted to be insertable into and removably retained within a space or material to be heated.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 277+, for subsurface (e.g., oil well) heaters.
- 316+, for immersible liquid heaters.
- 381+, for immersion type heaters for fluid.
- 403, for heating unit combined with a housing capable of being inserted into and removed from an oven type enclosure.
- 415+, for deep well heaters.
- 437+, for vessel and stand immersion heater.

## SEE OR SEARCH CLASS:

- 4, Baths, Closets, Sinks, and Spittoons, subclass 545 for bathtub heaters.
- 5, Beds, subclass 284 for bed heaters.
- 36, Boots, Shoes, and Leggings, subclass 2.6 for boot heaters.
- 175, Boring or Penetrating the Earth, subclasses 11+ for boring in the earth by directly applying heat particularly subclass 16 which provides for electrically produced heat.
- 338, Electrical Resistors, subclass 229 for resistors encased in probe type casing.
- 405, Hydraulic and Earth Engineering, subclass 131 for apparatus for applying heat to the earth.

**524 Comprising hinged or separable compartment (e.g., waffle iron type):**

This subclass is indented under subclass 520. Subject matter wherein the particular housing, casing or support structure consists of two or more hinged or otherwise separable sections or compartments. The sections or compartments may or may not be adjustable relative to each other and each containing a separate heating unit or one or more sections of a single unit. Heat transfer may be accomplished by radiation, convection, conduction or a combination of one or more of these.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 225, for hair heating devices with heated clamp means.

## SEE OR SEARCH CLASS:

- 38, Textiles: Ironing or Smoothing, appropriate subclasses for opposed heated platen, ironing machines or implements.
- 99, Foods and Beverages: Apparatus, subclasses 372+ for waffle iron type cooking apparatus and subclasses 385+ especially subclasses 393+ for toaster devices with opposed heaters.
- 100, Presses, subclasses 92+ for heated presses.

**525 With plurality of or sectional heating means:**

This subclass is indented under subclass 524. Subject matter wherein the heating means consists of a plurality of heating units or a single unit consisting of plural sections.

**SEE OR SEARCH CLASS:**

99, Foods and Beverages: Apparatus, subclasses 374 and 389+ for cooking apparatus comprising hinged compartments, molds or grill combined with plural heating units or elements.

**526 With means for attaching housing or casing to an external device (e.g., magnetic or vacuum):**

This subclass is indented under subclass 520. Subject matter wherein the significant housing, casing or support structure includes means whereby the housing, casing or support may be secured or attached to an object or surface to be heated. The transfer of heat energy may be of convection, conduction or radiation.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

201+, for electric heaters combined with diverse type art device.

**527 Body-supported (e.g., human body):**

This subclass is indented under subclass 526. Subject matter wherein the significant casing or support structure includes straps or other devices whereby it may be attached to or supported by, some portion of an animal body, (e.g., human body).

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

211, for electric heaters associated with wearing apparel.  
227+, for hand held electrically heated tools or instruments.

**SEE OR SEARCH CLASS:**

224, Package and Article Carriers, appropriate subclasses for body and belt attached article carriers in general.  
607, Surgery: Light, Thermal, and Electrical Application, subclass 149 for devices for the application of heat or

electricity to the human body and adapted for body attachments.

**528 Flexible or resilient (e.g., warming pad):**

This subclass is indented under subclass 520. Subject matter wherein the significant housing, casing or support structure is pliable or capable of being flexed or bent without permanent distortion.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

456, for heater with a support adjustable to the shape of material to be heated.  
535, for heating unit specially formed to fit material to be heated.  
549, for heating element support of flexible material.

**SEE OR SEARCH CLASS:**

138, Pipes and Tubular Conduits, subclass 35 for portable pipe heaters.  
338, Electrical Resistors, subclasses 210+ for flexible or folding resistors and subclass 259 for resistors, per se, combined with a round, braided or woven casing or housing.  
607, Surgery: Light, Thermal, and Electrical Application, subclass 149 for heating devices for the human body, particularly for bands and belts.

**529 Cloth or other fabric:**

This subclass is indented under subclass 528. Subject matter wherein the significant container or support structure consists of cloth or other fabric material.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

211, for electrical heater combined with wearing apparel.  
212, for electrical heater combined with bed covering (e.g., blanket).  
545, for resistive element interwoven with fabric support.

**SEE OR SEARCH CLASS:**

5, Beds, subclasses 482+ for structural details of bed clothing which may include electric heating means and subclass 423 for heated mattresses or cushions.

- 338, Electrical Resistors, subclass 208 for mesh, woven or braided resistance element.
- 607, Surgery: Light, Thermal, and Electrical Application, subclass 96 for thermal applicators in general for therapeutic purposes.

**530 With heat storage or transfer means (vanes):**

This subclass is indented under subclass 520. Subject matter wherein the significant housing, casing or support structure includes means whereby heat energy is stored or is transferred to a material or object to be heated. The transfer of the heat energy may be conduction or radiation, as by a reflector, or convection.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 258, for sole plate pressure application heating devices (sad irons) with heat storage or transfer means.
- 276, for vaporizers with heat transfer means.
- 302, for forced circulation heater with heat storage.
- 325+, for liquid heaters with heat storage or exchange means.
- 341, for radiant fluid heaters with heat storage or transfer means.
- 365, for convection heaters with heat transfer or storage means.
- 378, for fluid heaters with heat storage means.
- 399+, for ovens combined with heat transfer distribution or accumulator means.
- 430, for a vessel and stand combined with heat storage or transfer means.
- 439, for a vessel alone combined with heat storage or transfer means.
- 462, for electrical hot plates with heat storage or transfer means.
- 540, for a heating unit structure per se with heat storage or exchange means.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclass 400 for heat accumulator structure in general.
- 165, Heat Exchange, appropriate subclasses for heat transfer or exchange means in general.

- 338, Electrical Resistors, subclass 59 for resistors, per se, combined with heat storing means.

**531 With thermal insulation or cooling means:**

This subclass is indented under subclass 520. Subject matter wherein the significant housing, casing or support structure includes thermal insulation or other means whereby unwanted heat is dissipated or prevented from effecting at least some portion of the housing, casing or support means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 460, for planar surface heater with heating unit support with thermal insulation or ventilating means.
- 540, for heating element for heat transfer plate or fins.
- 542+, for resistive element with particular electrical insulation means.

SEE OR SEARCH CLASS:

- 338, Electrical Resistors, subclasses 51+ for resistors, per se, combined with heat dissipating vanes and subclasses 53+ for resistors combined with cooling gas or liquid circulation.

**532 With open frame or grid-type support:**

This subclass is indented under subclass 520. Subject matter wherein the significant support means is comprised of an open frame or grid with the heating unit or units supported on or by the grid members usually by tubular or spool type insulator means. The heating element or elements in this subclass are generally exposed straight resistance wire or coils but they may be sheathed, as in a "Calrod" type.

SEE OR SEARCH CLASS:

- 338, Electrical Resistors, appropriate subclasses for open frame or grid supported resistance elements, particularly subclasses 226+ for incased resistors, which may be comprised of zigzag or helical wound type, subclasses 283+ for zigzag or sinuous type, subclasses 296+ for helical or wound type elements in general and subclasses 315+ for resistors, per se, combined with mounting or supporting means.

**533 Portable (e.g., with handle):**

This subclass is indented under subclass 520. Subject matter wherein the significant housing, casing or support structure includes handle or other means whereby the housing, casing or support is adapted to be carried by or held in the hand.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 227+, for hand held or manipulative tool devices combined with heater devices.
- 245+, for sadirons with heating means.
- 260+, for portable igniters.
- 346, for portable containers combined with heating devices.
- 386+, for portable containers combined with heating devices.
- 527, for body supported (e.g., human body) heaters.

**534 Rigid tubular housing, casing, or support (e.g., flattened tube):**

This subclass is indented under subclass 520. Subject matter wherein the significant housing, casing or support structure comprises rigid tubes. The structure usually comprises a flattened tube but may include tubes adapted to have the heating unit mounted in such a manner as to allow the material to be heated to flow through or be contained within the housing.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 300, for liquid heater wherein the liquid conveying tube is the heater unit.
- 301, for liquid heater wherein the heater unit is attached to or surrounds the liquid conveying tube.
- 306+, for liquid heater, wherein the heater unit is enclosed within the liquid conveying path.
- 374, for fluid heater wherein the heating element is directly in the fluid path.
- 544, for heater unit structure wherein the resistance element is embedded within or surrounded by a core sheath or support.

**535 Specially formed or adapted to fit material to be heated (e.g., a pipe):**

This subclass is indented under subclass 520. Subject matter wherein the housing, casing or support structure claimed includes significant details of means whereby the device may be applied to or shaped to fit the contours of an object to be heated.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 201+, for electric heaters combined with other art devices.
- 301, for liquid heater with heater unit attached to or surrounding the liquid conveying means.
- 456, for planar surface heaters wherein the material support is adjustable to the shape of the material heated.
- 528+, for heating unit of flexible or resilient construction.
- 545, for heating element interwoven with fabric.
- 549, for heating element on flexible support.

SEE OR SEARCH CLASS:

- 104, Railways, subclass 279 for rail heaters.
- 105, Railway Rolling Stock, subclass 451 for seat heaters.
- 123, Internal-Combustion Engines, subclasses 543+ for charge forming devices (carburetors) with heating means and subclass 142.5 for heating devices adapted to be applied to a motor.
- 138, Pipes and Tubular Conduits, subclass 33 for electric pipe heaters.
- 165, Heat Exchange, subclasses 48.1+ for heating or cooling apparatus adapted for special structural installation.
- 191, Electricity: Transmission to Vehicles, subclass 27 for heated conductors.
- 312, Supports: Cabinet Structure, subclass 236 for cabinet structure combined with heating means.
- 313, Electric Lamp and Discharge Devices, subclasses 11+ for discharge devices combined with temperature modifying means.

- 429, Chemistry: Electrical Current Producing Apparatus, Product, and Process, for battery having heat exchange feature.
- 607, Surgery: Light, Thermal, and Electrical Application, appropriate subclasses under subclass 1 for heat applicators adapted to fit various parts of the human body.
- 536 With heating unit mounting or attaching means:**  
This subclass is indented under subclass 520. Subject matter wherein the housing, casing or support structure includes significant structure whereby the heating unit is attached to or mounted upon or within the housing, casing or support means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 463, for planar surface heater with heating unit attachment or securing means.
- 542+, for resistive element attaching or securing means.
- 537 Plural units combined with single casing housing or support:**  
This subclass is indented under subclass 536. Subject matter wherein a single housing, casing or support structure is combined with a plurality of heating units having significant attachment means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 478, for plural separate heating devices with unitary housing, support or casing means.
- 538 With heating unit structure:**  
This subclass is indented under subclass 200. Subject matter consisting of a heating element, usually resistive, with a core, sheath or support means, the combination comprising a basic heating unit adapted to form a subcombination of a more comprehensive combination which is classifiable higher up in this class or in another art class.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 119+, for metal heating resistance welding electrodes.
- 145.1+, and 146.1+, for metal heating arc welding electrodes.
- 221+, for specific heating unit means combined with a hand tool.
- 254+, for a specific heating unit combined with an electric iron.
- 270, for a specific igniter unit.
- 275, for specific heating unit means combined with a vaporizer.
- 278, for a specific heating unit combined with an oil well heater.
- 335+, for a specific heating unit combined with a liquid heater.
- 353, for a specific heating unit combined with a radiant heater.
- 385, for a specific heating unit combined with a convection heater.
- 414+, for a specific heating unit combined with an over type enclosure.
- 431+, for significant heating unit means combined with a crucible or furnace.
- 469+, for significant heating unit means combined with a hot plate.
- 520+, for the combination of a heater unit with a particular housing or casing therefor in general.
- 600+, for induction heating system and subsystem.
- 678+, for microwave heating system and subsystem.
- 764+, for capacitive dielectric heating system and subsystem.
- 539 Comprising plural separate and distinct resistive elements:**  
This subclass is indented under subclass 538. Subject matter comprising a plurality of heating elements combined with core, sheath or support means. The plurality of elements may or may not be attached to a single core, sheath or support means.
- (1) Note. To complete the search for this subject matter, search should be made above in the indented subclass under each special type heating devices listed.
- SEE OR SEARCH CLASS:
- 338, Electrical Resistors, particularly subclass 48, for plural separate diverse resistors, subclasses 76, 120, 122+, and 128+ for mechanically variable resistor which may involve a plurality of resistors with a support, subclass

203, for structures readily separable into a plurality of resistors, subclasses 235, 239 and 260+ for plural resistors which are embedded, incased or housed, subclass 295, for plural resistance elements connected by a jumper, subclass 299, for plural helix or winding type resistor with support, subclass 319, for plural resistors extending between supports and subclass 320, for plural resistors with mounting or supporting means in general.

**540 With heat storage or transfer means (e.g., fins or plate):**

This subclass is indented under subclass 538. Subject matter including significant heat transfer or storage means, such as fins or plates whereby the heat energy generated in the heating unit is transferred to a space or body of material which is to be heated.

- (1) Note. To complete the search for this subject matter consult the appropriate subclasses under each special type heating device listed under "Search This Class, Subclass" of subclass 530.

**SEE OR SEARCH CLASS:**

338, Electrical Resistors, subclasses 51+ for resistors with heat dissipating projections (e.g, vanes); subclasses 53+ for resistors with cooling gas or liquid circulation means and subclass 59 for resistors with heat storing means.

**541 With terminal or connector means (e.g., to external circuit means):**

This subclass is indented under subclass 538. Subject matter including specific terminal or connector elements whereby an electrical connection with an external electrical circuit may be made.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

247, for electric flatiron with stand and electrical connector means.  
256+, for electric flatiron with terminal structure.  
318, for readily detachable liquid heater units.

321, for liquid heater with plural selectively replaceable heater units.  
351, for radiant heaters with interchangeable or readily detachable heating units.  
403, for ovens with heating units detachable from heated enclosure.  
436+, for vessel and stand with heating unit attaching means.  
447, for vessel with plural detachable or interchangeable heater units.

**SEE OR SEARCH CLASS:**

338, Electrical Resistors, appropriate subclasses for particular resistors with terminals and subclasses 322+ for electrical resistors, per se, with terminal means in general ("Search This Class, Subclass" under subclass 322 lists particular resistors with connectors or terminals in Class 338).  
439, Electrical Connectors, appropriate subclasses, for terminals of the separable type, per se, which may be applied to heater units.

**542 With resistive-element attaching, securing or electrical insulation means:**

This subclass is indented under subclass 538. Subject matter including a heating element secured or attached to, or insulated from, a core, sheath or support by specific means.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

536, for heater unit with a mounting or attaching means.

**SEE OR SEARCH CLASS:**

338, Electrical Resistors, subclasses 226+ for resistor means incased, embedded or housed and subclasses 306+ for a resistor element with a base extending along the element.

**543 Comprising coating printed or deposited on core sheath or support means:**

This subclass is indented under subclass 542. Subject matter including a core, sheath or support means having a heating element attached thereto by printing or deposited thereon by other coating or bonding means.

## SEE OR SEARCH CLASS:

- 174, Electricity: Conductors and Insulators, subclasses 250+ for preformed panel circuit arrangements, such as printed circuits.
- 338, Electrical Resistors, subclass 307 for printed resistance element and subclasses 308+ for coated resistance element resistors.

**544 Element embedded within or completely surrounded by core, sheath, or support means:**

This subclass is indented under subclass 542. Subject matter comprising a heating element embedded in or completely surrounded by a core, sheath or other support means. The element may be enclosed or surrounded by electrical insulating material within a groove or recessed in the core or sheath or may be simply inserted into a recess in the core or sheath.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 534, for heater unit combined with a rigid, tubular housing, casing or support.

## SEE OR SEARCH CLASS:

- 338, Electrical Resistors, subclasses 226+ for resistor, per se, incased, embedded or housed within a sheath.

**545 Resistive element interwoven with fabric support:**

This subclass is indented under subclass 542. Subject matter consisting of an element of electrical resistive material interwoven with a support means of nonconductive material. The nonconductive material generally consists of glass or asbestos fibers but may consist of any other nonconductive fabric.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 211, for electrical heater combined with wearing apparel.
- 212, for electrical heater combined with bed covering (e.g., blanket).
- 529, for heater unit with a support of cloth or other fabric.
- 549, for heater resistance element with flexible core, sheath or support means.

## SEE OR SEARCH CLASS:

- 139, Textiles: Weaving, subclass 425 for interwoven fabric and metal in general.
- 338, Electrical Resistors, subclass 208 for mesh woven or braided resistance element, per se, and subclass 259 for resistor means combined with a wound, braided or woven casing or housing.

**546 Core, sheath, or support means for heating element:**

This subclass is indented under subclass 538. Subject matter wherein the significant structural details relate to the particular core, sheath or support means for the resistive or other heating element.

## SEE OR SEARCH CLASS:

- 338, Electrical Resistors, subclass 321 for resistive element cores and frames.

**547 Comprising material to be heated:**

This subclass is indented under subclass 546. Subject matter wherein the significant core, sheath or support means is comprised wholly, or in part, of the material to be heated; such as a glass panel having a resistive heating element adhered thereto or imbedded therein.

## SEE OR SEARCH CLASS:

- 338, Electrical Resistors, subclasses 226+ for resistor means incased or embedded in a support.

**548 Of particular construction or material:**

This subclass is indented under subclass 546. Subject matter wherein the core, sheath or support means is compromised of a significant material or is constructed in a particular manner.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 354, for fluid heaters of the radiant type with heating unit structure of particular construction or material.
- 409+, for oven with heating unit structure or composition.
- 426, for furnace with heating unit of particular structure or composition.

- 468, for planar surface heater with heating unit with particular resistance element structure or material.
- 553, for heating element of particular construction or material.

## SEE OR SEARCH CLASS:

- 338, Electrical Resistors, appropriate subclasses for resistor means with a significant core or sheath.

**549 Flexible:**

This subclass is indented under subclass 548. Subject matter wherein the significant core, sheath or support means is comprised of material which is adapted to be flexed, folded or rolled upon itself without becoming permanently deformed.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 211, for electric heater combined with wearing apparel.
- 212, for electric heater combined with bed clothing.
- 456, for heater with a support adjustable to the shape of the material to be heated.
- 528+, for heater unit with flexible or resilient support.
- 545, for resistive element interwoven with fabric support.

## SEE OR SEARCH CLASS:

- 338, Electrical Resistors, subclasses 210+ for flexible or folding resistor devices.

**550 Sectional or interconnectable insulator means:**

This subclass is indented under subclass 548. Subject matter wherein the significant core, sheath or support means consists of plural sections or elements of insulative material adapted to be joined together to form a single whole device.

## SEE OR SEARCH CLASS:

- 174, Electricity: Conductors and Insulators, subclasses 137+ and appropriate subclasses for insulators which may be joined or sectional.

**551 Gasket or wafer-type insulator means:**

This subclass is indented under subclass 548. Subject matter wherein the significant core, sheath or support means is recited as comprising a thin plate or wafer element of insulating material and including means whereby the element may be rigidly inserted between two external members; usually metallic, in the manner of a conventional gasket.

## SEE OR SEARCH CLASS:

- 174, Electricity: Conductors and Insulators, subclasses 137+, especially subclass 138 for special application and subclasses 151+ for through wall or plate insulators.

**552 Heating element structure:**

This subclass is indented under subclass 538. Subject matter wherein the heating unit structure comprises significant details of a particular resistance or other type heating element.

- (1) Note. The resistor structures in this and the indented subclasses are similar to the electrical resistor structure to be found in Class 338, but are restricted to those resistive devices peculiarly adapted to efficiently convert electrical energy into heat energy and limited to use in the heating devices under the class definition of this class (219). The resistor structures in Class 338 are primarily and peculiarly adapted for use as current impeding or limiting electrical resistors where the heat generated is incidental or undesired and secondary to the primary current impeding or limiting function. See Lines With Other Classes and Within This Class in Class 338, Electrical Resistors, for a more detailed explanation of the line between Class 318 and Class 219.

**553 Of particular construction and/or material (e.g., infrared generator):**

This subclass is indented under subclass 552. Subject matter wherein the significant resistance or other type element comprises particular structural elements or is made from a specific material; such, for example, as carbon pellets or granular material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 354, for fluid heaters of the radiant type with heating element of particular construction or composition.
- 548+, for heater unit element core, sheath or support means of particular construction or material.

**600 INDUCTIVE HEATING:**

This subclass is indented under the class definition. Subject matter for electric heating whereby an electromagnetic field interacts in close proximity to an electrically conducting material or object causing current to flow through a material or object and producing heat proportional to a resistance of the material or object.

- (1) Note. Inductive, capacitive dielectric, and microwave heating applications are in the radio frequency region of the electromagnetic spectrum, with the exception of inductive heating which may be in a frequency range as low as 50 hertz. Specifically, inductive and capacitive dielectric heating are commonly in the frequency ranges from 1000 hertz to 1 gigahertz, and microwave heating is in the frequency ranges from 1 gigahertz to 3 gigahertz (also called microwave range).
- (2) Note. For claims reciting both food (edible) and nonfood (nonedible) heating by an electric heating device or method, classification is proper for Class 219. If the claims recited are limited to food (edible) heating methods, composition, product, or processes, classification is proper for Class 426.
- (3) Note. The heating may be combined with working the metallic or nonmetallic material heated.
- (4) Note. The work may have electric current or potential induced therein and thus constitute the secondary of a transformer, or it may be a continuation of the inductor core.

- (5) Note. A closed transformer secondary may be the inductively heated member for the purpose of heat transfer.
- (6) Note. An inductive heating apparatus with corona prevention means, shock protection means, and the like, is classified herein.
- (7) Note. An inductive heater with means to heat the inductor to prevent condensation thereon is classified herein.
- (8) Note. An inductive heating apparatus with means to prevent dissipation of heat from the work by simultaneously heating the work holder or support is classified herein.
- (9) Note. This subclass and the indented subclasses include inductive heating having means for applying pressure to the work (see subclass 659) or for cooling the inductor apparatus during the application of electrical energy (see subclass 632). If the cooling apparatus is provided for use subsequent to the heating or is for the purpose of treating the material or object being heated, classification is proper with the art collection to which it pertains.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 108+, especially indented subclass 116 for electric supply systems for heating metal where the work is heated by connecting it in series with the secondary of a transformer so as to complete a conductive current path from the secondary through the work. In subclasses 108+, the transformer secondary is not the heated member, nor is the workpiece a part of the secondary of the transformer.

SEE OR SEARCH CLASS:

- 118, Coating Apparatus, subclasses 50.1, 620+, and 724+ for means to apply electrical and/or radiant energy to work and/or coating.
- 148, Metal Treatment, for metal fusion bonding or working of metal, is com-

- bined with significant heat treatment of metal as defined in the Class Definition of Class 148.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 272.2+ for methods and subclasses 379.6+ for means of surface bonding and/or assembly thereof with direct application of electrical, magnetic, or radiant energy to work.
- 204, Chemistry: Electrical and Wave Energy, subclasses 193+ for apparatus for treating substances with electrical or radiant energy to effect a chemical change.
- 266, Metallurgical Apparatus, appropriate subclasses for miscellaneous apparatus particularly adapted for the treatment of metals and metalliferous material. Class 266, subclass 129, provides for apparatus having inductive heating means in combination with other heat treatment means such as quenching apparatus.
- 373, Industrial Electric Heating Furnaces, appropriate subclasses for miscellaneous electrical furnaces; see subclasses 4, 6, 7, and 138+ for induction furnaces.
- 600, Surgery, subclasses 9+ for a magnetic field applied to the body for therapeutic purposes.
- 606, Surgery, subclasses 27+ or 32+ for instruments for heat or electrical application.
- 607, Surgery: Light, Thermal, and Electrical Application, subclasses 1+ for light and thermal application to the body and subclasses 114 through 156 for an electrical energy applicator.
- 601 With diverse-type heating:**  
This subclass is indented under subclass 600. Subject matter wherein both an inductive heater and a different type of heater are provided for in a heating arrangement.
- (1) Note. Examples of different types of heaters are resistance heaters, incandescent lamps, infrared lamps, microwave and capacitive dielectric heating, etc.
- (2) Note. The meaning of “workpiece” is any object or material that work (in the form of heat) is applied to.
- (3) Note. An inductive heater whose circuit is completed through a workpiece in order to obtain both resistive and inductive heating effects is classifiable here.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
680+, for microwave heating with other types of heating elements included in the heating apparatus.
- 602 Metal working:**  
This subclass is indented under subclass 600. Subject matter wherein a metallic workpiece is physically changed in shape or deformed by inductive heating.
- (1) Note. Metal working is defined as the changing of the physical shape of the metal (as, for example, by plastic deformation or by cutting) as, for example, by heat treatment.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
50+, for especially indented subclasses 149+ for similar subject matter not having inductive heating.
- SEE OR SEARCH CLASS:  
29, Metal Working, subclasses 400.1+ for methods of mechanical manufacturing.  
72, Metal Deforming, subclasses 342.1+ for a device with a temperature modification of a tool or specific portion of work.
- 603 Bonding:**  
This subclass is indented under subclass 602. Subject matter wherein two or more opposing metallic surfaces are permanently joined together by inductive heating.
- (1) Note. This subclass relates, for example, to welding, brazing, or soldering of metal-to-metal.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 633, for bonding with a heat exchange.
- 765, for bonding in which the object or material is nonmetallic.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 428+ for assembling or joining.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 272.2+ for methods and subclasses 379.6+ for means of surface bonding and/or assembly thereof with direct application of electrical, magnetic, or radiant energy to work.
- 228, Metal Fusion Bonding, appropriate subclasses for nonelectric metal fusion bonding.

**604 Container sealing:**

This subclass is indented under subclass 603. Subject matter wherein the bonded surfaces result in a tightly enclosed vessel having the capacity for holding material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 769, for bonding containers by capacitive dielectric heating.

SEE OR SEARCH CLASS:

- 53, Package Making, subclasses 477+ for closing a package by heat sealing and digest 2 for high frequency electric sealing.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 272.2+ and 379.6+ for methods and means of surface bonding and/or assembly thereof with direct application of electrical, magnetic, or radiant energy to work, and subclass 69 for application of end closures to containers.

**605 Wire (e.g., cable, etc.):**

This subclass is indented under subclass 603. Subject matter wherein the bonding is between plural ends of elongated solid flexible cylindrical conductors.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 56+, for wire, rod, or bar bonding by resistance heating.
- 636, for hardening wire or cable by inductive heating.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 825+ for conductor or circuit manufacturing.
- 228, Metal Fusion Bonding, subclasses 173.1+ for bonding a rod, bar, or wire-like object by deforming.

**606 Ring:**

This subclass is indented under subclass 603. Subject matter wherein a circular band is bonded to a conductor.

- (1) Note. The circular band may be a seat on which a flap or lid rests (e.g., a valve seat).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 641, for hardening a valve seat by inductive heating.
- 642, for hardening a ring or link by inductive heating.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 890.12+ for valve making.

**607 Tube (i.e., pipe):**

This subclass is indented under subclass 603. Subject matter wherein the metal workpiece is bonded together to form a hollow cylinder or plural hollow cylinders forming one unit.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 59.1+, for similar subject matter involving resistance heating.
- 643+, for heating a preformed tubular object.

SEE OR SEARCH CLASS:

- 228, Metal Fusion Bonding, subclass 60 for tube end closing and subclasses 144+ for edge joining of a piece blank or strip.

- 285, Pipe Joints or Couplings, subclass 41 for heating or cooling thereof.
- 608 With electrical control (e.g., speed, temperature, gaging thickness, etc.):**  
This subclass is indented under subclass 607. Subject matter wherein an electric device continuously adjusts the forming of a tube according to a specific result.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
663, for an inductive heating system with condition responsive controlled power supply.
- 609 Layering (e.g., coating, lining, etc.):**  
This subclass is indented under subclass 607. Subject matter wherein a coating or lining is applied to an interior or exterior surface of a tube wall, or a tube is formed around an object.
- (1) Note. A tube may be formed around other objects such as wire, cable, or another tube.
- SEE OR SEARCH CLASS:  
118, Coating Apparatus, subclasses 50.1 and 620+ for means applying electrical and/or radiant energy to work and/or coating material.  
427, Coating Processes, subclasses 543 and 591 for processes with dielectric or induction heating or utilizing radio or microwave energy.
- 610 With preheating or postheating:**  
This subclass is indented under subclass 607. Subject matter wherein the metal workpiece is heated prior to, or after, the forming of the tube.
- (1) Note. Apparatus for operating on the material or object prior to the heating may be included only if the sole purpose of such a preparatory operation is to facilitate the inductive heating.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
601, for inductive heating with another diverse type of heating.
- 656, for an inductive heating system with multiple stations of plural heating zones.
- 611 Plural (e.g., end to end, etc.):**  
This subclass is indented under subclass 607. Subject matter wherein a tube end is bonded together with another tube thereby forming one unit.
- SEE OR SEARCH CLASS:  
285, Pipe Joints or Couplings, subclass 41 for heating or cooling thereof.
- 612 Seam bonding:**  
This subclass is indented under subclass 607. Subject matter wherein a tube is formed by permanently joining together two opposing outer edges of a C cross-sectional elongated metal strip.
- SEE OR SEARCH CLASS:  
228, Metal Fusion Bonding, subclasses 144+ for edge joining of one piece blank or strip.
- 613 With impeder:**  
This subclass is indented under subclass 612. Subject matter including a device which modifies or intensifies a current path traveling along the seam of the tube.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
670, for inductive heating systems with a specific transformer core structure.
- 614 With guiding device:**  
This subclass is indented under subclass 612. Subject matter including an arrangement of roller-type apparatus that curves outer edges of an elongated metal strip inward to form a C cross-section or arranged to direct the tube movement.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
61.13, and 61.3, for resistance heating cylinders with edge guidance means.  
647, for an inductive heating device with workpiece support.

**615 Brazing (e.g., cladding, etc.):**

This subclass is indented under subclass 603. Subject matter wherein a melted alloy of copper or brass is used to fill the joint between the opposing surfaces.

- (1) Note. The melting point of braze metal is usually lower than the base metal to be bonded, therefore base metal fusion is not required. Braze metal is also called hard solder.

SEE OR SEARCH THIS CLASS, SUBCLASS:

85.1+, for brazing or soldering by resistance heating.

**616 Soldering:**

This subclass is indented under subclass 603. Subject matter wherein a melted alloy of lead and tin is melted and used to fill the joint between the opposing surfaces.

- (1) Note. The melting point of solder is usually lower than the base metal to be bonded, therefore base metal fusion is not required.

SEE OR SEARCH THIS CLASS, SUBCLASS:

85.1+, brazing or soldering by resistance heating.

SEE OR SEARCH CLASS:

228, Metal Fusion Bonding, subclasses 33+ for means to apply flux and subclasses 51+ for a metallic heat applicator.

**617 Welding:**

This subclass is indented under subclass 603. Subject matter wherein the opposing surfaces are heated until soft enough to adhere to each other.

- (1) Note. Welding may be accomplished with the application of heat and mechanical force.

SEE OR SEARCH THIS CLASS, SUBCLASS:

50+, for similar subject matter using resistance heating.

**618 With heat exchange:**

This subclass is indented under subclass 600. Subject matter wherein an intermediate member is inductively heated so as to transfer heat to another member, material, or object.

SEE OR SEARCH CLASS:

- 165, Heat Exchange, appropriate subclasses for a heat exchange structure.  
266, Metallurgical Apparatus, appropriate subclasses for apparatus for heating and cooling (by quenching, for example) solid metal, including such apparatus where inductive heating means are provided.  
336, Inductor Devices, subclasses 55+ for the structure of transformers and inductive reactors with means to modify the temperature thereof.  
361, Electricity: Electrical Systems and Devices, subclasses 381+ for an electronic system with cooling means.

**619 Roller (e.g., godet, etc.):**

This subclass is indented under subclass 618. Subject matter wherein an intermediate member is a rotatable drum-like cylinder.

- (1) Note. This includes, for example, a godet which is defined as a roller around which synthetic filaments are passed under tension for stretching.

SEE OR SEARCH THIS CLASS, SUBCLASS:

469+, for a cylindrical or roller-type support for material to be heated by resistance heating.

SEE OR SEARCH CLASS:

100, Presses, subclasses 300+ for a roll press with heating means.

**620 Cooking:**

This subclass is indented under subclass 618. Subject matter wherein the intermediate member is arranged to transfer heat to warm, defrost, or cook (edible) food.

- (1) Note. For claims reciting both food (edible) and nonfood (nonedible) heating by an electric heating device or method, classification is proper for Class 219. If

the claims recited are limited to food (edible) heating methods, composition, product, or processes, classification is proper for Class 426.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 385+, for similar subject matter utilizing resistance heating.
- 725+, for cookware for microwave cooking.
- 771, for cooking by capacitive dielectric heating.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 451 for electric radiant or vibrational treating means and digest 14 with induction heating.
- 126, Stoves and Furnaces, subclasses 1+ for cooking.
- 392, Electric Resistance Heating Devices, for appropriate subclasses having similar subject matter using resistance heating.
- 426, Food or Edible Material: Processes, Compositions, and Products, subclasses 237+ for direct application of electrical or wave energy to food material.

**621 Utensil (e.g., pot, pan, etc.):**

This subclass is indented under subclass 620. Subject matter wherein the intermediate member is a container or vessel used to hold food (edible) while cooking.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 725+, for cookware for microwave heating.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, digest 14 for cooking with induction heating.
- 126, Stoves and Furnaces, for general heat applying apparatus having other than electrical heating means, subclasses 373.1 through 390.1 for a liquid heater having an open-top vessel that may include a lid.
- 220, Receptacles, subclasses 573.1+ and 912 for cookware.

**622 With support:**

This subclass is indented under subclass 620. Subject matter wherein a rigid structure is useable for sustaining a utensil and an inductive heating element within close proximity of each other.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 385+, for a resistance heating device combined with a container, enclosure, or support for material to be heated.
- 647+, for inductive heating device having a workpiece support.

SEE OR SEARCH CLASS:

- 312, Supports: Cabinet Structure, subclass 236 for support with heating, cooling, or heat exchange means.

**623 Having cooling device:**

This subclass is indented under subclass 622. Subject matter including a device to remove heat from an inductive cooking support or food serving support.

- (1) Note. This subclass does not provide for inductive heaters combined with devices for cooling only the work. Such excluded subject matter may be found in the classes which provide for the apparatus which treats the specific materials and object which are cooled.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 399+, for an electrical oven with heat energy transfer distribution or accumulator means.
- 632, for an inductive heater with cooling arrangement.
- 757, for a microwave oven with cooling or ventilation.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclass 21 for ventilated ovens and subclass 299 for a stove with stove surface ventilation.
- 361, Electricity: Electrical Systems and Devices, subclasses 381+ for an electrical system with cooling means.

**624 Core or coil structure:**

This subclass is indented under subclass 620. Subject matter wherein (a) a magnetic conductor of a particular geometric shape links an inductive winding (primary) to the intermediate member (secondary) or (b) a conducting wound wire (primary) induces an alternating current in the intermediate member (secondary).

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 670, for an inductive heating system with specific transformer.
- 672+, for an inductive heating system with specific inductor configuration.

SEE OR SEARCH CLASS:

- 336, Inductor Devices, for appropriate subclasses for core or coil structures.

**625 Intermediate member condition responsive:**

This subclass is indented under subclass 620. Subject matter wherein an automatic controlling device is regulating or adjusting an inductive heating element interaction upon an intermediate member according to a preselected result.

- (1) Note. The automatic controlling device must include means to sense a condition and means to vary a condition in response to the sensed condition. Means to maintain a condition constant is included as an automatic control where the system includes means to sense deviations from the condition and to adjust the system to maintain the desired value constant.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 482+, for a resistance heating device with a control system.
- 663, for inductive heating systems with automatic control.
- 702, for a microwave heating device with a control system.
- 779, for a capacitive dielectric heating device with a control system.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclasses 325+ for a cooking device with automatic control.
- 307, Electrical Transmission or Interconnection Systems, appropriate subclasses for the miscellaneous power distribution and supply systems.
- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for the miscellaneous systems for controlling phase angle or voltage and/or current magnitude and for the miscellaneous transformer and impedance systems.
- 363, Electric Power Conversion Systems, appropriate subclasses for inverter and/or converter systems.

**626 Load sensing:**

This subclass is indented under subclass 625. Subject matter wherein a device is condition responsive to a presence or absence of an intermediate member or to the ability of the intermediate member to conduct.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 665+, for an inductive heating control system responsive to a load condition.

**627 Temperature:**

This subclass is indented under subclass 625. Subject matter wherein a device is condition responsive to an increase or decrease in a thermal change of the intermediate member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 494+, for an electrical resistive heating device with thermally responsive automatic regulating or control means.
- 667, for an inductive heating device with a power control responsive to load temperature.
- 710+, for a microwave heating device with a power control responsive to load temperature.

## SEE OR SEARCH CLASS:

374, Thermal Measuring and Testing, for subclass 149 for temperature measurement combined with a cooking compartment.

**628 Fluid or liquid heater:**

This subclass is indented under subclass 618. Subject matter wherein the intermediate member is arranged to transfer heat to a fluent material.

- (1) Note. A fluent material is one that flows easily from container to container and may be a fine granular material, liquid, or air.
- (2) Note. An inductively heated intermediate member is usually a conduit or container where the heat is to be supplied to a fluent material.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

687+, for a microwave fluid heater.  
772, for apparatus for dielectric heating a fluent material where the electromagnetic field acts directly on the fluent material.

## SEE OR SEARCH CLASS:

137, Fluid Handling, subclass 341 having an electric heater.  
138, Pipes and Tubular Conduits, subclass 33 for fluid conduits with electric thawing and freeze protection means.  
336, Inductor Devices, subclasses 55+ for the structure of transformers and inductive reactors with means to modify the temperature thereof.  
392, Electric Resistance Heating Devices, subclasses 311+ for a noninductive electrical fluid heater.

**629 By tube (i.e., pipe):**

This subclass is indented under subclass 628. Subject matter wherein the intermediate member is a hollow cylinder which transports a fluent material.

## SEE OR SEARCH CLASS:

392, Electric Resistance Heating Devices, subclasses 320+ for an electrical resistance heater with a tube or pipe forming a flow path.

**630 Core or coil structure:**

This subclass is indented under subclass 629. Subject matter wherein (a) a magnetic conductor of particular geometric shape links an inductive winding (primary) to the tube (secondary) or (b) a conducting wound wire (primary) induces an alternating current in the tube (secondary).

## SEE OR SEARCH THIS CLASS, SUBCLASS:

670, for a power supply system with a specific transformer structure.  
677, for specific inductor configuration having a cooling arrangement.

## SEE OR SEARCH CLASS:

336, Inductor Devices, subclasses 221 through 234 for coil and core structures.

**631 Core rotation:**

This subclass is indented under subclass 630. Subject matter wherein the core is subjected to a spinning or circular motion relative about its axis.

**632 With cooling arrangement:**

This subclass is indented under subclass 618. Subject matter including an apparatus to remove heat from the intermediate member.

- (1) Note. This subclass does not provide for inductive heaters combined with devices for cooling only the work. Such excluded subject matter may be found in the classes which provide for the apparatus which treats the specific materials and object which are cooled.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

677, for a specific inductor having a cooling arrangement.

**633 Bonding (e.g., nonmetallic, etc.):**

This subclass is indented under subclass 618. Subject matter wherein the intermediate member is arranged to transfer heat to permanently unite two or more surfaces together.

- (1) Note. Bonding by inductive heat exchange (using an intermediate member to transfer heat) is most common when the materials or workpieces are nonmetallic substances or when bonding metal to plastic using thermal sensitive glue.
- (2) Note. Apparatus for operating on the material or object prior to the heating may be included only if the sole purpose of such a preparatory operation is to facilitate the inductive heating.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 603+, for bonding metal by direct inductive heating.  
765+, for bonding by capacitive dielectric heating.

SEE OR SEARCH CLASS:

- 65, Glass Manufacturing, appropriate subclasses, especially subclasses 36+ for a process of bonding glass by a glassworking operation to a preformed part and subclasses 152+ for glassworking apparatus including fusion bonding means.  
75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, etc., appropriate subclasses for bonding particulate metal by heat and/or pressure.  
156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 272.2+ for laminating processes which include heating or other effects produced by electrical energy; see subclasses 379.6+ for apparatus therefor.  
228, Metal Fusion Bonding, appropriate subclasses for nonelectric metallurgical fusion bonding.

- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 460+ for direct application of electrical or wave energy for heating purposes in processes of molding or shaping plastic materials within the class definition and subclasses 109+ for forming articles by uniting discrete, bulk assembled particles.  
373, Industrial Electric Heating Furnaces, appropriate subclasses for electric furnaces involving sintering.  
419, Powder Metallurgy Processes, appropriate subclasses for processes for making articles by uniting discrete, bulk assembled metal particles.  
425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclasses 174+ for means applying electrical or wave energy directly to a workpiece.

**634 Susceptor:**

This subclass is indented under subclass 618. Subject matter wherein the intermediate member has highly absorbing thermal energy properties and transfers the thermal energy to a workpiece.

- (1) Note. The meaning of "workpiece" is any object or material that work (in the form of heat) is applied to.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 730, for microwave cookware with a susceptor.  
759, for a microwave heating device with a heat exchange susceptor.

SEE OR SEARCH CLASS:

- 118, Coating Apparatus, subclasses 724+ for a gas or vapor deposition coating device with heater.

**635 Specific heating application:**

This subclass is indented under subclass 600. Subject matter wherein an object or material of a particular shape or form is subjected to inductive heating.

- (1) Note. This and indented subclasses are intended primarily as subclasses for specific applications of electric inductive

heating. Examples of specific applications are an inductive heater claimed in combination with an article of unique configuration or with a specific material, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

770+, for a specific capacitive dielectric heating application.

SEE OR SEARCH CLASS:

148, Metal Treatment, subclasses 566+ for induction heating of metal.

266, Metallurgical Apparatus, subclasses 121 through 129 for metal quenching with heating means.

**636 Wire (e.g., cable, etc.):**

This subclass is indented under subclass 635. Subject matter wherein the heating is applied to an elongated solid flexible cylindrical conductor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

605, for bonding wire or cable ends together.

**637 Rod:**

This subclass is indented under subclass 635. Subject matter wherein the heating is applied to an elongated solid nonflexible bar of material or object.

**638 Semiconductor:**

This subclass is indented under subclass 637. Subject matter wherein the rod material has conductivity ranges between that of a conductor and an insulator.

SEE OR SEARCH CLASS:

117, Single-Crystal, Oriented-Crystal, and Epitaxy Growth Processes; Non-Coating Apparatus Therefor, particularly subclasses 7+ for solid phase single crystallization techniques, subclasses 13+ for liquid phase single crystallization techniques of the melt-pull type, subclasses 51+ for liquid phase single crystallization techniques of the float zone type utilizing electromagnetic induction, subclass 102 for chemical vapor deposition techniques of form-

ing a single crystal utilizing inductive heating, and subclass 222 for apparatus for forming a single crystal involving a moving solid-liquid-solid interface, such apparatus having details of the heating means for use therein.

373, Industrial Electric Heating Furnaces, subclass 139 for an induction furnace device for zone melting.

423, Chemistry of Inorganic Compounds, subclasses 349+ for the chemically reactive production of elemental silicon utilizing as a starting material a silicon containing compound, wherein the production may be affected through the use of inductive heating.

438, Semiconductor Device Manufacturing: Process, appropriate subclass for methods of making semiconductor electrical devices; see the search notes therein.

**639 Irregular (e.g., camshaft, etc.):**

This subclass is indented under subclass 637. Subject matter wherein the rod is nonsymmetrical about its cross-sectional area.

**640 Gear:**

This subclass is indented under subclass 635. Subject matter wherein the heating is applied to a cylindrical disk with a serrated (teeth) outer edge.

SEE OR SEARCH CLASS:

148, Metal Treatment, subclasses 566+ for processes of heat treating ferrous metal gears using electrical energy.

266, Metallurgical Apparatus, subclasses 125+ for the miscellaneous apparatus for the heat treatment of metal gears.

**641 Valve:**

This subclass is indented under subclass 635. Subject matter wherein the heating is applied to a circular band having a flap or lid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

606, for bonding a valve seat to a conductor.

- SEE OR SEARCH CLASS:  
29, Metal Working, subclasses 890.12+ for valve making.
- 642 Ring or link:**  
This subclass is indented under subclass 635. Subject matter wherein the heating is applied to a circular band or a series of circular bands that are interlocked together.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
606, for bonding a circular band to a conductor.
- 643 Tube (i.e., pipe):**  
This subclass is indented under subclass 635. Subject matter wherein the heating is applied to a hollow cylinder.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
59.1+, for similar subject matter involving resistance heating.  
607+, for bonding tubes.
- 644 Interior surface:**  
This subclass is indented under subclass 643. Subject matter wherein the heating is applied to an inner tube wall.
- 645 Strip (e.g., sheet, etc.):**  
This subclass is indented under subclass 635. Subject matter wherein the heating is applied to a thin flexible broad object.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
619, for an inductive heating roller for a strip.  
773, for capacitive dielectric heating devices.
- SEE OR SEARCH CLASS:  
226, Advancing Material of Indeterminate Length, appropriate subclasses for methods of and apparatus for feeding material without utilizing the leading or trailing ends to effect movement of the material.  
242, Winding, Tensioning, or Guiding, appropriate subclasses for apparatus for winding or unwinding a web or strand in general use, and particularly Cross-Reference Art Collection 909 for heating or cooling that may be appropriate to winding, tensioning, or guiding elongated material.
- 266, Metallurgical Apparatus, subclasses 103+ for miscellaneous heat treating apparatus for heating metal webs, sheets, or strands.
- 432, Heating, subclasses 59+ for a residual device for heating a longitudinally moving web, strand, or sheet.
- 646 Slab (e.g., ingot, etc.):**  
This subclass is indented under subclass 635. Subject matter wherein the heating is applied to a thick, nonflexible, broad object.
- 647 With workpiece support:**  
This subclass is indented under subclass 600. Subject matter wherein a material or an object is contained in, held in place by, or set to rest upon an arrangement during inductive heating.
- (1) Note. The meaning of "workpiece" is any object or material that work (in the form of heat) is applied to.
- (2) Note. An inductor of the heating device may constitute the support.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
385+, for an electrical resistance heater combined with a container, enclosure, or support for material.  
622, for an inductive cooking support structure.  
676, for support of the inductor.  
774+, for workpiece support in which capacitive dielectric heating is applied.
- SEE OR SEARCH CLASS:  
373, Industrial Electric Heating Furnaces, appropriate subclasses for electric furnaces wherein a crucible forms the work support.  
414, Material or Article Handling, for appropriate subclasses for workpiece handling.  
432, Heating, subclasses 227+ for a residual heating device with associated work support.

- 648 Levitation:**  
This subclass is indented under subclass 647. Subject matter wherein the workpiece is subjected to electromagnetic forces in order to maintain it in a position without physical contact.
- 649 Materials:**  
This subclass is indented under subclass 647. Subject matter wherein the workpiece support is of a particular substance.
- SEE OR SEARCH CLASS:  
198, Conveyors: Power-Driven, subclass 957 for conveyor material.
- 650 With monitoring (e.g., regulating, etc.):**  
This subclass is indented under subclass 647. Subject matter including a device for checking or regulating the workpiece support.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
663, for a switching power supply system responsive to a load condition.
- 651 Gas environment:**  
This subclass is indented under subclass 647. Subject matter wherein an atmospheric condition other than air is surrounding the workpiece.
- (1) Note. A gaseous environment in combination with an enclosure surrounding the material or object is classified within.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
686, for a microwave heating device with a specific gas environment.
- 652 Rotation of workpiece:**  
This subclass is indented under subclass 647. Subject matter wherein the workpiece is subjected to a spinning or circular motion relative about its axis.
- (1) Note. To be classified here, the workpiece must be turning or spinning as the heating is being applied.
- 653 Conveyor:**  
This subclass is indented under subclass 647. Subject matter wherein the workpiece support provides continuous movement of the workpiece from one location to another.
- (1) Note. No details of a conveyor are classified herein, for conveyors, per se, see SEARCH CLASS below.
- (2) Note. The meaning of “workpiece” is any object or material that work (in the form of heat) is applied to.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
388, for an electrical resistance heater with conveyor means.  
700, for conveying a workpiece in a microwave tunnel furnace.  
775, for conveying a workpiece in which dielectric heating is applied.
- SEE OR SEARCH CLASS:  
198, Conveyors: Power-Driven, for appropriate subclasses for specific conveyor structure.  
414, Material or Article Handling, subclasses 150+ for a chamber of a type utilized for a heating function and either a driven device or an inclined flow path for carrying or conveying material into, within, and out of the chamber.  
432, Heating, subclasses 239+ for a residual heating device having work feeding, agitating, discharging, or conveying subcombination.
- 654 Charge or discharge:**  
This subclass is indented under subclass 653. Subject matter wherein a force is applied to guide or move forward the workpiece onto the conveyor or to move the workpiece from the conveyor.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
657, for a conveyor moving in a curved path.  
752+, for microwave heating devices with a load support turntable.

**655 Multiple stations:**

This subclass is indented under subclass 653. Subject matter wherein the workpiece is conveyed to a plurality of different work locations.

- (1) Note. Work locations or stations, besides heating, may provide operations such as pressing, cooling, cutting, etc., on the workpiece.

**656 Plural heating zones:**

This subclass is indented under subclass 655. Subject matter wherein the workpiece is subjected to inductive heating at two or more stations along the conveyor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 662, for systems with plural inductors having a switching power supply.  
671, for an inductive heating device with plural inductors.  
701, for a conveyor with plural microwave heating zones.  
776, for a conveyor with plural dielectric heating zones.

**657 Curve path:**

This subclass is indented under subclass 653. Subject matter wherein the line of movement of the conveyor is circular or approximates an arc of a circle.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 652, for the rotation of a workpiece.

**658 Lift (i.e., vertical movement):**

This subclass is indented under subclass 653. Subject matter wherein the line of movement of the conveyor is vertical (an up and down direction).

**659 Pressure applicator (e.g., clamp, etc.):**

This subclass is indented under subclass 647. Subject matter wherein the workpiece support applies a force on the workpiece to keep the workpiece from moving about.

- (1) Note. This subclass does not include a heating apparatus wherein the heater and the work are brought into proper relationship, the heat applied, and the heater

and work then separated. In this subclass, the work must be moved with respect to the heater during the heating operation.

- (2) Note. Apparatus for molding, shaping, or metal working are excluded from this subclass. For such excluded subject matter see SEARCH THIS CLASS, SUBCLASS and SEARCH CLASS below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 149+, for resistance heating.  
602, for inductive metal working.  
777, for a capacitive dielectric heating device with pressure applicator.

SEE OR SEARCH CLASS:

- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 405+ for processes of molding or shaping plastic materials within the class definitions which include a heating step by means of direct application of electrical or wave energy.  
269, Work Holders, appropriate subclasses for a clamp structure.  
425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 174 for a molding machine for shaping or reshaping nonmetals combined with means for applying radiant energy (e.g., electrical, electromagnetic, etc.) to the work.

**660 With power supply system:**

This subclass is indented under subclass 600. Subject matter wherein electrical energy is fed to an inductive heating apparatus for operation.

- (1) Note. The combination of a specific inductor and a power supply, therefor, where the power supply is recited by name only and is not classified in this or the indented subclass. Details of an inductor and power supply must be recited.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 482+, for an electrical resistance heater with a power supply and control means.

- 702+, for a microwave heating device with a control system.
- 778+, for a power supply system for capacitive dielectric heating systems.

**SEE OR SEARCH CLASS:**

- 307, Electrical Transmission or Interconnection Systems, appropriate subclasses for the miscellaneous power distribution and supply systems.
- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for the miscellaneous systems for controlling phase angle or voltage and/or current magnitude, and for the miscellaneous transformer and impedance systems.
- 363, Electric Power Conversion Systems, appropriate subclasses for inverter and/or converter systems.

**661 Power switching:**

This subclass is indented under subclass 660. Subject matter wherein a device controls the on and off periods of energy being supplied from the power supply to the inductive heating apparatus.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 715, for a microwave heating device with power switching.

**SEE OR SEARCH CLASS:**

- 307, Electrical Transmission or Interconnection Systems, subclasses 112+ for switching systems.

**662 Plural load inductors:**

This subclass is indented under subclass 661. Subject matter wherein the power switching device controls the energy being supplied to two or more inductive heating apparatuses.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 476+, for electrical resistance heating with plural separate heating devices.
- 656, for a workpiece support with plural heating zones.
- 671, for a power supply with plural inductors.
- 717, for a microwave heating device with plural power supplies.

**SEE OR SEARCH CLASS:**

- 307, Electrical Transmission or Interconnection Systems, subclasses 11+ for plural load circuit systems.

**663 Condition responsive:**

This subclass is indented under subclass 661. Subject matter wherein the on and off periods of the power supplied to the inductive heating apparatus are automatically regulated according to a preselected result.

- (1) Note. The automatic controlling device must include means to sense a condition and means to vary a condition in response to the sensed condition. Means to maintain a condition constant are included as an automatic control where the system includes means to sense deviations from the condition and to adjust the system to maintain the desired value constant.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 704+, for a microwave heating device with a load condition sensor.
- 779, for capacitive dielectric heating systems with automatic control.

**SEE OR SEARCH CLASS:**

- 307, Electrical Transmission or Interconnection Systems, appropriate subclasses for the miscellaneous power distribution and supply systems.
- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for the miscellaneous systems for controlling phase angle or voltage and/or current magnitude, and for the miscellaneous transformer and impedance systems.
- 361, Electricity: Electrical Systems and Devices, for pertinent subclass(es) as determined by schedule review.
- 363, Electric Power Conversion Systems, for pertinent subclass(es) as determined by schedule review.

**664 Input monitoring:**

This subclass is indented under subclass 663. Subject matter including an arrangement for checking or regulating input power supplied to the inductive heating apparatus.

**665 Load sensing:**

This subclass is indented under subclass 663. Subject matter wherein a device is indicative of or condition responsive to a physical state of a material or an object being heated.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

626, for an inductive cooking system with load sensing.

704, for a microwave heating device with a load condition sensor.

**666 With tuning:**

This subclass is indented under subclass 665. Subject matter wherein the sensing device matches electrical parameters of an input energy signal with that of an impedance of the load.

**667 Temperature:**

Subject matter under 665 wherein the sensing device is responsive to a thermal change of the load.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

494+, for electrical resistance heating with a thermally responsive control system.

627, for an induction cooking system responsive to temperature.

710, for a microwave heating system with temperature sensing.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclasses 584+ for an indicating system responsive to thermal conditions.

374, Thermal Measuring and Testing, appropriate subclasses for temperature measuring devices.

**668 With protection:**

This subclass is indented under subclass 661. Subject matter wherein an arrangement is provided to prevent damage to the power switching device.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

716, for microwave heating devices having a power switching system with detectors.

723, for a microwave heating device with interlock circuiting and an additional safety feature.

SEE OR SEARCH CLASS:

361, Electricity: Electrical Systems and Devices, subclasses 1+ for the safety and protection of systems and devices.

**669 Polyphase:**

This subclass is indented under subclass 661. Subject matter wherein the power supply provides two or more phases of alternating current.

**670 With specific transformer:**

This subclass is indented under subclass 660. Subject matter wherein a device is provided to transfer power from one or more circuits to one or more other circuits at a constant frequency and with voltage and current changes in direct proportion to a ratio of turns between a primary coil winding and a secondary coil winding.

(1) Note. A specific structure of the transformer core for modifying the magnetic flux is appropriate under this subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

630+, for an inductive fluid or a liquid heater with a specific core or coil structure.

SEE OR SEARCH CLASS:

336, Inductor Devices, appropriate subclasses for a transformer and core structure.

**671 With plural load inductors:**

This subclass is indented under subclass 660. Subject matter wherein an arrangement is provided to supply power to two or more inductive heating apparatuses.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 662, for an inductive switching power supply for plural inductors.  
 656, for an inductive heater with work-piece support for a plurality of heating zones.
- 672 Specific inductor configuration:**  
 This subclass is indented under subclass 600. Subject matter wherein a wire wound around an iron core or a coil having a distinctive external contour or unique shape induces currents for inductive heating.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 624, for an inductive cooking system with a core or coil structure.  
 635+, for an inductive device specifically designed for various heating applications.
- SEE OR SEARCH CLASS:  
 29, Metal Working, subclass 620 for methods of making coils.  
 336, Inductor Devices, appropriate subclasses for the structure of transformers and inductive reactors of general utility and subclasses 225+ for coils of special configuration.  
 600, Surgery, subclasses 9, 10, and 15 for inductor coils for use in high frequency diathermy and for treatment of the human body.
- 673 U-coil section:**  
 This subclass is indented under subclass 672. Subject matter wherein the coil or core configuration is in a fork-like shape.
- 674 Cylindrical coil:**  
 This subclass is indented under subclass 672. Subject matter wherein the coil or core configuration is in a cylinder shape.
- 675 Planar coil:**  
 This subclass is indented under subclass 672. Subject matter wherein the coil or core configuration lies substantially in a single plane.
- 676 With inductor support:**  
 This subclass is indented under subclass 672. Subject matter wherein the inductor is held in place in close proximity to a conductive work-piece (material or object).
- 677 With cooling arrangement:**  
 This subclass is indented under subclass 672. Subject matter including an apparatus to remove heat from the inductor.
- (1) Note. This subclass does not provide for inductive heaters combined with devices for cooling only the work. Such excluded subject matter may be found in the classes which provide for the apparatus which treats the specific materials and object which are cooled.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 632, for an inductive heating system having a cooling arrangement.
- SEE OR SEARCH CLASS:  
 336, Inductor Devices, subclasses 55+ for inductor devices with a temperature modifier.
- 678 MICROWAVE HEATING:**  
 This subclass is indented under the class definition. Subject matter for the electric heating of a material or object by applying a field of electromagnetic wave radiation in a frequency range from about 1 gigahertz to 3 gigahertz.
- (1) Note. The work may be exposed to the emanations of a free space antenna or placed at an appropriate position in a wave guide or resonant cavity, etc.
- (2) Note. For claims reciting both food (edible) and nonfood (nonedible) heating by an electric heating device or method, classification is proper for Class 219. If the claims recited are limited to food (edible) heating methods, composition, product, or processes, classification is proper for Class 426.

## SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclass 1 by electromagnetic energy.
- 99, Foods and Beverages: Apparatus, subclass 451 for apparatus for treating food by radiant electrical energy and digest 14 for cooking by induction heating.
- 126, Stoves and Furnaces, subclasses 19+ and 273+ for oven structure.
- 174, Electricity: Conductors and Insulators, subclasses 350 through 397 for shielded or screened anti-inductive structures.
- 204, Chemistry: Electrical and Wave Energy, subclasses 193+ for treating substances with electrical or radiant energy to effect a chemical change.
- 250, Radiant Energy, subclasses 324+ for a method and apparatus for a fluent material or object for corona irradiation; subclasses 428+ for a method and apparatus for fluent material containment, support, or transfer means with or without an irradiating nuclear or electromagnetic radiation source; and subclasses 453.11+ for methods and apparatus to support an object for nuclear or electromagnetic radiation.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 405+ for direct application of electrical or wave energy to work.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 39+ for a discharge device load with a distributed parameter-type transmission line, subclasses 39.51+ for a distributed parameter resonator-type magnetron, and subclasses 94+ with a cathode or cathode heater supply circuit.
- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for power supplies and regulators of electrical device systems.
- 331, Oscillators, appropriate subclasses 86+ for a magnetically controlled space discharge device (e.g., magnetron).
- 333, Wave Transmission Lines and Networks, appropriate subclasses for wave transmission lines and networks, particularly subclasses 24+ for coupling networks and subclasses 219+ for resonators (e.g., cavity or wave guides).
- 334, Tuners, appropriate subclasses for tuners which may be adapted for use as a heating device, especially subclasses 26+ for tuning units which may be adapted for use as a heating device and which have means for automatically centering the frequency to which the tuner is adjusted.
- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), appropriate subclasses for radio wave energy.
- 343, Communications: Radio Wave Antennas, subclasses 700+ for antenna structures.
- 363, Electric Power Conversion Systems, appropriate subclasses for an inverter and/or converter system.
- 392, Electric Resistance Heating Devices, for heating devices using resistance heaters.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 21 and 22+ for processes of the class using microwave or other electrical or electromagnetic radiation and subclasses 186+ for apparatus for the chemical treatment of material using radiant electrical energy.
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclasses 174+ for means of applying electrical or wave energy directly to work.
- 426, Food or Edible Material: Processes, Compositions, and Products, subclasses 107+ for a packaged or wrapped product having a specific electrical or wave feature and subclasses 234+ for the direct application of electrical or wave energy to food material.
- 600, Surgery, subclasses 9+ for a magnetic field applied to the body for therapeutic purposes.

- 606, Surgery, subclasses 27+ and 32+ for heat or electrical application.
- 607, Surgery: Light, Thermal, and Electrical Application, subclasses 1+ for light and thermal application to the body and subclasses 114 through 156 for an electrical energy applicator.
- 679 With diverse device:**  
This subclass is indented under subclass 678. Subject matter wherein both a microwave heater and a functionally different type of device are provided for in an arrangement.
- (1) Note. A functionally different type of device is a device that performs a function other than heating, for combination with different types of heaters see SEARCH THIS CLASS, SUBCLASS below.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
601, for inductive heating with diverse-type heaters.  
680, for microwave heating with diverse-type heaters.
- 680 With diverse-type heating:**  
This subclass is indented under subclass 678. Subject matter wherein both a microwave heating arrangement and a different type of heater are provided for in a heating apparatus.
- (1) Note. Examples of different types of heaters are resistance heaters, incandescent lamps, infrared lamps, etc.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
601, for inductive heating with diverse-type heaters.
- 681 Convection heating:**  
This subclass is indented under subclass 680. Subject matter wherein the diverse-type heating is transferring heat to a load by a bodily movement of heated particles of matter.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
400, for heat transfer by convection.  
757, for an enclosed cavity structure with cooling or ventilation.
- SEE OR SEARCH CLASS:  
126, Stoves and Furnaces, subclasses 21+ for ventilated ovens.
- 682 Steam generating:**  
This subclass is indented under subclass 681. Subject matter wherein the convection heating produces vapor particles (mixture of gas and liquid particles).
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
401, for a resistive heating device generating steam.  
731, for cookware with heat exchange by fluent material.
- 683 Gas burner:**  
This subclass is indented under subclass 681. Subject matter wherein the convection heating is produced by burning a gaseous fuel.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
126, for gas burning stoves and furnaces.
- 684 Tunnel type:**  
This subclass is indented under subclass 681. Subject matter wherein the convection heating takes place in an elongated hollow cavity with opening or closing ends.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
698+, for a microwave tunnel furnace.
- 685 Resistive heating:**  
This subclass is indented under subclass 680. Subject matter wherein the diverse type of heating is applying an electric current through a load or conductor which produces an impedance to the current flow that results in a dissipation of energy in a form of heat.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
50+, for resistance heating.
- SEE OR SEARCH CLASS:  
392, Electric Resistance Heating Devices, for heating devices using resistance heaters.

**686 Gas environment (e.g., pressurized, etc.):**  
This subclass is indented under subclass 678. Subject matter wherein an atmospheric condition other than air is surrounding a material or an object to be heated.

- (1) Note. A gaseous environment in combination with an enclosure surrounding the material or object is classified within.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 440, for an electrical resistance heating vessel with pressure generating or maintaining means.  
651, for inductive heating under a gas environment.

**687 Fluid heater:**  
This subclass is indented under subclass 678. Subject matter wherein a microwave heating apparatus is arranged to heat a fluent material.

- (1) Note. A fluid material is one that flows easily from container to container and may be a fine granular material or just air.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 628+, for inductive heating of fluid or liquid.  
772, for apparatus for dielectric heating a fluent material where the electromagnetic field acts directly on the fluent material.

SEE OR SEARCH CLASS:

- 122, Liquid Heaters and Vaporizers, for pertinent subclass(es) as determined by schedule review.  
137, Fluid Handling, subclass 341 for fluid handling apparatus having an electric heater.  
138, Pipes and Tubular Conduits, subclass 33 for fluid conduits with electric thawing and freeze protection means.  
166, Wells, subclass 60 for an electrical heater in a well and subclass 248 for processes of passing electric current or electrical wave energy through earth for treating it.

392, Electric Resistance Heating Devices, subclasses 301+ for fluid heating by electric resistance heating devices, also see subclass 341 for electric well heaters.

**688 Water:**  
This subclass is indented under subclass 687. Subject matter wherein the fluid being heated is a chemical compound of two hydrogen atoms combined with one oxygen atom.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, for general heat applying apparatus having other than electrical heating means, subclasses 344 through 363.1 for a liquid heater that may include a kettle, a steam generator, stove pipe for use with a stove, and a domestic water heater or boiler (e.g., kitchen boiler, range boiler, etc.) for use with a stove or furnace.  
392, Electric Resistance Heating Devices, for pertinent subclass(es) as determined by schedule review.

**689 Beverage (e.g., coffee, etc.):**  
This subclass is indented under subclass 687. Subject matter wherein the fluid being heated is any drinkable liquid.

SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 451 for apparatus for treating food by radiant electrical energy and subclasses 275+ for beverage makers.

**690 Waveguide applicator:**  
This subclass is indented under subclass 678. Subject matter wherein the microwave energy passes through an elongated hollow conductor which confines a traveling microwave propagation to its physical boundaries to heat a material or an object.

SEE OR SEARCH CLASS:

- 333, Wave Transmission Lines and Networks, subclasses 248+ for waveguide elements and components.

**691 Slotted:**  
This subclass is indented under subclass 690. Subject matter wherein a narrow slit opening is located on a waveguide applicator.

**692 Meander (e.g., zigzag, etc.):**

This subclass is indented under subclass 691. Subject matter wherein an inlet and outlet openings are provided in a serpentine configuration on the waveguide applicator.

**693 Having load passage:**

This subclass is indented under subclass 691. Subject matter wherein a pair of slotted inlet and outlet openings are aligned at diametrically opposite locations on the waveguide applicator through which a material or an object is passed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

698, for a microwave tunnel furnace.

**694 With dummy load:**

This subclass is indented under subclass 690. Subject matter wherein a device dissipates microwave energy entering the waveguide applicator not adsorbed by the workpiece.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclass 22 for dissipating terminations for long lines.

**695 Input power port arrangement:**

This subclass is indented under subclass 690. Subject matter wherein an energy source is introduced in a specific orientation or placement in the waveguide applicator.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

746, for a microwave heating device with a feed structure for field modification.

**696 With tuning:**

This subclass is indented under subclass 695. Subject matter wherein the input power port is adjusted to optimize an amount of microwave energy being applied to a load.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

750, for a microwave heating device with feed structure having tuning or a particular mode for field modification.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclass 17.3 for a system with impedance matching and subclasses 223+ for resonators with tuning means.

334, Tuners, appropriate subclasses for tuners which may be adapted for use as a heating device, especially subclasses 26+ for tuning units which may be adapted for use as a heating device and which have means for automatically centering the frequency to which the tuner is adjusted.

**697 Plural feed:**

This subclass is indented under subclass 695. Subject matter wherein two or more input power ports are located within the waveguide applicator.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

701, for a tunnel furnace with plural heating zones.

**698 Tunnel furnace:**

This subclass is indented under subclass 678. Subject matter wherein an elongated hollow cavity with open ends having microwave conducting interior walls is provided.

(1) Note. A tunnel furnace may also be called a tunnel oven.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

684, for a microwave tunnel-type oven with convection heating.

**699 With leakage suppression:**

This subclass is indented under subclass 698. Subject matter wherein an arrangement is provided to reduce or prevent microwave energy from escaping the open ends of the tunnel furnace.

(1) Note. The reduction of microwave energy may be by filtering, shielding, reflection, or absorption.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

736+, for radiation protection of microwave energy.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, subclasses 350 through 397 for shielded or screened anti-inductive structures.

#### 700 **Conveyor:**

This subclass is indented under subclass 698. Subject matter wherein a workpiece is supported by a continuously moving assembly through a tunnel furnace.

(1) Note. No details of a conveyor are classified within, for conveyors, per se, see SEARCH CLASS below.

(2) Note. The meaning of "workpiece" is any object or material that work (in the form of heat) is applied to.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

388, for an electrical resistance heating device with conveyor means.

653, for an inductive heating device with conveyor.

775, for conveying a workpiece in which capacitive dielectric heating is applied.

SEE OR SEARCH CLASS:

198, Conveyors: Power-Driven, appropriate subclasses for a conveyor structure.

414, Material or Article Handling, subclasses 150+ for a chamber of a type utilized for a heating function and either a driven device or an inclined flow path for carrying or conveying material into, within, and out of the chamber.

#### 701 **Plural heating zones:**

This subclass is indented under subclass 700. Subject matter wherein the workpiece is subjected to microwave heating at two or more stations along the conveyor.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

656, for a conveyor with plural inductive heating zones.

776, for a conveyor with plural capacitive dielectric heating zones.

#### 702 **With control system:**

This subclass is indented under subclass 678. Subject matter wherein a device is provided that indicates, maintains, or changes a condition on how the microwave energy acts upon a material or an object to be heated.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

428+, for an electrical resistance heating device with power supply and voltage or current regulation or current control means.

625+, for inductive cooking with a condition responsive system.

663+, for an inductive heating switching power supply with a condition responsive system.

779, for a capacitive dielectric heating device with a condition responsive power supply system.

#### 703 **Defrost:**

This subclass is indented under subclass 702. Subject matter wherein a device is controlling the microwave heating apparatus to remove frost or ice from a material or an object so as to thaw out or become unfrozen.

SEE OR SEARCH CLASS:

244, Aeronautics and Astronautics, subclasses 134+ for ice prevention.

426, Food or Edible Material: Processes, Compositions, and Products, subclass 524 for cooling, freezing, or treating cooled or frozen product; e.g., thawing, etc.

#### 704 **Load condition sensor:**

This subclass is indented under subclass 702. Subject matter wherein a device is indicative of or responding to a physical state of the material or object.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

626, for an inductive cooking system with load sensing.

665, for an inductive heating device with load sensing responsive switching power supply.

**705 Plural diverse types:**

This subclass is indented under subclass 704. Subject matter wherein the sensing device is indicative of or responding to more than one condition of the load.

(1) Note. A plural sensing device must include two or more conditions being sensed or different sensors which may or may not be at separate locations.

**706 By ultrasonic or acoustic:**

This subclass is indented under subclass 704. Subject matter wherein the sensing device is responsive to sound waves at or above audible frequency.

SEE OR SEARCH CLASS:

73, Measuring and Testing, for measuring and testing devices.

367, Communications, Electrical: Acoustic Wave Systems and Devices, for acoustic wave communications.

**707 Gas or vapor:**

This subclass is indented under subclass 704. Subject matter wherein the sensing device is responsive to (a) a state of matter being of an aeriform fluid having an ability to spread out and occupy an entire enclosure in which it is present or (b) an aeriform fluid having particles of liquid mixed within having an ability to spread out and occupy an entire enclosure in which it is present.

(1) Note. Vapor may also be called fog, mist, humidity, or steam.

SEE OR SEARCH CLASS:

73, Measuring and Testing, for the measuring and testing of fluid pressure.

**708 Weight:**

This subclass is indented under subclass 704. Subject matter wherein the sensing device is indicative of a force of gravity acting on the load.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

518, for resistive heating with automatic switching responsive to weight, position, or the presence of the body to be heated.

SEE OR SEARCH CLASS:

177, Weighing Scales, for weighing devices.

**709 Field intensity/reflection:**

This subclass is indented under subclass 704. Subject matter wherein the sensing device is responding to feedback from a quantity of microwave energy being applied to the load.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing, subclasses 600+ for impedance, admittance, or other quantities representative of electrical stimulus response relationships.

**710 Temperature:**

This subclass is indented under subclass 704. Subject matter wherein the sensing device is responsive to an increase or decrease in thermal change to the load.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

494, for the automatic regulating of a power supply responsive to thermal properties.

627, for inductive cooking with a temperature sensor.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclass 325 for an automatic control and subclass 421 for a cooking device with an impaling temperature control device.

374, Thermal Measuring and Testing, subclasses 100+ for temperature measurement.

**711 By infrared:**

This subclass is indented under subclass 710. Subject matter wherein the temperature sensor is responsive to the radiation of wavelengths just beyond the red end of the visible spectrum.

**SEE OR SEARCH CLASS:**

374, Thermal Measuring and Testing, subclasses 120+ for temperature measurement in spaced noncontact relationship to specimens.

**712 Probe:**

This subclass is indented under subclass 710. Subject matter wherein the temperature sensor penetrates into the load and senses an interior temperature.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

516, for an electric resistance heater with a thermally responsive device insertable into or in direct contact with heated material.

**SEE OR SEARCH CLASS:**

99, Foods and Beverages: Apparatus, subclass 421 for a working device with impaling-type temperature serving means.  
374, Thermal Measuring and Testing, subclass 155 for a temperature measurement with piercing element.

**713 Wireless type:**

This subclass is indented under subclass 712. Subject matter wherein the probe transmits through the air the temperature of the load to the control system.

**714 Remote (e.g., card, etc.):**

This subclass is indented under subclass 702. Subject matter wherein a device is controlling the microwave heating apparatus from a distance or transporting the controlling device to another microwave heating apparatus.

**SEE OR SEARCH CLASS:**

235, Registers, subclasses 435+ for coded record sensors.  
340, Communications: Electrical, subclasses 1.1 through 16.1 for selective communication.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclass 274 for speech signal controlled systems.

**715 Power switching:**

This subclass is indented under subclass 702. Subject matter wherein a device controls on and off periods of energy being supplied from the power supply to the microwave heating apparatus.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

661, for an inductive heating device with a switching power supply system.

**SEE OR SEARCH CLASS:**

323, Electricity: Power Supply or Regulation Systems, for pertinent subclass(es) as determined by schedule review.  
363, Electric Power Conversion Systems, for pertinent subclass(es) as determined by schedule review.

**716 With detector:**

This subclass is indented under subclass 715. Subject matter wherein a device senses the power being supplied to the microwave heating apparatus.

**717 Plural power supplies:**

This subclass is indented under subclass 715. Subject matter wherein two or more power sources are feeding microwave energy to the load.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

476+, for an electric resistance heating device with plural separate heaters.  
662, for an inductive heating device with a switching power supply for plural load inductors.  
697, for a waveguide applicator with plural input power.  
701, for a microwave tunnel furnace with plural heating zones.

**SEE OR SEARCH CLASS:**

307, Electrical Transmission or Interconnection Systems, subclasses 11+ for a plural load circuit system and subclasses 43+ for plural supply circuits or sources.

**718 Having duty cycle:**

This subclass is indented under subclass 715. Subject matter wherein a device is controlling an intermittently operating microwave heating apparatus from an on-time period to an off-time period.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

492+, for an electrical resistance heating device with automatic regulating or control means comprising timing or cycling means.

507+, for an electrical resistance heating device with current connection and/or disconnection means (e.g., switch).

**SEE OR SEARCH CLASS:**

307, Electrical Transmission or Interconnection Systems, subclasses 112+ for switching systems.

**719 With timer:**

This subclass is indented under subclass 702. Subject matter wherein a device controls an operating timing period or the duration of a microwave heating apparatus.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

492+, for an electric resistance heating device with automatic regulating or control means comprising timing or cycling means.

**SEE OR SEARCH CLASS:**

200, Electricity: Circuit Makers and Breakers, subclass 38 for a cam operated resettable interval timer for an oven or range.

340, Communications: Electrical, subclasses 309.16 through 309.9 for timer controlled systems.

368, Horology: Time Measuring Systems or Devices, subclasses 1+ for a timer controlled by a disparate device and

subclasses 10+ for a timer combined with a disparate device.

**720 With display or alarm:**

This subclass is indented under subclass 702. Subject matter wherein the sensing device produces a humanly perceptible visual or hearing indication of a condition sensed.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

506, for an electric resistance heating device with signal or indicating means.

**SEE OR SEARCH CLASS:**

116, Signals and Indicators, subclasses 67+ for alarms.

340, Communications: Electrical, subclasses 500+ for alarms or display communications for condition responsive indicating systems.

**721 Starting circuitry:**

This subclass is indented under subclass 702. Subject matter wherein a device controls the power supply at the beginning of the energization of a microwave heating apparatus.

**SEE OR SEARCH CLASS:**

323, Electricity: Power Supply or Regulation Systems, subclass 901 for starting circuit and subclass 908 for inrush current limiters.

361, Electricity: Electrical Systems and Devices, for control devices.

363, Electric Power Conversion Systems, subclass 49 with starting arrangement.

**722 Interlock circuitry and structure:**

This subclass is indented under subclass 702. Subject matter wherein a device controls deenergizing a power source by opening a door handle or an access cover of a microwave heating apparatus.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

739, for a microwave heating device with a door assembly for leakage prevention.

## SEE OR SEARCH CLASS:

- 200, Electricity: Circuit Makers and Breakers, subclasses 50.01+ for interlocking switch.
- 307, Electrical Transmission or Interconnection Systems, subclasses 112+ for switching systems.

**723 With additional safety feature:**

This subclass is indented under subclass 722. Subject matter wherein an additional safeguard other than the interlock device provides deenergization of the power supply when a door or access cover is opened.

## SEE OR SEARCH CLASS:

- 361, Electricity: Electrical Systems and Devices, subclasses 1+ for the safety and protection of systems and devices.

**724 With latch assembly:**

This subclass is indented under subclass 722. Subject matter wherein the interlock device is locked into a specific condition or state and must be energized or deenergized to change its condition or state.

## SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclass 197 for stove doors and windows combined latch and operator.
- 292, Closure Fasteners, for fastening objects together to form a closure.

**725 Cookware (e.g., vessel, utensil, etc.):**

This subclass is indented under subclass 678. Subject matter wherein a supporting or containing structure is subjected to microwave energy to warm, defrost, or cook edible material (food).

- (1) Note. Also may be called a cooking utensil or cooking vessel.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 620+, for cooking by inductive heating through a heat exchange.
- 771, for capacitive dielectric heating of food.

## SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 451 for apparatus for treating food by radiant electrical energy and digest 14 for induction heating.
- 126, Stoves and Furnaces, for general heat applying apparatus having other than electrical heating means, subclasses 373.1 through 390.1 for a liquid heater having an open-top vessel that may include a lid.
- 229, Envelopes, Wrappers, and Paperboard Boxes, subclasses 902+ for a box for prepared or processed food.
- 426, Food or Edible Material: Processes, Compositions, and Products, subclasses 106+ for packaged or wrapped product and subclasses 234+ for the treatment of a food product by electrical or wave energy.
- 428, Stock Material or Miscellaneous Articles, subclasses 34.1+ for a hollow or container-type article.

**726 With food mixer:**

This subclass is indented under subclass 725. Subject matter including a device to stir or agitate an edible material (food) during microwave cooking.

## SEE OR SEARCH CLASS:

- 99, Foods and Beverages: Apparatus, subclass 348 for a cooking device with stirring means.
- 366, Agitating, for pertinent subclass(es) as determined by schedule review

**727 Expandable:**

This subclass is indented under subclass 725. Subject matter wherein the cookware provides an ability to increase in size and volume during microwave cooking.

## SEE OR SEARCH CLASS:

- 426, Food or Edible Material: Processes, Compositions, and Products, subclass 111 for a packaged or wrapped product having a telescoping feature to allow for a decreased package dimension or having a packaging structure cooperating with food expansion.

**728 With field modifier:**

This subclass is indented under subclass 725. Subject matter wherein the cookware provides an arrangement to vary the microwave energy intensity at a specific location.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

745, for a microwave heating device with a field modification.

SEE OR SEARCH CLASS:

426, Food or Edible Material: Processes, Compositions, and Products, subclass 107 for a packaged or wrapped product having a specific electrical or wave energy feature.

**729 Shielding:**

This subclass is indented under subclass 728. Subject matter wherein the cookware provides an arrangement to prevent microwave energy from heating a specific location.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

736, for a microwave heating device with radiation protection.

**730 With heat exchange (e.g., susceptor, etc.):**

This subclass is indented under subclass 725. Subject matter wherein the cookware has highly absorbing microwave energy properties that convert microwave energy into thermal energy and transfer the thermal energy to an edible material (food).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

634, for inductive heating with a heat exchange susceptor.

759, for general heat exchange devices, noncookware related.

SEE OR SEARCH CLASS:

426, Food or Edible Material: Processes, Compositions, and Products, subclass 109 for a packaged or wrapped product having heat exchange material.

**731 By fluent material (e.g., steaming, boiling, or frying, etc.):**

This subclass is indented under subclass 730. Subject matter wherein the heat exchange is arranged to transfer heat to a fluent material.

(1) Note. A fluent material is one that flows easily from container to container and may be a fine granular material, liquid, or air.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

401, for an electrical resistance oven with steam generating means.

682, for a microwave heating device combined with steam generating.

772, for apparatus for the capacitive dielectric heating of a fluent material where the electromagnetic field acts directly on the fluent material.

**732 With stand or handle:**

This subclass is indented under subclass 725. Subject matter wherein (a) the cookware is supported in an upright position by legs, feet, or pedestal or (b) a part is provided on or attaches to the cookware for grasping or gripping the cookware by hand or a mechanical apparatus.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

762, for a microwave heating device with load support.

SEE OR SEARCH CLASS:

16, Miscellaneous Hardware (e.g., Bushing, Carpet Fastener, Caster, Door Closer, Panel Hanger, Attachable or Adjunct Handle, Hinge, Window Sash Balance, etc.), subclasses 110.1+, especially subclasses 422+ and 430+ for handles.

220, Receptacles, subclasses 212.5, 710.5, and 752 for a container with handle.

426, Food or Edible Material: Processes, Compositions, and Products, subclass 110 for a packaged or wrapped product having package attached support means.

**733 With drainage:**

This subclass is indented under subclass 725. Subject matter wherein an arrangement to draw or carry away liquid from a region containing edible material is used during cooking.

**SEE OR SEARCH CLASS:**

99, Foods and Beverages: Apparatus, subclasses 425 and 444+ for a cooking device having drip segregating, receiving, or directing means.

**734 With cover:**

This subclass is indented under subclass 725. Subject matter wherein a lid is arranged to place on, over, or in front of to seal or enclose edible material within the cookware.

**735 Having vent:**

This subclass is indented under subclass 734. Subject matter wherein a small opening in the cookware cover provides for a release of gas or vapor within the cookware.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

757, for a microwave heating cavity with cooling or ventilation.

**SEE OR SEARCH CLASS:**

220, Receptacles, subclasses 360+ for a container having a closure with vent means and subclass 913 for a ventilated container.  
426, Food or Edible Material: Processes, Compositions, and Products, subclass 118 for a packaged or wrapped product having packaging structure cooperation with food generated gas.

**736 Radiation protection:**

This subclass is indented under subclass 678. Subject matter wherein an arrangement is provided to eliminate any exposure to microwave energy emissions outside of a confined zone.

(1) Note. A confined zone may be a microwave oven; i.e., a closed cavity or tunnel furnace.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

699, for a microwave-tunnel furnace with leakage suppression.

**SEE OR SEARCH CLASS:**

174, Electricity: Conductors and Insulators, subclasses 350 through 397 for shielded or screened anti-inductive structures.  
250, Radiant Energy, subclass 505.1 for radiation shielded receptacles for a radioactive source.  
315, Electric Lamp and Discharge Devices: Systems, subclass 85 for electromagnetic wave radiation preventing or shielding means.  
361, Electricity: Electrical Systems and Devices, subclass 424 for a shielding device for housings and mounting assemblies with electrical components.

**737 With leakage detector:**

This subclass is indented under subclass 736. Subject matter wherein a device is indicative of the presence of electromagnetic radiation from a specific region of a microwave heating apparatus.

**SEE OR SEARCH CLASS:**

324, Electricity: Measuring and Testing, subclasses 95+ with a waveguide or long line.

**738 With leakage prevention:**

This subclass is indented under subclass 736. Subject matter wherein microwave energy is impeded from escaping a cavity.

**SEE OR SEARCH CLASS:**

174, Electricity: Conductors and Insulators, subclasses 350 through 397 for shielded materials, stock, and screen rooms.  
333, Wave Transmission Lines and Networks, subclass 12 for transmission line inductive or radiation interference reduction systems.

- 739 Door assembly:**  
This subclass is indented under subclass 738. Subject matter wherein a movable structure which turns on a hinge or slides on a groove is used for opening or closing an access entrance to a cavity.
- SEE OR SEARCH CLASS:  
126, Stoves and Furnaces, subclass 190 for stove doors and windows.
- 740 With screen or window:**  
This subclass is indented under subclass 739. Subject matter wherein a door panel consisting of a mesh or grid or transparent material is held in place by a door assembly.
- SEE OR SEARCH CLASS:  
126, Stoves and Furnaces, subclass 200 for stove doors and windows having a transparent panel.
- 741 With choke or seal:**  
This subclass is indented under subclass 739. Subject matter wherein a device is used to prevent microwave energy from escaping past the door assembly.
- SEE OR SEARCH CLASS:  
333, Wave Transmission Lines and Networks, subclass 12 for a transmission line inductive or radiation interference reduction system.
- 742 Slotted choke:**  
This subclass is indented under subclass 741. Subject matter wherein the choke device comprises narrow slit openings.
- 743 Choke cavity cover:**  
This subclass is indented under subclass 741. Subject matter wherein an arrangement is provided for enclosing the choke.
- 744 Absorption:**  
This subclass is indented under subclass 738. Subject matter wherein microwave energy is absorbed as a result of its interaction with leakage prevention materials.
- SEE OR SEARCH CLASS:  
174, Electricity: Conductors and Insulators, subclasses 350 through 397 for shielded or screened anti-inductive structures.  
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 1+ for a radio wave absorber.
- 745 Field modification:**  
This subclass is indented under subclass 678. Subject matter wherein the microwave energy is altered in its distribution throughout a cavity or to a load.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
728, for microwave cookware with a field modifier.
- 746 With power feed structure:**  
This subclass is indented under subclass 745. Subject matter wherein an apparatus receives microwave energy that is being supplied to the cavity from a power source.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
695, for a microwave waveguide applicator with an input power port arrangement.
- SEE OR SEARCH CLASS:  
333, Wave Transmission Lines and Networks, subclasses 219+ for resonators, waveguide elements, and components.
- 747 Phase shifting:**  
This subclass is indented under subclass 746. Subject matter wherein a fractional or residual part of the microwave energy is changed in frequency to match the impedance of the cavity and load.
- 748 Radiator (e.g., antenna, etc.):**  
This subclass is indented under subclass 746. Subject matter wherein the feed structure provides a device which spreads and distributes the microwave energy into the cavity.

## SEE OR SEARCH CLASS:

343, Communications: Radar Wave Antennas, for radio wave antennas.

**749 Rotating:**

This subclass is indented under subclass 748. Subject matter wherein the radiator (antenna) moves about its axis while radiating microwave energy.

**750 With tuning or particular modes:**

This subclass is indented under subclass 746. Subject matter wherein (a) an arrangement matches electrical parameters of an input microwave energy signal with that of an impedance of the cavity or a load within or (b) a power source generates a specific form of wave propagation within the cavity.

- (1) Note. Electrical parameters are commonly voltage, current, amplitude, or frequency.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

696, for a microwave waveguide applicator having an input power port arrangement with tuning.

## SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclasses 231+ for cavity resonators with tuning.

**751 Mixer (e.g., rotating stirrer, etc.):**

This subclass is indented under subclass 745. Subject matter wherein a device is provided which combines and distributes microwave energy of various strengths within the cavity.

**752 By load support movement:**

This subclass is indented under subclass 745. Subject matter wherein the load is contained in, held in place by, or set to rest upon a moving device within the cavity.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

388, for an electric resistance heating device with means whereby material is continuously passed through a heated area.

700, for a microwave tunnel furnace with a conveyor.

762, for a microwave heating device with a load support.

## SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 421+ for cooking movably or adjustably supported and subclasses 443+ for a cooking device with conveyor or movably supported.

**753 Horizontal and vertical:**

This subclass is indented under subclass 752. Subject matter wherein the load support provides movement in both perpendicular and parallel planes to the horizon.

**754 Horizontal (e.g., turntable, etc.):**

This subclass is indented under subclass 752. Subject matter wherein the load support provides movement in a parallel plane to the horizon.

## SEE OR SEARCH CLASS:

108, Horizontally Supported Planar Surfaces, for pertinent subclass(es) as determined by schedule review.

126, Stoves and Furnaces, subclass 338 for a rotary oven shelf or rack.

**755 Portable:**

This subclass is indented under subclass 754. Subject matter wherein the load support provides an ability to be transported or moved by hand (carried) in and out of the cavity.

**756 Enclosed cavity structure:**

This subclass is indented under subclass 678. Subject matter wherein the microwave energy is applied to a material or an object within a closed chamber.

- (1) Note. The chamber described above may also be referred to as a microwave oven.

## SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclasses 227+ for a cavity resonator.

**757 With cooling or ventilation:**

This subclass is indented under subclass 756. Subject matter wherein an arrangement is provided for reducing heat or an opening is provided for escaping or releasing gas or vapor pressure within the enclosed cavity.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 623, for an inductive cooking device with a support having a cooling device.
- 632, for an inductive heating device with a cooling arrangement.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclasses 21+ for ventilated ovens.
- 361, Electricity: Electrical Systems and Devices, subclasses 381+ for electronic systems and devices having cooling means.

**758 With cavity illumination:**

This subclass is indented under subclass 756. Subject matter wherein a source (lamp) provides light to the enclosed cavity.

SEE OR SEARCH CLASS:

- 362, Illumination, subclasses 92+ for illumination with heater or refrigerator.

**759 With heat exchange (e.g., susceptor, etc.):**

This subclass is indented under subclass 678. Subject matter wherein an arrangement provides highly absorbing microwave energy properties that convert microwave energy into thermal energy and transfers the thermal energy to a material or an object.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 618+, for an inductive heating device with heat exchange.
- 730, for microwave cookware with a heat exchange to an edible material.

**760 With specific transformer:**

This subclass is indented under subclass 678. Subject matter wherein an electromagnetic induction transfers electric energy from one or more circuits to one or more other circuits at a constant frequency with voltage and current changes in direct proportion to a ratio of turns

between a primary coil winding and a secondary coil winding.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 670, for an inductive heating device having a power supply system with a specific transformer.

SEE OR SEARCH CLASS:

- 323, Electricity: Power Supply or Regulation Systems, subclasses 355+ for a power supply including a transformer or an inductor.
- 336, Inductor Devices, subclasses 182+ for a transformer structure.

**761 With specific generator:**

This subclass is indented under subclass 678. Subject matter including a device which produces microwave energy in the heating apparatus.

SEE OR SEARCH CLASS:

- 315, Electric Lamp and Discharge Devices: Systems, subclasses 39.51+ for a distributed parameter resonator-type magnetron.
- 331, Oscillators, subclasses 86+ for a device with a magnetically controlled space discharge device.

**762 Load support:**

This subclass is indented under subclass 678. Subject matter wherein an apparatus provides an arrangement that a material or an object is contained in, held in place by, or set to rest upon.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 385, for an electric resistance heating device combined with a container, enclosure, or support for material to be heated.
- 647+, for an inductive heating device having a workpiece support.
- 752, for a microwave heating device with a field modification by load support movement.
- 774, for a capacitive dielectric heating device having workpiece support.

## SEE OR SEARCH CLASS:

- 248, Supports, for supporting structure, per se.
- 312, Supports: Cabinet Structure, subclass 236 for support combined with heating, cooling, or heat exchange means.

**763 Shelf:**

This subclass is indented under subclass 762. Subject matter wherein a load support is attached to a cavity wall.

## SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclasses 337+ for an oven shelf or a rack.

**764 CAPACITIVE DIELECTRIC HEATING:**

This subclass is indented under the class definition. Subject matter for electric heating whereby a normally insulating (nonconducting) material or object interacts between conducting surfaces having an alternating electric field thereby causing internal energy losses in the material or object and a rise in temperature.

- (1) Note. Typical dielectric materials are air, wood, plastic, ceramic, mica, and wax-impregnated paper. The internal losses are from the molecular friction of the dielectric material.
- (2) Note. A conductive dielectric heater with means to heat the electrodes to prevent condensation thereon is classified herein.
- (3) Note. A conductive dielectric heating apparatus with means to prevent dissipation of heat from the work by simultaneously heating the work holder or support is classified herein.
- (4) Note. For claims reciting both food (edible) and nonfood (nonedible) heating by an electric heating device or method, classification is proper for Class 219. If the claims recited are limited to food (edible) heating methods, composition, product, or processes, classification is proper for Class 426.

- (5) Note. A capacitive dielectric heater with a diverse heater included is classified herein. If the diverse heater is an inductive or microwave type, classification is above.

## SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclasses 1+ for material subjected to electromagnetic energy.
- 99, Foods and Beverages: Apparatus, subclass 358 for cooking with an electrode-type heater; subclass 451 for treating food by electric, radiant, or vibrational energy; and digest 14 for induction heating food materials.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 272.2+ for methods of and subclasses 379.6+ for means of surface bonding and/or assembly thereof with direct application of electrical, magnetic, or radiant energy to work.
- 204, Chemistry: Electrical and Wave Energy, subclasses 193+ for apparatus for treating substances with electrical or radiant energy to effect a chemical change.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 402+ for processes of heating a mold utilizing direct application of electrical or wave energy, digest 46 for molding processes utilizing electrical heat, and subclasses 405+ for processes utilizing direct application of electrical or wave energy to the work.
- 361, Electricity: Electrical Systems and Devices, subclasses 271+ for electrostatic capacitors.
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclasses 174+ for a device with means for applying electrical or wave energy directly to work.
- 426, Food and Edible Material: Processes, Compositions, and Products, subclasses 237+ for the direct application of electrical or wave energy to food material.

- 600, Surgery, subclasses 9+ for a magnetic field applied to the body for therapeutic purposes.
- 606, Surgery, subclasses 27+ and 32+ for devices for heat or electrical applications.
- 607, Surgery: Light, Thermal, and Electrical Application, subclasses 1+ for light and thermal application to the body and subclasses 114 through 156 for an electrical energy applicator.

**765 Bonding:**

This subclass is indented under subclass 764. Subject matter wherein two or more opposing surfaces are permanently joined together by dielectric heating.

- (1) Note. This subclass relates, for example, to the bonding of wood, plastic, or paper by thermal-sensitive glue.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 603, for bonding by inductive heating in which the object or material bonded is metallic.
- 633, for bonding by inductive heating in which an intermediate member transfers heat (heat exchange) to the material or objects (usually nonmetallic) being bonded.

SEE OR SEARCH CLASS:

- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 272.2+ for laminating processes which include heating or other effects produced by electrical energy; see subclasses 379.6+ for apparatus therefor.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 405+ for direct application of electrical or wave energy to work.
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclasses 174+ for a device with means for applying electrical or wave energy directly to work.

**766 Shoe:**

This subclass is indented under subclass 765. Subject matter wherein the bonded material or object results in forming or repairing footwear apparel.

SEE OR SEARCH CLASS:

- 12, Boot and Shoe Making, appropriate subclasses for apparatus and processes for making shoes.
- 36, Boots, Shoes, and Leggings, subclass 2.6 for heated boots and shoes.

**767 Die embroidery:**

This subclass is indented under subclass 765. Subject matter wherein a geometric pattern is formed (imprinted) on the material or object while being bonded.

SEE OR SEARCH CLASS:

- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclass 380.8 for an electrode with a shaping or deforming workpiece function.

**768 Sewing machine type:**

This subclass is indented under subclass 765. Subject matter wherein an apparatus is applying mechanically driven rollers to bond together a seam, or a needle-like point is spot welding two or more materials together.

**769 Container sealing:**

This subclass is indented under subclass 765. Subject matter wherein the bonded surfaces result in a tightly enclosed vessel having the capacity for holding material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 604, for bonding containers by inductive heating.
- 633, for bonding nonmetallic objects by inductive heating.

SEE OR SEARCH CLASS:

- 53, Package Making, digest 2 for high frequency electric sealing, subclass 557 for heat shrinking, and subclasses 477+ for heat sealing.

156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 272.2+ for processes and subclasses 379.6+ for apparatus therefor for laminating.

**770 Specific heating application:**

This subclass is indented under subclass 764. Subject matter wherein a material or an object of a particular shape or form is subjected to dielectric heating.

- (1) Note. This and other indented subclasses are intended primarily as subclasses for specific applications of dielectric heating. Examples of specific applications are a dielectric heater claimed in combination with an article of specific configuration, with a specific material, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

635+, for an inductive heater for a specific heating application.

**771 Food:**

This subclass is indented under subclass 770. Subject matter wherein the heating application is to warm, defrost, or cook (edibles) food.

- (1) Note. For claims reciting both food (edible) and nonfood (nonedible) heating by an electric heating device or method, classification is proper for Class 219. If the claims recited are limited to food (edible) heating methods, composition, product, or processes, classification is proper for Class 426.

SEE OR SEARCH THIS CLASS, SUBCLASS:

620+, for inductive cooking.

725+, for microwave cooking.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclass 358 for cooking with an electrode-type heater; subclass 451 for treating food by electric, radiant, or vibrational energy; and digest 14 for induction heating food materials.

426, Food or Edible Material: Processes, Compositions, and Products, subclasses 237+ for the direct application of electrical or wave energy to food material.

**772 Fluent material:**

This subclass is indented under subclass 770. Subject matter wherein the heating application is to a fluid or liquid substance.

- (1) Note. A fluent material is one that flows easily from container to container and may be a fine granular material, liquid, or air.

- (2) Note. The dielectric heating must act directly on the fluent material. If the heating is inductive with an intermediate member such as a conduit or container which in turn heats the fluent material, see SEARCH THIS CLASS, SUBCLASS below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

628, for inductively heating a fluent material through an intermediate member (heat exchange).

687, for a microwave fluid heater.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclass 451 for apparatus for sterilizing foods by electrical energy.

204, Chemistry: Electrical and Wave Energy, subclasses 155+ and 157.15+ for methods involving chemical reactions induced by radiant energy, and subclasses 193+ for the corresponding apparatus.

250, Radiant Energy, subclass 432 for methods and apparatus for subjecting fluent material to a radiant energy source.

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 405+ for processes utilizing direct application of electrical or wave energy to the work, especially subclasses 413+ for treating or producing a porous product, subclasses 437 for conveying or aligning particulate material, subclasses 454+ for direct

- application of fluid pressure, subclasses 464+ for extrusion molding, subclass 478 for injection molding.
- 392, Electric Resistance Heating Devices, appropriate subclasses for fluid heating by resistance heaters.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 21 and 22+ for processes of the class using microwave or other electrical or electromagnetic radiation and subclasses 186+ for apparatus for the chemical treatment of material using radiant electrical energy.
- 773 Sheet (e.g., board, etc.):**  
This subclass is indented under subclass 770. Subject matter wherein the dielectric heating application is to a flat, rectangular-shaped material or object.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 645, for the inductive heating of metal sheet materials.
- SEE OR SEARCH CLASS:
- 226, Advancing Material of Indeterminate Length, appropriate subclasses for methods of and apparatus for feeding material without utilizing the leading or trailing ends to effect movement of the material.
- 242, Winding, Tensioning, or Guiding, appropriate subclasses for winding and reeling apparatus.
- 432, Heating, subclasses 59+ for a residual device for heating a longitudinally moving web, strand, or sheet.
- 774 With workpiece support:**  
This subclass is indented under subclass 764. Subject matter wherein a material or an object is contained in, held in place by, or set to rest upon an arrangement during dielectric heating.
- (1) Note. The meaning of "workpiece" is any object or material that work (in the form of heat) is applied to.
- (2) Note. This subclass includes the subject matter of the subclass in combination with an enclosure therefor.
- (3) Note. An electrode of the heating device may constitute the support.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 385+, for an electrical resistance heater combined with a container, enclosure, or support for material.
- 647+, for workpiece support in which inductive heating is applied.
- SEE OR SEARCH CLASS:
- 373, Industrial Electric Heating Furnaces, appropriate subclasses for electric furnaces wherein a crucible forms the work support.
- 414, Material or Article Handling, for appropriate subclasses for workpiece handling.
- 432, Heating, subclasses 227+ for a residual heating device associated with work support.
- 775 Conveyor:**  
This subclass is indented under subclass 774. Subject matter wherein the workpiece support provides for a line of continuous movement of the workpiece from one location to another.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 388, for an electrical resistance heater with conveyor means.
- 645, for apparatus to move a web, strand, or sheet through an inductive heating zone.
- 653+, for an inductive heating system with a conveyor.
- SEE OR SEARCH CLASS:
- 198, Conveyors: Power-Driven, for appropriate subclasses for specific conveyor structure.
- 414, Material or Article Handling, subclasses 150+ for a chamber of a type utilized for a heating function and either a driven device or an inclined flow path for carrying or conveying material into, within, and out of the chamber.
- 432, Heating, subclasses 239+ for a residual heating device having work feed-

ing, agitating, discharging, or conveying subcombination.

**776 Multiple stations:**

This subclass is indented under subclass 775. Subject matter wherein the workpiece is conveyed to a plurality of heating zones or work locations.

- (1) Note. The plural heating zones may be for simultaneously heating plural objects or different portions of one object or for heating one object in diverse manners.
- (2) Note. A nonuniform or progressively increasing or decreasing field in the direction of travel of the work is considered to come within the meaning of plural heating zones.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 656, for a conveyor with plural inductive heating zones.  
701, for a conveyor with plural microwave heating zones.

**777 Pressure applicator (e.g., clamp, etc.):**

This subclass is indented under subclass 774. Subject matter wherein the workpiece support applies a force on the workpiece to keep the workpiece from moving about.

- (1) Note. This subclass does not include heating apparatus wherein the heater and the work are brought into proper relationship, the heat applied, and the heater and work then separated. In this subclass, the work must be moved with respect to the heater during the heating operation.
- (2) Note. Means for molding, shaping, or metal working are excluded from this subclass. For such excluded subject matter see SEARCH THIS CLASS, SUBCLASS and SEARCH CLASS below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 149+, for electrical metal heating and working.

659, for an inductive heating device with a pressure applicator.

SEE OR SEARCH CLASS:

- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 405+ for processes of molding or shaping plastic materials within the class definitions which include a heating step by means of direct application of electrical or wave energy.  
269, Work Holders, for appropriate subclasses for a clamp structure.  
425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclasses 174+ for a molding machine for shaping or reshaping nonmetals combined with means for applying radiant energy (e.g., electrical, electromagnetic, etc.) to the work.

**778 With power supply system:**

This subclass is indented under subclass 764. Subject matter wherein an electrical energizing source is fed to a dielectric heating apparatus for operation.

- (1) Note. The combination of a specific electrode and a power supply therefor where the power supply is recited by name only is not classified in this or the indented subclass. Details of an electrode and power supply must be recited.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 482+, for an electrical resistance heater with a power supply and control means.  
660+, for a power supply system for inductive heating systems.  
702+, for a microwave heating device with a control system.

SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, appropriate subclasses for the miscellaneous power distribution and supply systems.  
323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for the miscellaneous systems for controlling phase angle or voltage and/or current magnitude and for the miscel-

- laneous transformer and impedance systems.
- 331, Oscillators, appropriate subclasses for electrical oscillator systems in general.
- 333, Wave Transmission Lines and Networks, subclasses 34+ for coupling networks for coupling electric energy which varies over a band of frequencies to another transmission line or network.

**779 Condition responsive:**

This subclass is indented under subclass 778. Subject matter wherein the power supplied to the dielectric heating apparatus is automatically regulated according to a preselected result.

- (1) Note. The automatic control means must include means to sense a condition and means to vary a condition in response to the sensed condition. Means to maintain a condition constant is included as an automatic control where the system includes means to sense deviations from the condition and to adjust the system to maintain the desired value constant.
- (2) Note. The automatic control may be in response to or control the working temperature, duration of heating cycle, tuning of the load circuit or power supply, or the coupling impedance between the power supply and heating apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 663+, for inductive heating systems with automatic control.
- 704+, for a microwave heating device with a load condition sensor.

SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, appropriate subclasses for the miscellaneous power distribution and supply systems.
- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for the miscellaneous systems for controlling phase angle or voltage and/or current magnitude and for the miscel-

- laneous transformer and impedance systems.
- 333, Wave Transmission Lines and Networks, subclasses 34+ for coupling networks for coupling electric energy which varies over a band of frequencies to another transformer line or network.

**780 Specific electrode configuration:**

This subclass is indented under subclass 764. Subject matter wherein a conducting surface having a distinctive exterior contour or unique shape generates an electromagnetic alternating field for dielectric heating.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 25.41+ for methods of making condensers.
- 361, Electricity: Electrical Systems and Devices, subclasses 271+ and 503+ for capacitors of general utility.
- 607, Surgery: Light, Thermal, and Electrical Application, subclasses 154+ for condenser-type electrodes for use in high frequency diathermy and for treatment of the human body.

END