

## **CLASS 314, ELECTRIC LAMP AND DISCHARGE DEVICES: CONSUMABLE ELECTRODES**

### **SECTION I - CLASS DEFINITION**

Electric space discharge devices having at least one electrode formed of and/or containing a solid material which is consumed during the operation of the discharge device, and such devices in combination with a current supply system therefor.

- (1) Note. Most of the discharge devices in this class are provided with means to feed the electrodes of the discharge device together so as to compensate for the consumption of the consumable electrode and to maintain the proper distance for the space discharge between the electrode, the feeding being intermittent or continuous.

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

Patents claiming an "arc discharge device" or an "arc lamp," or arc discharge device circuits, or arc lamp circuits, are not classified in this class unless the claims are limited by claimed subject matter to discharge devices of the consumable electrode type. For arc lamps, arc discharge devices, and methods and apparatus for utilizing arc discharge devices for treating materials, objects or spaces, see References to Other Classes below.

This class does not provide for electric space discharge devices with mechanisms for bringing together and separating the electrodes of a discharge device merely to initiate the discharge unless the claims are limited by claimed subject matter to discharge device of the consumable electrode type. For discharge devices, per se, electrodes together and then separating them so as to initiate the discharge, search Class 313, Electric Lamp and Discharge Devices, subclasses 146+. Search Class 315, Electric Lamp and Discharge Devices: Systems, subclasses 327+ for systems where the discharge device is not a consumable electrode discharge device and the system includes means to bring the electrodes together and then to separate them to initiate the discharge.

This class does not provide for electrical systems including a consumable electrode discharge device and another device which is not a discharge device or lamp, such systems being classified in Class 307, Electrical Transmission or Interconnection Systems, subclasses

155+, or in the class which provides for the particular art to which they relate, except that this class does provide, in subclasses 13 and 14, for systems wherein an impedance is substituted in the circuit for the consumable electrode device when the consumable electrode device is removed from the circuit, and provides, in subclasses 115 and 135, for systems wherein an impedance is included in the circuit of the discharge device when the sole function of the impedance is to regulate the current flow to the consumable electrode discharge device.

This class does not take methods or apparatus for utilizing consumable electrode space discharge devices for treating materials or objects, or for apparatus or methods where the consumable electrode discharge device is utilized to generate ray energy, such as ultra violet light, for treating materials or objects. For such methods and apparatus, see References to Other Classes below. This class does take all patents claiming merely means for feeding the consumable electrode to compensate for the consumption of the electrode even though the electrode is disclosed as being for a particular art device, such as an electric furnace or arc welding or heating device. Merely naming one of the electrodes as a particular material or object broadly defined, such as "the work to be welded and/or heated," will not exclude the patent from this class provided the claims are directly only to the feeding means for the consumable electrode.

This class does not take electrical systems which are provided with a consumable electrode discharge device for controlling and/or modifying the current and/or potential supplied to a load device other than a consumable electrode discharge device. For such systems, search the appropriate electrical system class.

This class does not include illumination devices provided with consumable electrode discharge device lamps. Such illumination devices are classified in Class 362, Illumination; see References to Other Classes below for the subclasses in Class 362 which provide for such illumination devices.

This class, except in subclass 60, does not provide for electrodes, per se, for consumable electrode discharge devices nor for the electrode holders, clamps, or electrodes where the structure claimed is not limited by claimed subject matter to use with consumable electrode discharge devices provided with means for feeding the electrodes to compensate for the consumption of the electrode. Class 373, Industrial Electric Heating Furnaces, subclasses 67+ and 88+, provides for arc furnace electrodes; Class 219, Electric Heating, subclasses 121.11+, for arc welding electrodes; and Class 313,

Electric Lamp and Discharge Devices, subclasses 326+ for miscellaneous discharge devices electrode structure. See subclass 357 for rod-like electrodes of the type usually used with consumable electrode discharge devices. Note that Class 252, subclass 500, and the classes specified in the Notes thereto, provides for the materials for use for making discharge device electrodes and for discharge device electrodes which are defined only by the material of which they are composed. See section XI, 3 of the class definition of Class 313 for the classification of electrodes for discharge devices which are provided with electrical connector structure.

For electric systems for supplying electric current and/or potential to electric lamps and discharge devices other than consumable electrode discharge devices search the classes in References to Other Classes below.

### SECTION III - REFERENCES TO OTHER CLASSES

#### SEE OR SEARCH CLASS:

- 219, Electric Heating, subclasses 50+, especially 121.11+, for electric arc welding and heating apparatus provided with consumable electrodes. Class 219 provides for all patents which are limited by claimed subject matter to electric arc welding and/or heating, including, for example, such patents as claim means for holding, handling, feeding, and/or moving the work which is to be welded and/or heated. Class 219 also provides for all handheld tools for holding an electrode, such as are used in manual welding.
- 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.
- 250, Radiant Energy, subclasses 281+ for methods and apparatus for the ionic separation or analysis of materials wherein the material maybe ionized by subjecting the material to electronic or ionic bombardment, subclass 306 for method and apparatus to inspect solid or liquid materials by charged particles, subclass 324 for methods and apparatus to corona irradiate materials, subclasses 440.11+ for object supports to irradiate objects by charged particles in a vacuum, and subclasses 492.1+ to irradiate objects or materials generally.
- 313, Electric Lamp and Discharge Devices, appropriate subclasses for arc lamps and electric

space discharge devices other than the consumable electrode type. Class 313, subclasses 238, 243, 267, and 268 provide for the supporting and spacing structure for electrodes for arc lamps which are not within a sealed envelope. Subclass 325 of Class 313 also contains many patents for arc discharge devices which are not within a sealed casing or envelope. See Lines With Other Classes above for the subclasses in Class 313 which provide for discharge devices with movable electrodes, and (6) Note above for the subclasses in Class 313 which provide for the electrodes for discharge devices.

- 315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for all such supply systems for electric lamp and for such supply systems for electric space discharger devices of the gas or vapor ionization type, including arc and spark devices.
- 323, Electricity: Power Supply or Regulation Systems, subclasses 220 through 354 for systems for controlling voltage or current in a single circuit.
- 327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electric space discharge systems not otherwise classified.
- 331, Oscillators, subclasses 78 and 126 for oscillator systems utilizing gaseous space discharge devices, particularly subclass 127, indented under subclass 126, wherein the space discharge device is of the spark or open arc type.
- 362, Illumination, appropriate subclasses for arc lamps provided with means to modify and/or distribute the illumination, and/or with protective means, such as casings, globes, or guards, and for the supports and holders for arc lamps. Particular reference is made to the following subclasses: subclass 20 for automatic substitution of light sources, one of which may be of the carbon arc type; subclass 210 for plural, carbon arc-type light sources; subclass 228 for plural light sources, one of which may be of the carbon arc type; subclasses 261+ for carbon arc-type light source combined with a light modifier; subclasses 362+ for housings for carbon arc-type light sources; subclass 376 for guard means for carbon arc-type light sources; and subclass 416 for arc lamp hangers.
- 373, Industrial Electric Heating Furnaces, subclasses 67+ for electric arc furnaces provided with consumable electrodes.

## SUBCLASSES

**1 AUTOMATIC SUBSTITUTION OF DISCHARGE DEVICE, ELECTRODE OR LAMP:**

This subclass is indented under the class definition. Subject matter having (a) two or more discharge devices, at least one of which is of the consumable electrode type, or (b) a consumable electrode device and a lamp, or (c) a consumable electrode discharge device having a plurality of cathodes and/or anodes, and provided with means for operating one of the discharge devices, lamps, or one of the cathodes and/or anodes and its corresponding electrode while the other discharge device, lamp, or electrode is maintained in a nonoperative condition until the first operated device or electrode fails, either through consumption of the electrode, or some other condition rendering it inoperative, and having means provided which operate automatically in response to either the failure of the first operated device or electrodes, or the consumption of the electrode in the consumable electrode device, to place the other device or electrodes in operative condition whereby such other device or electrodes are substituted for the first operated device or electrodes.

- (1) Note. The device or electrodes which are substituted for the first operated device or electrodes need not be in the same electrical circuit, and the substitution may be made for the purpose of maintaining a discharge, or maintaining the light, or maintaining a load in the circuit.

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

- 9, for discharge devices and systems under the class definition provided with a signaling means, or alarm means to indicate some condition in the discharge device.
- 10, and indented subclasses, for discharge devices and systems under the class definition provided with automatically operating means to complete an electrical circuit in shunt about the discharge device or some part thereof, and/or to open the electric circuit of the discharge device or some part thereof, such means being automati-

cally operated in response to some condition of the discharge device which prevents further operation of the discharge device in the normal manner.

- 34, for discharge devices under the class definition and the current supply systems therefor wherein the discharge device is provided with at least two principal electrodes and an auxiliary starting electrode, the discharge being initiated between one of the principal electrodes and the starting electrode, the discharge being then transferred to the other principal electrode and maintained only between the principal electrodes.

**SEE OR SEARCH CLASS:**

- 313, Electric Lamp and Discharge Devices, subclass 236 for miscellaneous space discharge devices which are provided with a spare electrode to be used in place of a defective electrode and subclass 237 for miscellaneous discharge devices which are especially designed so that a defective electrode may be replaced or especially designed to be readily taken apart so that they may be repaired.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 87 and subclass 88 for miscellaneous current supply systems for electric lamps and/or electric space discharge devices other than consumable electrode discharge devices, the system being provided with automatically operated means for substituting another lamp, discharge device, or electrode when the first operated lamp, discharge device, or electrode fails to operate properly.
- 362, Illumination, subclass 20 for lanterns designed to use a plurality of light sources, one of which may be an arc lamp, and provided with means for automatically substituting another light source in the event the first operated light source is destroyed or extinguished.

**2 With current-shifting switch:**

This subclass is indented under subclass 1. Subject matter having an electric switch which is automatically operated in response to the failure of the first operated discharge device, lamp or electrodes to complete the circuit to the second operated device or electrodes.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

15, 16, and 17 and indented subclasses, for discharge devices, and systems under the class definition provided with an automatically operated electric switch means for completing an electrical circuit in shunt about the discharge device or some part thereof, and/or to open the electric circuit of the discharge device or some part thereof, such switch means being automatically operated in response to some condition of the discharge device which prevents further normal operation of the discharge device.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, appropriate subclasses for electric switches of general application, especially subclass 47 for limit switches.

315, Electric Lamp and Discharge Devices: Systems, subclass 93 for miscellaneous electric lamp and/or electric space discharge device systems which are provided with an automatically operating electric switch for substituting another lamp, discharge device, or electrode when the first operated lamp, discharge device, or electrode fails to operate properly.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 2 for electromagnetically actuated switches.

**3 Differential separation type:**

This subclass is indented under subclass 1. Subject matter having (a) two or more consumable electrode discharge devices, or (b) a consumable electrode discharge device having a plurality of cathodes and/or anodes included in the same circuit, wherein the separating mechanism for the movable electrodes operates to

separate the movable electrodes from the other electrodes either (a) simultaneously, or (b) one of the movable electrodes is separated from its other electrode an instant before the other movable electrode is separated from its other electrode, so that the discharge is maintained only between one of the movable electrodes and the other electrode due to the difference in impedance in the two branch circuits containing the respective discharge devices or electrodes.

**4 Common electrode-operating type:**

This subclass is indented under subclass 1. Subject matter wherein a consumable electrode discharge device is provided with a plurality of cathodes and/or anodes, two or more of the electrodes being movable, the movable electrodes being operated by means of the same motive power means.

(1) Note. In most of the devices in this subclass, one of the movable electrodes is held stationary while the first operated electrode is fed to the discharge, and means are provided for automatically releasing the stationary electrode so that it may be actuated by the feed regulating mechanism when the first operated electrode is consumed or fails to operate.

(2) Note. Continue the search in subclass 3 of this class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

38, for miscellaneous discharge devices and systems under the class definition wherein the discharge device is provided with two or more anodes, and has two or more movable electrodes connected together by mechanical means so that these movable electrodes are moved by the same motive power means.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 2 for mechanisms for releasing or tripping mechanisms of general application.

**5 Electrode magazine type:**

This subclass is indented under subclass 4. Subject matter provided with a receptacle for containing and storing at least one electrode in addition to the electrode which is to be first operated, with means for delivering an electrode from the storage container to the proper position in the discharge device to be used as the electrode for the discharge device when the electrode which has theretofore been maintaining the discharge has been wholly or partially consumed.

**SEE OR SEARCH CLASS:**

- 221, Article Dispensing, appropriate subclasses for article dispensing devices not otherwise provided for, including devices for dispensing cylindrical articles such as rod shaped electrodes.
- 312, Supports: Cabinet Structure, subclasses 45 and 72 for article retaining magazines having article removal facilitating means, for holding cylindrical articles such as rod-shaped electrodes and making them available for removal therefrom.

**6 Current- and/or potential-actuated release:**

This subclass is indented under subclass 4. Subject matter wherein an electroresponsive device, which is automatically operated in response to the failure of the first operated electrode, is used to place the second operated electrode in operative condition.

- (1) Note. Continue the search in subclass 2 of this class.

**7 PLURAL DEVICES:**

This subclass is indented under the class definition. Subject matter wherein (a) two or more consumable electrode discharge devices, or (b) a consumable electrode discharge device and another type of electric space discharge device or lamp are claimed.

- (1) Note. To be classified in this subclass or the indented subclasses as plural consumable electrode-type discharge devices, there must be provided a cathode, an anode, and a separate electrode separating and feeding mechanism for each consumable electrode discharge

device, although the electrode separating and/or feeding mechanism of one device may be influenced by the voltage and/or current flow in the other device. The plurality of discharge devices may be mounted in a single frame.

Where there is a plurality of cathodes and/or anodes, and only a single electrode cooperating with the plural cathodes or anodes, the patent is classified as a single device in subclass 36 and indented subclasses of this class, even though there is a plurality of movable electrodes, each of which is actuated by a separate electrode feed regulating mechanism.

- (2) Note. For electrical systems for supplying electric current to two or more lamps or discharge devices other than consumable electrode devices, search classes in the search notes below for electric lamp and discharge devices and for miscellaneous active electrical nonlinear devices.

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

- 1, and indented subclasses, for plural consumable electrode discharge devices, or for a consumable electrode discharge device and another type of discharge device or lamp, provided with means for operating one of the discharge devices or lamps while the other device or lamp is maintained in nonoperative condition until the first operated device or lamp fails and then automatically substituting the second device or lamp for the first operated device or lamp.

**SEE OR SEARCH CLASS:**

- 313, Electric Lamp and Discharge Devices, subclass 1 for miscellaneous structures which include either a plurality of lamps or a plurality of discharge devices integrally combined in a single unitary structure or which include a discharge device and an electric lamp integrally combined in a single unitary structure.

- 315, Electric Lamp and Discharge Devices: Systems, subclass 312 and the subclasses specified in the notes to the definition of those subclasses for all such supply systems for a plurality of electric lamps and for such supply systems for a plurality of electric space discharge devices of the gas or vapor ionization type; note especially indented subclass 324 where there is a plurality of discharge devices.
- 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 530+ for miscellaneous circuits with specific source of supply or bias voltage.
- 362, Illumination, appropriate subclasses, especially subclass 210 for plural carbon arc-type light sources, and subclasses 228+ for plural light sources, one of which may be of the carbon arc type.

**8****Series-connected:**

This subclass is indented under subclass 7. Subject matter wherein two or more of the discharge devices are connected in series relation in the circuit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 33, for discharge devices and systems wherein the discharge device is provided with three or more electrodes connected in electrical series relation.

SEE OR SEARCH CLASS:

- 250, Radiant Energy, appropriate subclasses for miscellaneous systems not otherwise classified, which include a plurality of series connected discharge devices.
- 315, Electric Lamp and Discharge Devices: Systems, subclass 179 and indented subclasses, subclass 185 and indented subclasses, and the subclasses specified in the notes to the definitions of those subclasses for miscellaneous systems for supplying electric current to series connected electric lamps and/or electric space discharge devices of the gas or vapor ionization type.

**9****WITH SIGNAL, INDICATOR AND/OR ALARM:**

This subclass is indented under the class definition. Subject matter provided with signaling means, or indicator means, or alarm means operated by some part of the consumable electrode discharge device or the electrical circuits therefor to indicate some condition in the discharge device.

- (1) Note. The condition indicated may be the amount of consumption of the electrodes or the time that the discharge device has been operated, or the degree of heat of some part of the discharge device, or any other desired condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 1, and indented subclasses, for systems including (a) a consumable electrode discharge device and another device or lamp, or (b) a consumable electrode discharge device having a plurality of cathodes and/or anodes, and provided with means for automatically substituting for (1) the consumable electrode discharge device the other discharge device or lamp, or (2) the first operated electrode another electrode, when the first operated device or electrode fails to maintain the discharge or is extinguished.
- 10, and indented subclasses, for discharge devices and systems provided with automatically operating means to complete an electrical circuit in shunt about the discharge device or some part thereof, and/or to open the electric circuit of the discharge device or some part thereof, such means being automatically operated in response to some condition of the discharge device which prevents further operation of the discharge device in the normal manner.

SEE OR SEARCH CLASS:

- 116, Signals and Indicators, appropriate subclasses for nonelectrical signals and indicators of general application.

- 315, Electric Lamp and Discharge Devices: Systems, subclasses 120 and 129 and indented subclasses for miscellaneous systems for supplying electric current to electric lamps and/or electric space discharge devices of the gas or vapor ionization type, the system including signal means, indicator means, or alarm means for indicating some condition affecting the operation of the system.
- 340, Communications: Electrical, subclasses 500+ for electric signaling and alarm systems automatically responsive to a condition.

#### 10 **WTH AUTOMATIC SHUNT AND/OR CUTOUT:**

This subclass is indented under the class definition. Subject matter provided with means to complete an electrical in shunt about the discharge device or some part thereof, and/or to open the electric circuit of the discharge device or some part thereof, such means being automatically operated (a) when the electrodes have been consumed, or (b) when the feed regulating mechanism fails to feed the feeding electrode, or (c) when an electrode is broken and/or becomes nonconductive, or (d) when the supply voltage becomes either too high or too low for the proper operation of the discharge device, or (e) after the electrodes have been in operation for a predetermined time.

- (1) Note. This subclass includes discharge devices having means on the electrode and/or the electrode holding rod or mechanism for preventing further feeding of the feeding electrode when the feeding electrode has been consumed to a predetermined extent, thereby opening the electrical circuit by keeping the electrodes too far apart to maintain an electrical discharge between them.
- (2) Note. In many of the devices in this subclass, the shunt circuit is placed about only the regulating mechanism, such as the magnet coils, or only the circuit to the regulating mechanism is open circuited, the circuit to the electrodes being maintained, the electrodes being permitted either to come into contact and thereby establish a short circuit, or to

maintain the discharge until the electrodes have been consumed to such an extent that the electrodes are spaced too far apart to maintain the discharge between them, thereby opening the circuit through the discharge device.

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

- 1, and indented subclasses, for systems including (1) a consumable electrode discharge device and another electric discharge device or lamp, or (2) a consumable electrode discharge device having a plurality of cathodes and/or anodes, and provided with means for automatically substituting for (a) the consumable electrode discharge device the other discharge device or lamp, or (b) the first operated electrode another electrode, when the first operated device or electrode fails to maintain the discharge or is extinguished.
- 9, for discharge devices and systems provided with signaling means, indicating means, and/or alarm means operated by some means responsive to a condition of the discharge device to indicate such condition.

#### SEE OR SEARCH CLASS:

- 315, Electric Lamp and Discharge Devices: Systems, subclasses 65 and 119 and its indented subclasses for miscellaneous systems for supplying electric current to electric lamps and/or electric space discharge devices of the gas or vapor ionization type, the system being provided with automatically operated shunt-circuit closing or cut-out means for the lamp or discharge device.

#### 11 **Shunt circuit closing:**

This subclass is indented under subclass 10. Subject matter wherein an electrical circuit in shunt is completed about the discharge device or some part thereof.

- (1) Note. In many of the devices in this subclass, the shunt circuit is placed about only the regulating mechanism, such as the magnet coils.

- (2) Note. The shunt circuit is usually of lower resistance than the resistance of the discharge device and/or the part around which it is completed and is often a "short circuit," but it may be of higher resistance.

**SEE OR SEARCH CLASS:**

315, Electric Lamp and Discharge Devices: Systems, subclasses 75 and 125 for miscellaneous systems for supplying electric current to electric lamps and/or electric space discharge devices or the gas or vapor ionization type, the system being provided with automatically operated shunt-circuit closing means for the lamp or discharge device.

**12 Regulating magnet placed in the shunt:**

This subclass is indented under subclass 11. Subject matter having the feed regulating mechanism operated and/or controlled by electromagnetic means, the coil of one of the electromagnets of the feed regulating mechanism being included in the shunt circuit when it is completed.

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

113, and indented subclasses, for electromagnetically operated and/or controlled feed mechanism for consumable electrode discharge devices.

**13 With compensating impedance:**

This subclass is indented under subclass 11. Subject matter provided with an electrical impedance in the shunt circuit.

- (1) Note. This subclass includes arrangements wherein an electroresponsive switch, such as an electromagnetic or thermostatic switch, is included in the shunt circuit, and the switch actuating means, such as the coil or the heater for the thermostat, is included in the shunt circuit so as to hold the switch in operated condition as long as the supply voltage is maintained.
- (2) Note. Continue the search in subclass 12 of this class.

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

- 2, 3, 4, and 6, for systems including (a) a consumable electrode discharge device and another electric discharge device or lamp, or (b) a consumable electric discharge device having a plurality of cathodes and/or anodes, and provided with means for automatically substituting for (1) the consumable electrode discharge device the other discharge device or lamp, or (2) for the first operated electrode another electrode, when the first operated device or electrode fails to maintain the discharge or is extinguished, the substituted device or electrode being placed in shunt to the first operated device or electrode.

**14 Feed-regulating mechanism, actuated switch:**

This subclass is indented under subclass 13. Subject matter having the feed regulating mechanism operated by electroresponsive means, such as an electromagnet, and having the switch which completes the shunt circuit actuated by the movement of the feed regulating mechanism.

- (1) Note. Continue the search in subclass 12 of this class.
- (2) Note. In most of the devices in this subclass, the feed regulating mechanism is given an abnormal movement when the electrodes are either consumed or fail to feed, and the abnormal movement of the feed regulating mechanism is utilized to operate the shunt circuit completing switch to its circuit completing position.
- (3) Note. This subclass does not include discharge devices having the switch operated by means of a cam, projection, detent, or other means carried by the electrode rod, or electrode supporting means, or some other part of the discharge device which moves in relation to the movement of the electrode so that the switch is operated only when the electrode has been moved to a predetermined position. Discharge devices having only

this type of shunt switch operation to complete the circuit through the shunt impedance are in subclass 13.

**15 Current- and/or potential-actuated switch:**

This subclass is indented under subclass 11. Subject matter wherein the switch which completes the shunt circuit is an electroresponsive switch operated by means of voltage and/or current changes in the circuit of the discharge device.

- (1) Note. Continue the search in subclasses 13 and 14 of this class.
- (2) Note. This subclass does not include discharge devices having the switch operated by means of a cam, projection, detent, or other means carried by the electrode rod or electrode supporting means, or some other part of the discharge device which moves in relation to the movement of the electrode, so that the switch is operated only when the electrode has been moved to a predetermined position. Discharge devices having only this type of shunt switch operation are in subclass 11 or in indented subclasses 12 and 13.

**SEE OR SEARCH CLASS:**

- 335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 2 for electromagnetic responsive switches of general application.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for electrothermally actuated switches of general application.

**16 Feed-regulating mechanism, actuated switch:**

This subclass is indented under subclass 15. Subject matter having the feed regulating mechanism operated by the electroresponsive means, such as an electromagnet, and having the shunt circuit switch actuated by the movement of the feed regulating mechanism.

- (1) Note. Continue the search in subclasses 12 and 14 of this class.

- (2) Note. In most of the devices in this subclass, the feed regulating mechanism is given an abnormal movement when the electrodes are either consumed or fail to feed, and this abnormal movement is utilized to operate the shunt circuit switch.

**17 Switch-operated type:**

This subclass is indented under subclass 10. Subject matter wherein an electric switch is actuated to control the circuit of the discharge device.

- (1) Note. Continue the search in subclass 11 and indented subclasses of this class for similar shunt circuit closing combinations.

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

- 2, for systems including (a) a consumable electrode discharge device and another electric discharge device or lamp, or (b) a consumable electrode discharge device having a plurality of cathodes and/or anodes, and provided with automatically operated electric switch means for substituting for (1) the consumable electrode discharge device the other discharge device or lamp, or (2) the first operated electrode another electrode, when the first operated device fails to maintain the discharge or is extinguished.

**SEE OR SEARCH CLASS:**

- 200, Electricity: Circuit Makers and Breakers, appropriate subclasses for electric switches of general application.
- 315, Electric Lamp and Discharge Devices: Systems, subclass 74 and indented subclass and subclass 127 and indented subclass for miscellaneous systems for supplying electric current to electric lamps and/or electric space discharge devices of the gas or vapor ionization type, the system being provided with an automatically operated electric switch for completing a shunt circuit about or opening the circuit of the lamp or discharge device.

**18 Current- and/or potential-actuated switch:**  
This subclass is indented under subclass 17. Subject matter wherein the switch is an electro-responsive switch operated by means of voltage and/or current changes in the circuit of the discharge device.

- (1) Note. Continue the search in subclasses 12, 13, 14, 15, and 16 of this class.

**SEE OR SEARCH CLASS:**

- 335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 2 for electromagnetic responsive switches of general application.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for electrothermally actuated switches of general application.

**19 Feed-regulating mechanism, switch-actuated type:**

This subclass is indented under subclass 18. Subject matter having the feed regulating mechanism operated by electroresponsive means, such as an electromagnet, and having the switch actuated by the movement of the feed regulating mechanism.

- (1) Note. Continue the search in subclasses 12, 14, and 16 of this class.
- (2) Note. In most of the devices in this subclass, the feed regulating mechanism is given an abnormal movement when the electrodes are either consumed or fail to feed, and the abnormal movement is utilized to operate the switch.
- (3) Note. This subclass does not include discharge devices having the switch operated by means of a cam, projection, detent, or other means carried by the electrode rod or electrode supporting means, or some other part of the discharge device which moves in relation to the movement of the electrode, so that the switch is operated only when the electrode has been moved to a predetermined position. Discharge devices having only this type of switch operation are in subclass 17.

**20 WITH DISCHARGE-DEFLECTING MEANS:**

This subclass is indented under the class definition. Subject matter provided with means for deflecting the electric discharge, which is formed between the electrodes, from the path the discharge would normally occupy in the absence of the deflecting means.

- (1) Note. In most of the patents in this subclass, an electromagnet is positioned adjacent the discharge area between the electrodes, and the magnetic lines of force of the electromagnet cause the discharge to be deflected from the path the discharge would occupy in the absence of the electromagnet, but this subclass also includes patents wherein the deflecting means is means for directing a jet of gas towards the discharge, or other means for deflecting the discharge.

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

- 22, for consumable electrode discharge devices provided with means to feed an initially fluent material to the discharge.
- 28, for consumable electrode discharge devices provided with a ventilator, fume director, and/or condenser.

**SEE OR SEARCH CLASS:**

- 313, Electric Lamp and Discharge Devices, subclass 153 for miscellaneous discharge devices which are provided with an electromagnet for deflecting the space discharge and subclasses 231.01+ for miscellaneous discharge devices which are provided with means for directing a jet of fluent material towards the discharge for deflecting the space discharge.
- 315, Electric Lamp and Discharge Devices: Systems, for miscellaneous systems for supplying electric current and/or potential to electric space discharge devices including electric space discharge lamps, the discharge device being provided with means for

deflecting the discharge from the path it would normally occupy; subclasses 111.01+ where the deflecting means is a jet of gas or other fluent material; and subclass 267 and subclass 344 where the deflecting means is an electromagnet.

373, Industrial Electric Heating Furnaces, subclasses 64 and 107 for electric arc furnaces provided with means for deflecting the arc from its normal path.

## 21 WITH AUXILIARY MATERIAL SUPPLY TO THE DISCHARGE:

This subclass is indented under the class definition. Subject matter provided with means to supply a material to the discharge area between the electrodes, the material being either a fluent material and/or designed to be converted to a fluent material by the heat of the discharge.

- (1) Note. The material may be a material (a) which is consumed by combustion in the discharge and/or (b) which is heated by the discharge and which converts such heat into radiant energy rays such as light, and/or (c) to facilitate the flow of discharge current between the electrodes, and/or (d) which is a flux, and/or (e) to retard oxidation or combustion.
- (2) Note. This subclass includes patents wherein a material is placed about or in contact with the movable electrode so as to wholly or partially cover the electrode, as a coating, as it is fed to the discharge. Search Class 252, Compositions, subclass 500 for the coating compositions for use on the electrodes of consumable electrode discharge devices; Class 313, Electric Lamp and Discharge Devices, subclass 354 for cored rod electrodes (e.g., "carbons") and subclass 355 for the miscellaneous electrode structures which have a coating thereon; and Class 428, Stock Material or Miscellaneous Articles, subclass 375 for electrodes for arc discharge devices which involve nonelectrical structure and are generally merely a base (e.g., rod) with at least one coating thereon.

(3) Note. This subclass does not include patents wherein the only material to be supplied to the discharge is the material of the electrodes, such as consumable electrodes discharge devices having electrodes containing flaming and/or luminous salts. Such consumable electrode devices are classified on the type of discharge device and/or the type of feeding mechanism used to regulate the feed of the electrodes.

(4) Note. Compare this subclass and subclass 25 of this class. Search Class 252, subclass 500 and the classes specified in the Notes thereto for the composition of electrodes which contain flaming and/or luminous materials. Also see (2) Note above.

### SEE OR SEARCH THIS CLASS, SUBCLASS:

- 20, for consumable electrode discharge devices provided with means for directing a jet of gas towards the discharge for deflecting the discharge from its normal path.
- 129, for consumable electrode discharge devices provided with means to transfer the electric current from the lead wires to the movable electrode, including such transfer devices used with electrodes having a covering of nonconducting material.

### SEE OR SEARCH CLASS:

- 219, Electric Heating, subclass 50, especially 121.11+, for electric welding and heating with feeding of material to be welded or heated into the discharge zone. Note also subclass 72 where a different material, such as slag or a gas, is fed to the weld or heating zone.
- 252, Compositions, see (2) Note and (4) Note above.
- 313, Electric Lamp and Discharge Devices, subclasses 231.01+ for miscellaneous discharge devices which are provided with means to supply a fluent material to the discharge space. Also see (2) Note above.

- 373, Industrial Electric Heating Furnaces, subclasses 79+ for electric furnaces provided with means for feeding the material to be treated into the discharge area.
- 427, Coating Processes, see (2) Note above.

**22 Fluent material feed:**

This subclass is indented under subclass 21. Subject matter designed to feed an initially fluent material into the discharge area.

**SEE OR SEARCH CLASS:**

- 313, Electric Lamp and Discharge Devices, see the reference to this class under (7) Search Class, in the Notes to subclass 21, above.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 111.01+ for miscellaneous systems for supplying electric current and/or potential to electric space discharge devices of the gas or vapor ionization type, including space discharge lamps, the discharge device being provided with means to supply a fluent material to the discharge space.

**23 WITH ELECTRODE TIP CLEANER OR FILM-PUNCTURING MEANS:**

This subclass is indented under the class definition. Subject matter provided with means operated by the discharge device mechanism to remove and/or to penetrate deposits of electrically nonconductive material on the discharge end of one of the electrodes so that good electrical contact can be made between the discharge electrodes whereby the discharge can be more easily initiated between the electrodes when they are brought into contact with each other.

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

- 21, for consumable electrode discharge devices provided with means for feeding an auxiliary material to the discharge area between the electrodes for the purpose of cleaning the electrodes.
- 34, for consumable electrode discharge devices having two principal discharge electrodes and an auxiliary electrode designed to initiate a dis-

charge between itself and one of the principal electrodes, the auxiliary electrode being placed with respect to the principal electrode so that the discharge is initiated at a part of the principal electrode which is not covered with a nonconductive deposit, the discharge being shifted to the principal electrodes when the nonconducting deposit has been heated and rendered conducting.

**24 Repeated contact type:**

This subclass is indented under subclass 23. Subject matter of the type having means for feeding the electrodes into contact with each other and then separating the electrodes to initiate the discharge, and provided with means by which (if the electrodes are not brought into contact electrically, even though they may be in physical contact, so that the discharge cannot be initiated) the electrodes are repeatedly separated and fed towards each other until the obstruction to the flow of current between the electrodes is removed from the space between the electrodes.

- (1) Note. Discharge devices wherein the electrodes are manually moved, and which may have the electrodes repeatedly contacted by operation of the manual moving means, are not included in this subclass but are in subclasses 57 and 58 of this class.

**25 WITH ECONOMIZER:**

This subclass is indented under the class definition. Subject matter provided with a device known in the art as an economizer which is placed in proximity to the discharge end of at least one of the electrodes.

- (1) Note. An economizer may be defined for the purpose of classification in this subclass as (a) a mass of refractory material placed near the discharge end of at least one of the electrodes, usually surrounding the discharge end of the electrode, and designed to receive heat from the electrode and to either return the heat to the electrode or to convert the heat into radiant energy rays, such as light, and/or (b) a body, usually cup-shaped, placed around the discharge end of one of the

electrodes and designed to retard the flow of fumes from the electrodes so as to either conserve the heat of the electrode and/or to facilitate complete combustion of the combustible gases in the fumes.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

26, for consumable electrode discharge devices provided with ventilating means, fume flow shields, fume condenser, and/or temperature modifying means.

**26 WITH VENTILATOR, FUME FLOW SHIELD, FUME CONDENSER AND/OR TEMPERATURE MODIFYING MEANS:**

This subclass is indented under the class definition. Subject matter wherein the discharge device is provided with (a) means to direct and/or circulate a gas or vapor, which may be air, in contact with at least part of the discharge device structure such as the electrode and/or electrode moving mechanism, and/or (b) means to prevent the gaseous fumes given off by the discharge from flowing into contact with the electrode moving mechanism, and/or (c) means to cool the gaseous fumes given off by the discharge so as to cause condensation of the more readily condensable constituents of the fumes, and/or (d) means for cooling and/or heating at least part of the discharge structure, such heating means being in addition to the heat generated by the discharge between the electrodes and/or (e) means to obstruct or to facilitate the flow of heat generated by the electrodes to other parts of the discharge device structure.

(1) Note. Continue the search in subclass 25 of this class.

SEE OR SEARCH CLASS:

165, Heat Exchange, subclass 47 for a structurally installed heat exchanger and appropriate subclasses for a heat exchanger, per se.

313, Electric Lamp and Discharge Devices, subclass 11 for miscellaneous discharge devices which are provided with means for cooling and/or heating at least part of the discharge device structure and subclasses 231.01+ for

discharge devices of other than the consumable electrode types which are provided with a gas or vapor flow directing means.

315, Electric Lamp and Discharge Devices: Systems, subclass 112 for miscellaneous systems for supplying current and/or potential to electric lamps and electric space discharge devices of the gas or vapor ionization type, the lamp or discharge device being provided with heating and/or cooling means for the lamp or discharge device structure.

**27 Movable type, connected to the electrode or electrode-moving mechanism:**

This subclass is indented under subclass 26. Subject matter having such means movable mounted and having the mounting means connected to the electrode and/or the electrode moving mechanism so as to be moved in proportion to the movement of the electrode to maintain such means in spaced relation to the discharge end of the movable electrode.

**28 Ventilator, fume director and/or condenser:**

This subclass is indented under subclass 26. Discharged devices provided with a ventilator, fume director, and/or a fume condenser.

(1) Note. A mere baffle to prevent the fumes from flowing into contact with the electrode moving mechanism is not considered to be a fume director within the meaning of the definition of this subclass, but a conduit to carry the fumes and to prevent the circulation of the fumes around the electrode moving mechanism is considered to be a fume director within the meaning of the definition of this subclass.

(2) Note. This subclass includes casings placed only about the electrode moving mechanism and provided with ventilating means, but where the casing is an enclosure for the entire discharge device, see the search notes below.

SEE OR SEARCH CLASS:

313, Electric Lamp and Discharge Devices, subclasses 20, 33, and 34 for discharge devices which are enclosed

within a sealed envelope and which are provided with an internal temperature modifying baffle or a condensing chamber or surface to cool the vapors within the envelope.

362, Illumination, subclasses 21, 22, 159, 183, 198, 261-265, 276, 294, 367, and 373 where the casing is an enclosure for the entire discharge device.

454, Ventilation, appropriate subclasses for apparatus for supplying air to or removing it from enclosures.

### 29 **Liquid-circulating type:**

This subclass is indented under subclass 26. Subject matter wherein the means to modify the temperature of at least a part of the discharge device structure, such as the electrode and/or the electrode holder, includes means for circulating a heat transfer liquid in contact with the part which is to have its temperature modified.

SEE OR SEARCH THIS CLASS, SUBCLASS:

22, for consumable electrode discharge devices provided with means to supply an initially fluent material to the interelectrode discharge area.

SEE OR SEARCH CLASS:

313, Electric Lamp and Discharge Devices, subclass 35 and the subclasses specified in the notes to those subclasses for miscellaneous discharge devices which are provided with means for circulating a heat transfer in contact with a part of the discharge device.

### 30 **Radiating transmitter type:**

This subclass is indented under subclass 26. Subject matter wherein the means to modify the temperature of at least part of the discharge device structure, such as the electrode and/or the electrode holder, includes a plurality of fins, flanges, or other means for increasing the heat transfer surface.

SEE OR SEARCH CLASS:

165, Heat Exchange, subclass 177 for a tubular structure with heat transfer means; and subclass 185 for a heat transmitter, per se.

313, Electric Lamp and Discharge Devices, subclasses 45 and 46 and the subclasses specified in the notes thereto for miscellaneous discharge devices which are provided with either a heat radiating surface or a heat conducting means.

### 31 **POLYPHASE A.C. SUPPLY:**

This subclass is indented under the class definition. Subject matter wherein the discharge device is supplied with polyphase alternating current.

(1) Note. This subclass includes system wherein the electrodes are supplied with alternating current of one phase, and the electrode moving mechanism is supplied with alternating current of a different phase.

(2) Note. This subclass includes systems wherein the alternating current source is a single phase source of supply, and means are provided for dividing the current into two or more out of phase currents for supplying polyphase alternating currents to the discharge device.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclass 137 and indented subclasses for miscellaneous systems for supplying electric lamps and/or electric space discharge devices of the gas or vapor ionization type with polyphase alternating current. Note especially subclass 138 for such systems where single phase current is converted to polyphase.

336, Inductor Devices, subclass 5 for the structure of polyphase transformers and inductive reactors of general utility.

363, Electric Power Conversion Systems, subclasses 148+ for phase conversion systems (e.g., single phase to polyphase and vice versa).

**32 WITH TRANSFORMER IN SUPPLY LINE:**

This subclass is indented under the class definition. Subject matter having a transformer connected to the current supply circuit of the discharge device.

- (1) Note. The transformer may be connected so as to convert the discharge current to a different value, or may have one of its windings in series or parallel with the discharge electrodes, the other winding being connected to the electrode regulating mechanism.
- (2) Note. Continue search in subclass 31 of this class.
- (3) Note. Other alternating current consumable electrode discharge devices are classified on the type of discharge or on the type of feed mechanism used to regulate the feed of the electrodes and the search should be for these characteristic features rather than for discharge devices which are disclosed as being particularly suitable for use in alternating current. Particular attention is called to subclasses 23, 24, 34, and 69 of this class, as many of the patents in these subclasses are disclosed as being particularly useful with alternating current.

**SEE OR SEARCH CLASS:**

- 315, Electric Lamp and Discharge Devices: Systems, subclasses 57, 70, 276, and 354, and the subclasses specified in the notes to the definition of those subclasses for miscellaneous systems which include a transformer for supplying electric current and/or potentials to electric lamps and electric space discharge devices of the gas or vapor ionization type. See subclasses 57, 70, and 276 where the transformer is in the supply circuit; and subclass 354 where the transformer is in the control circuit of discharge-control-type space discharge devices.
- 323, Electricity: Power Supply or Regulation Systems, subclasses 247 and 355, and the subclasses specified in the

notes to the definitions of those subclasses, for miscellaneous transformer systems and for systems for controlling the current and/or voltage in a single circuit by means including a transformer.

- 336, Inductor Devices, appropriate subclasses for the structure of transformers and inductive reactors.

**33 THREE OR MORE SERIES-CONNECTED ELECTRODES:**

This subclass is indented under the class definition. Subject matter having three or more discharge electrodes, the electrodes being connected in series relation in the discharge current circuit.

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

- 8, for systems including two or more consumable electrode discharge devices connected in series relation in the circuit.

**SEE OR SEARCH CLASS:**

- 313, Electric Lamp and Discharge Devices, subclass 306 and the subclasses specified in the notes thereto for miscellaneous discharge devices which have three or more discharge electrodes which are arranged so that the discharge electrodes are in series relationship with each other.

**34 WITH AUXILIARY-STARTING ELECTRODE:**

This subclass is indented under the class definition. Subject matter provided with two or more principal electrodes and an auxiliary starting electrode, the starting electrode being connected in the discharge circuit and placed with respect to one of the principal electrodes so that the discharge is initiated between the principal electrode and the starting electrode, the discharge then being transferred to the other principal electrode, the starting electrode then being either deenergized or removed from the discharge space so that the discharge is maintained only between the principal electrodes.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 1, for consumable electrode discharge devices having three or more electrodes wherein the discharge is initiated between two of the electrodes and is maintained between these electrodes until at least one of the electrodes consumed and/or fails to maintain the discharge, the discharge then being shifted to another electrode or to other electrodes.

SEE OR SEARCH CLASS:

- 313, Electric Lamp and Discharge Devices, subclasses 591 through 603 for miscellaneous discharge devices which are provided with an envelope containing an atmosphere of gas or vapor and which have an auxiliary starting electrode; and subclass 306 for miscellaneous discharge devices which are provided with three or more electrodes, one of which may be an auxiliary starting electrode.
- 315, Electric Lamp and Discharge Devices: Systems, subclass 335 and indented subclass, and the subclasses specified in the notes to the definitions of those subclasses, for miscellaneous systems for supplying electric current and/or potentials to electric space discharge devices of the gas or vapor ionization type, the discharge device being provided with an auxiliary starting electrode.

**35 WITH AUXILIARY-CONTROL ELECTRODE FOR THE ELECTRODE-MOVING MECHANISM:**

This subclass is indented under the class definition. Subject matter provided with an auxiliary electrode which is in circuit with the electrode moving mechanism, the flow of current in the auxiliary electrode circuit controlling the operation of the electrode moving mechanism.

- (1) Note. In the devices of this subclass, the auxiliary electrode is not supplied with discharge current, but is placed in or near the discharge space and is usually connected to one of the discharge electrodes through a circuit containing the electrode

moving mechanism so that the difference in potential between the auxiliary electrode and the discharge electrode controls the operation of the electrode moving mechanism.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 33, for consumable electrode discharge devices having three or more electrodes connected in electrical series relation and the electric current supply systems therefor.
- 34, for consumable electrode discharge devices provided with an auxiliary starting electrode and the electric current supply systems therefor.

**36 PLURAL CATHODE AND/OR ANODE TYPE:**

This subclass is indented under the class definition. Subject matter wherein the discharge device is provided with two or more cathodes and/or two or more anodes.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 1, and indented subclasses, for consumable electrode discharge devices having three or more electrodes wherein the discharge is initiated between two of the electrodes and is maintained between these electrodes until at least one of the electrodes is consumed, the discharge then being shifted to another electrode or to other electrodes.
- 31, for consumable electrode discharge devices having three or more electrodes supplied with polyphase alternating current.
- 33, for consumable electrode discharge devices having three or more electrodes connected in series in the electrical circuit.
- 34, for consumable electrode discharge devices having two or more electrodes, one of the electrodes designed only to initiate the discharge between two or more of the other electrodes.

## SEE OR SEARCH CLASS:

- 313, Electric Lamp and Discharge Devices, subclass 307 and the subclasses specified in the notes thereto for miscellaneous discharge devices which are provided with a plurality of cathodes and a plurality of anodes.
- 315, Electric Lamp and Discharge Devices: Systems, subclass 334 and indented subclasses and the subclasses specified in the notes to the definitions of those subclasses, for miscellaneous systems for supplying electric current and/or potential to a plural cathode and/or anode discharge device of the gas or vapor ionization type.

37

**Consumption feed type:**

This subclass is indented under subclass 36. Subject matter wherein the feed of at least one of the electrodes is accomplished by the consumption of the electrode material or by destruction by the heat of the discharge of obstructions to the motion of the electrodes.

- (1) Note. Where the electrode is connected to source of power, as a mechanical or electrical motor, which transmits motion to the electrode to cause it to feed, the feeding is not considered to be of the consumption feed type although the loss in weight of the electrode due to the consumption of the electrode may effect the feed or control the operation of the source of power.
- (2) Note. This subclass provides for discharge devices having three or more electrodes, one or more of which are fed by consumption feeding and others of which are fed by mechanical means.
- (3) Note. This subclass includes discharge devices having two or more of the electrodes placed so that the adjacent ends of the electrodes abut each other, the abutting electrodes acting in effect as a single electrode with respect to one or more other electrodes, the feeding of the abutting electrodes being accomplished by the consumption of either of the abutting electrodes.

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

- 59, for other consumable electrode discharge devices of the consumption feed type, and subclass 60 for electrodes limited by claimed subject matter to use with consumption feed-type consumable electrode discharge devices.

38

**Interconnected feed operator:**

This subclass is indented under subclass 36. Subject matter having two or more movable electrodes connected together by mechanical means so that these movable electrodes are each moved by the same motive power means.

- (1) Note. In many of the patents in this subclass, the two movable electrodes each cooperate with the same third electrode to establish the electrical discharge.
- (2) Note. Continue the search in subclass 37 of this class.

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

- 3, and 4 and indented subclasses, for consumable electrode discharge devices having three or more electrodes wherein the discharge is initiated between two of the electrodes and is maintained between these electrodes until at least one of the electrodes is consumed, the discharge then being shifted to another electrode or to other electrodes, and having two or more movable electrodes connected together by mechanical means so that these movable electrodes are operated by the same motive power means.
- 33, for consumable electrode devices having three or more electrodes connected in series relation in the circuit, and having two or more movable electrodes connected together by mechanical means so that these movable electrodes are operated by the same motive power means.
- 53, and indented subclasses, for miscellaneous consumable electrode discharge devices having the electrodes connected together by mechanical means

so that the electrodes are each fed towards the other by the same motive power means during the feeding operation.

**39 OSCILLATORY AND/OR ROTARY ELECTRODE MOTION TYPE:**

This subclass is indented under the class definition. Subject matter having the electrode holder mechanism arranged (a) to oscillate (including reciprocate) one of the electrodes across the end of the other electrode and/or (b) to rotate one of the electrodes about an axis which is either concentric or eccentric with an axis of the electrode during the operation of the discharge device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 46, and indented subclasses, for consumable electrode discharge devices having inclined or parallel electrodes and having one of the electrodes pivotally mounted in a support.
- 134, for consumable electrode discharge devices provided with adjustable supporting means for the electrodes so that the electrodes may be placed in different positions with respect to the supporting frame.

SEE OR SEARCH CLASS:

- 219, Electric Heating, subclasses 50+, especially indented subclasses 125.11 and 125.12 for electric arc welding with a rotating or oscillating electrode.
- 313, Electric Lamp and Discharge Devices, subclass 146 for miscellaneous discharge devices having a movable electrode.
- 373, Industrial Electric Heating Furnaces, subclasses 94+ and 105+ for electric arc furnaces provided with means for moving the furnace charge and the electrodes relative to each other in a similar manner.

**40 Interconnected feeding and oscillating and/or rotating mechanism:**

This subclass is indented under subclass 39. Subject matter having a common source of motive power for feeding the electrodes and oscillating and/or rotating the electrodes.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclasses 20 through 24 for mechanical mechanism for deriving two or more different types of motion or for deriving the same type of motion and an additional motion of a different type from one type of motion.

**41 Rotary motion-type power supply:**

This subclass is indented under subclass 40. Subject matter wherein the motive power means supplies rotary motion to the electrode moving mechanism, the feed mechanism, for feeding the electrodes being actuated from the rotary motion of the motive power.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclasses 22 through 24 for mechanical mechanisms for deriving reciprocating and rotary motion from rotary motion.
- 414, Material or Article Handling, subclasses 431+ for apparatus for advancing and rotating an elongated article by means adapted to engage the article between its ends.

**42 Rotary electrode:**

This subclass is indented under subclass 39. Subject matter wherein the electrode is designed to rotate about an axis which is either concentric or eccentric with an axis of the electrode during the operation of the discharge device.

- (1) Note. Continue the search in subclass 41 of this class.

SEE OR SEARCH CLASS:

- 414, Material or Article Handling, subclasses 431+ for apparatus for advancing and rotating an elongated article by means adapted to engage the article between its ends.

**43 Plural rotary electrode:**

This subclass is indented under subclass 42. Subject matter wherein two or more electrodes have rotary motion during the operation of the discharge device.

**44 DISK OR PLATE ELECTRODE TYPE:**  
This subclass is indented under the class definition. Subject matter provided with an electrode in the form of a disk or flat plate.

**45 INCLINED OR PARALLEL ELECTRODES:**  
This subclass is indented under the class definition. Subject matter provided with electrodes which have their longitudinal axes either inclined or parallel with respect to each other.

- (1) Note. This subclass includes all patents, either as originals or cross references, claiming consumable electrode discharge devices having the axes of the electrodes in other than straight line relationship with respect to each other.

**46 Pivoted electrode:**  
This subclass is indented under subclass 45. Subject matter having one of the electrodes pivotally mounted in a support.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 39, for consumable electrode discharge devices provided with means to either (a) oscillate one of the electrodes across the end of the other electrode, and/or (b) to rotate one of the electrodes about an axis which is either concentric or eccentric with an axis of the electrode.

**47 Plural pivoted electrodes:**  
This subclass is indented under subclass 46. Subject matter having plural electrodes pivotally mounted in a support.

- (1) Note. This subclass contains as original patents only patents claiming consumable electrode discharge devices having two electrodes which are each pivotally mounted, but takes as cross references patents from preceding subclasses, such as subclass 36 and indented subclasses, claiming consumable electrode discharge devices having three or more electrodes, where two or more of the electrodes are either mounted in inclined or parallel with respect to each other and which are pivotally mounted.

**48 Linear feed:**  
This subclass is indented under subclass 47. Subject matter wherein the feeding motion of the feeding electrode is along a straight line in the direction of the longitudinal axis of the feeding electrode.

- (1) Note. Search this class, subclass 48, for discharge devices under subclass 46 provided with linear feeds and one pivoted electrode.

**49 Linear feed:**  
This subclass is indented under subclass 46. Subject matter wherein the feeding motion of the feeding electrode is along a straight line in the direction of the longitudinal axis of the feeding electrode.

- (1) Note. Continue the search in subclass 48 of this class.

**50 Interconnected feed operator:**  
This subclass is indented under subclass 45. Subject matter having the electrodes connected together by mechanical means so that each of the electrodes is moved by the same feeding mechanism.

- (1) Note. Continue the search in subclasses 47 and 48 of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 37, for consumable electrode discharge devices having three or more electrodes and having two or more of the electrodes placed so that the ends of these electrodes abut each other, and having the longitudinal axis of these electrodes inclined with respect to each other, the abutting electrodes acting in effect as a single electrode with respect to the other electrodes, the feeding of the abutting electrodes being accomplished by the consumption of either of the abutting electrodes.
- 38, for consumable electrode discharge devices having three or more discharge electrodes and having two or more movable electrodes connected together by mechanical means so that

these movable electrodes are each moved by the same motive power means.

- 53, and indented subclasses, for miscellaneous consumable electrode discharge devices provided with plural movable electrodes which are connected together by mechanical means so that each of the electrodes is fed by the same motive power means.

### 51 PLURAL MOVABLE ELECTRODES:

This subclass is indented under the class definition. Subject matter provided with a plurality of electrodes which are moveably mounted.

- (1) Note. This subclass and the indented subclasses contain as original patents only patents claiming consumable electrode discharge devices having only two electrodes, both movable, but take as cross references patents from preceding subclasses, such as subclass 36 and indented subclasses, claiming consumable electrode discharge devices having three or more electrodes, where two or more of the electrodes are moveably mounted.
- (2) Note. In most of the devices in this subclass, each of the electrodes is mounted so as to be moved towards and away from the other electrode for other than feeding purposes; plural movable electrodes for feeding purposes being in the indented subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 3, and 4 and indented subclasses, for consumable electrode discharge devices having three or more electrodes wherein the discharge is initiated between two of the electrodes and is maintained between these electrodes until at least one of the electrodes is consumed or fails to maintain the discharge, the discharge then being shifted to another electrode or electrodes, and having the first operated consumable electrode and the substituted electrode connected together by mechanical means so that these movable electrodes are each

operated by the same mechanical means.

- 31, 33, and 36 and indented subclasses, for consumable electrode discharge devices provided with three or more electrodes and having at least two of the electrodes mounted so as to be movable with respect to the other electrodes.
- 34, for consumable electrode discharge devices having three or more electrodes, one of the electrodes being designed only to be moved towards and away from one of the principal electrodes to initiate the discharge between two of the other principal electrodes, and one of the principal electrodes being mounted so as to be movable to compensate for the consumption of the consumable electrode.
- 47, and 48, for consumable electrode discharge devices provided with plural pivoted electrodes which are mounted in inclined or parallel relation with respect to each other.

### 52 Plural electrode feeding:

This subclass is indented under subclass 51. Subject matter wherein the electrodes are each adapted to be moved towards the other during the feeding operation of the discharge device.

### 53 Interconnected operator:

This subclass is indented under subclass 52. Subject matter having the electrodes connected together by mechanical means so that each of the electrodes is fed by the same motive power means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 37, for consumable electrode discharge devices having a plurality of cathodes and/or anodes and having two or more electrodes placed so that the ends of the electrodes abut each other, the abutting electrodes acting in effect as a single electrode with respect to the other electrodes, the feeding of the abutting electrodes being accomplished by the consumption of either of the abutting electrodes.

- 47, 48, and 50, for consumable electrode discharge devices having the electrodes mounted so that their longitudinal axes are in other than straight line relation with respect to each other, and having the electrodes connected together by mechanical means so that each of the electrodes is moved by the same motive power means.
- 54 With separate movement of one electrode:**  
This subclass is indented under subclass 53. Subject matter provided with means whereby one of the electrodes may be moved separately from the motion given to the electrodes by the interconnected means.
- (1) Note. In most of the devices in this subclass, both of the electrodes are moved during the feeding operation, but only one of the electrodes is moved to separate the electrodes.
- (2) Note. Wherein only one electrode is moved for feeding purposes and the other electrode is moved only for separating purposes, see subclass 51 of this class.
- 55 With diverse rates of feed:**  
This subclass is indented under subclass 53. Subject matter wherein the feeding mechanism feeds one of the electrodes at a different rate from the rate at which the other electrode is fed.
- 56 Gear-, belt-, or chain-connected:**  
This subclass is indented under subclass 53. Subject matter wherein the means for connecting the electrodes together is gearing, or a belt or a chain.
- (1) Note. Continue the search in subclasses 54 and 55 of this class.
- 57 MANUAL FEED:**  
This subclass is indented under the class definition. Subject matter provided with means manually operated for transmitting motion to the electrode for feeding the electrode.
- SEE OR SEARCH CLASS:**
- 74, Machine Element or Mechanism, appropriate subclasses, especially subclasses 471, 479, and 491 and their indented subclasses, for manually operative mechanism of general application.
- 313, Electric Lamp and Discharge Devices, subclasses 146+ for miscellaneous discharge devices provided with a movable electrode and a manually operated means for moving the electrode.
- 58 With power drive:**  
This subclass is indented under subclass 57. Subject matter provided with power means for feeding the electrode.
- (1) Note. In the devices in this subclass, the electrodes may be manually operated in case of failure of the power means or the position of the electrodes may be adjusted manually to compensate for nonuniform feeding by the power means.
- SEE OR SEARCH CLASS:**
- 74, Machine Element or Mechanism, appropriate subclasses, especially subclass 625, for mechanism of general application for operation by either manual or power means.
- 59 CONSUMPTION FEED TYPE:**  
This subclass is indented under the class definition. Subject matter wherein the feed of the electrode is accomplished by the consumption of the electrode material or by the destruction of the electrode by the heat of the discharge of obstructions to the motion of the electrode.
- (1) Note. Where the electrode is connected to a source of power, as a mechanical or electrical motor, which transmits motion to the electrode to cause it to feed, the patent is not classified in this subclass although the loss in weight of the electrode due to the consumption of the electrode may effect the feed or control the operation of the source of power.
- (2) Note. Continue the search in subclass 37 of this class.

**SEE OR SEARCH CLASS:**

313, Electric Lamp and Discharge Devices, subclass 235 for discharge devices which have two electrodes which are maintained in imperfect electrical contact so that the passage of electric current from one electrode to the other will produce light or cause the electrode to be heated. In some of these devices, the electrodes are consumed and are fed together in a manner analogous to the discharge devices of this subclass (59) of Class 314.

**60 Electrodes:**

This subclass is indented under subclass 59. Electrodes limited by claimed structure to use with devices of the kind specified in ... .

- (1) Note. These are the only electrodes, per se, in this class. For other electrodes, per se, including other consumable electrodes, per se, see Note (6) in the main class definition.

**61 FLUID TRANSMISSION:**

This subclass is indented under the class definition. Subject matter wherein the means for transmitting power from the power source to the electrode moving mechanism includes a fluid transmission system and a motor actuated by the fluid.

**SEE OR SEARCH CLASS:**

60, Power Plants, subclass 325 for combined pump and motors, the pump supplying fluid pressure to the motor.

91, Motors: Expansible Chamber Type, for single motors of the expansible chamber type with the fluid control systems therefor.

251, Valves and Valve Actuation, subclass 12 for fluid actuated valves.

303, Fluid-Pressure and Analogous Brake Systems, subclasses 6.01+ for plural motors with fluid control systems therefor.

415, Rotary Kinetic Fluid Motors or Pumps, appropriate subclasses for fluid actuated rotary motors, per se.

418, Rotary Expansible Chamber Devices, for rotary expansible chamber devices, per se.

**62 MOTOR SPEED-CONTROLLED:**

This subclass is indented under the class definition. Subject matter in which initiation of the feeding of an electrode is dependent upon the speed of a motor, the motor being caused to operate in response to some characteristic of the apparatus indicating improper spacing between the discharge electrodes.

- (1) Note. Three common types are (a) the feeding of the electrode depends upon the speed differential between two motors; (b) a motor drives an electrical generator which supplies current to the feed operating means, the motor and the generator being arranged in the system so that the motor must attain some minimum speed before the generator will deliver the requisite energy to initiate the feeding operation; and (c) the motor drives a feed responsive device and when the motor attains some predetermined speed, the speed responsive device initiates the electrode feeding operation.
- (2) Note. When the motor upon whose speed the initiation of the feeding operation is dependent is an electric motor, the characteristic which varies its speed is most commonly the voltage across the discharge electrodes and/or the current supplied to the discharge electrodes.

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

69, for consumable electrode discharge devices wherein the means for supplying power to move the electrodes is a rotary electric motor.

**SEE OR SEARCH CLASS:**

73, Measuring and Testing, subclass 488 for a speed responsive device, per se.

200, Electricity: Circuit Makers and Breakers, subclass 80 for speed responsive electrical switches of general application.

**63 RADIANT ENERGY RESPONSIVE CONTROL TYPE:**

This subclass is indented under the class definition. Subject matter wherein the feeding of the electrode is controlled by means of a device sensitive to the radiant energy generated by the electric discharge.

- (1) Note. This subclass includes thermostatic devices which are actuated by the radiant heat of the discharge.

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

- 89, and 90, for consumable electric discharge devices provided with thermostats heated by means other than the discharge between the electrodes for moving or controlling the operation of the movable electrode.

**SEE OR SEARCH CLASS:**

- 250, Radiant Energy, subclass 200 and the classes and subclasses specified in the notes thereto for photocell controlled electric circuits and photocell apparatus, particularly subclass 205 where the photocell controls the light source which illuminates it.
- 315, Electric Lamp and Discharge Devices: Systems, subclass 149 for miscellaneous systems for supplying electric current and/or potential to electric lamps and/or electric space discharge devices of the gas or vapor ionization type, the system including a device sensitive to radiant energy (photocell, etc.)
- 318, Electricity: Motive Power Systems, subclass 16 for electric motor systems which are controlled by means of radiant electromagnetic waves (e.g., radio waves), subclass 460 for electric motor systems controlled by sonic or supersonic vibrations, and subclass 480 for electric motor systems controlled by radiant energy such as light, infrared rays, etc.
- 337, Electricity: Electrothermally or Thermally Actuated Switches, subclass 298 for thermally actuated switches of general application.

- 340, Communications: Electrical, subclasses 825.69 and 825.72 are the generic subclasses for the control of apparatus and devices at a distance by means of radio wave energy.

- 374, Thermal Measuring and Testing, subclasses 100+ for a thermometer.

**64 ELECTRIC DISCHARGE CONTROL CIRCUIT:**

This subclass is indented under the class definition. Subject matter wherein the circuit for controlling the operation of the motive power means includes an electric discharge device.

**SEE OR SEARCH CLASS:**

- 315, Electric Lamp and Discharge Devices: Systems, subclasses 200 and 352 for miscellaneous systems for supplying an electric current and/or potential to an electric lamp and/or electric space discharge device of the gas or vapor ionization type, the system including an electric space discharge device. See subclass 200 where the discharge device is in the supply circuit of the lamp or discharge device, and subclass 352 where the discharge device is in the control circuit of the discharge control means of a discharge control type discharge device.
- 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 518+ for miscellaneous control circuits which may include electron space discharge devices.

**65 WITH ELECTRODE SEPARATING MECHANISM AND FEEDING MECHANISM:**

This subclass is indented under the class definition. Subject matter provided with one mechanism for moving an electrode in the separating direction and separate means for moving the same electrode in the feeding direction.

- (1) Note. This subclass does not include (a) mechanisms which connect the electrode to a source of motive power in one direction of motion of the motive power means for moving the electrode against the force of gravity or against the resistance of a spring or weight and which

release the electrode from engagement with the source of motive power in the other direction of motion of the motive power means or when the motive power means is de-energized so that the electrode is free to move under the influence of gravity or the bias of the spring or weight, (b) mechanisms such as reversible motors or reversible transmission means, such as reversible gearing, or (c) other mechanisms which are reversible in their operation and which are used in one direction of their motion for feeding the electrodes, and in the other direction for separating the electrodes. Such mechanisms are excluded even though supplemental means are provided for controlling or aiding the release of the electrode from the motive power means or for controlling the mechanism to reverse the operation. Such mechanisms are in the subclasses below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

51, 52, and 54, for consumable electrode discharge devices wherein one of the electrodes is moved to separate the electrodes from each other, and the other electrode is moved to feed the electrodes together.

**66 Electromagnetic separating:**

This subclass is indented under subclass 65. Subject matter wherein the power for moving the electrode in the separating direction is supplied by means of an electromagnet having a movable armature.

(1) Note. Continue the search in subclasses 37 and 54 of this class.

**67 Electromagnetic feed:**

This subclass is indented under subclass 66. Subject matter provided with an electromagnet having a movable armature (which is separate from the separating electromagnet and armature) for moving the electrode in the feeding direction.

**68 POSITIVE FEED:**

This subclass is indented under the class definition. Subject matter wherein the electrode feeding mechanism positively feeds the elec-

trode during the feeding operation as distinguished from permitting the electrode to fail under the influence of gravity.

(1) Note. This subclass and the indented subclasses constitute the miscellaneous place for mechanisms for feeding the electrode positively where this is claimed. The succeeding subclasses, starting with subclass 82, ordinarily have positive electrode separating means, and gravity electrode feed means, or feed means so broadly claimed as not limited to positive feed means.

(2) Note. Continue the search in subclasses 21, 22, 51, 52, 58, and 65 and indented subclasses of this class.

(3) Note. This subclass includes feeding mechanisms wherein a spring or weight furnishes the motive power for feeding the electrode, excepting where the only weight is the weight of the electrode and/or the electrode holder.

SEE OR SEARCH THIS CLASS, SUBCLASS:

37, and 59, for consumable electrode discharge devices wherein the feed of the electrode is accomplished by the consumption of the electrode material or by the destruction by the heat of the discharge of obstructions to the motion of the electrode, the electrode usually being biased by means of a spring or other positively acting means to move the electrode or the obstructing means against a holding stop.

41, for consumable electrode discharge devices having power driven means for both rotating and positively feeding the consumable electrode.

SEE OR SEARCH CLASS:

313, Electric Lamp and Discharge Devices, subclass 146 for miscellaneous discharge devices which have a movable electrode and power means for moving the electrode.

**69****Rotary electric motor:**

This subclass is indented under subclass 68. Subject matter wherein the means for supplying the power to move the electrodes is a rotary electric motor.

- (1) Note. Most of the systems in this subclass and the indented subclasses have the motor connected in the circuit so as to be controlled in response to the condition of the electric discharge so that when the electrodes are spaced too far apart the motor will be rotated so as to feed the electrodes together.
- (2) Note. Most of the systems in this subclass and the indented subclasses are also arranged to cause the motor to separate the electrodes in the event they are too close together.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 62, for discharge devices and systems under the class definition in which the initiation of the feeding of an electrode is dependent upon the speed of a motor, the motor being caused to operate in response to some characteristic of the discharge device indicating improper interelectrode spacing.

SEE OR SEARCH CLASS:

- 310, Electrical Generator or Motor Structure, subclass 40 for rotary electric motors.
- 318, Electricity: Motive Power Systems, appropriate subclasses for electric motor control.

**70****With motor-braking:**

This subclass is indented under subclass 69. Subject matter provided with means to apply a braking force to the motor.

- (1) Note. In many of the systems in this subclass when the motor energizing circuit is opened after the electrodes have been moved to or almost to the proper position, an impedance in the system then acts as a load upon the motor, which is then acting as a generator, whereby the motor is dynamically braked.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 71, and 72, for systems under subclass 69 which include means for changing the impedance of the circuit supplying current to the motor for purposes other than dynamic braking.
- 74, for systems under subclass 69 provided with means for varying the operating characteristics of an electric switch placed in the motor circuit.
- 75, for systems under subclass 69 where the motor is supplied from a source of current which is separate from the current supply for the discharge.

SEE OR SEARCH CLASS:

- 318, Electricity: Motive Power Systems, subclass 362 for electric motor braking control.

**71****With motor circuit impedance regulator:**

This subclass is indented under subclass 69. Subject matter provided with means for changing the impedance of the circuit supplying current to the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 70, for systems under subclass 69 provided with an impedance in the motor circuit which acts as a dynamic brake on the motor when the electrodes have been moved to or almost to the proper position.

SEE OR SEARCH CLASS:

- 318, Electricity: Motive Power Systems, subclass 508, and the search notes thereunder, for electric motor control by impedance in the primary or armature circuit.

**72****Switch-controlled motor circuit:**

This subclass is indented under subclass 71. Subject matter having the circuit for controlling the supply of current to the motor controlled by an electric switch, the switch being operated in response to the condition of the electric discharge.

- (1) Note. In many of the systems in this subclass, the switch controls a shunt placed

about an impedance in the motor circuit, the shunt being opened to place the impedance in the motor circuit to retard the speed of rotation of the motor when the electrodes have been fed almost into contact with each other, thereby preventing overfeeding.

- (2) Note. For other electric motor controlled feeding systems wherein the motor rotates at varying speeds, see subclasses 70, 75, and 76 of this class.

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

- 70, for systems under subclass 69 provided with an impedance in the motor circuit which acts as a dynamic brake on the motor when the electrodes have been moved to or almost to the proper position.  
73, and 74, for other systems under subclass 69 having switch controlled motor circuits.

**SEE OR SEARCH CLASS:**

- 318, Electricity: Motive Power Systems, subclass 515, and the search notes thereunder, for electric motor control by switch means in combination with resistance in the armature or primary circuit.

**73 Switch-controlled motor circuit:**

This subclass is indented under subclass 69. Subject matter having the circuit for controlling the supply of current to the motor controlled by an electric switch, the switch being operated in response to the condition of the electric discharge.

- (1) Note. Continue the search in subclasses 70 and 72 of this class.

**SEE OR SEARCH CLASS:**

- 318, Electricity: Motive Power Systems, subclass 519, and the search notes thereunder, for electric motor control by means of armature or primary circuit making and breaking devices.

**74 With regulation of switch operator:**

This subclass is indented under subclass 73. Subject matter provided with means for varying the operating characteristics of the electric switch.

- (1) Note. In most of the systems in this subclass, the switch, when operated to one position, controls means to change the switch operating characteristics so that the switch will be operated to the reverse position in response to a different change in current and/or potential than that required to operate the switch without such auxiliary means so that the motor circuit may be opened and/or closed a short time before the motor has moved the electrodes to the desired distance of interelectrode spacing, thereby preventing overrunning of the motor with consequential improper electrode spacing.

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

- 70, for systems under subclass 69 provided with an impedance in the motor circuit which acts as a dynamic brake on the motor when the electrodes have been moved to or almost to the proper position.  
115, and 116, for miscellaneous systems provided with means for regulating the flow of current and/or voltage to the electromagnet which operates and/or controls the electrode feeding mechanism.

**75 Auxiliary motor circuit current supply:**

This subclass is indented under subclass 69. Subject matter wherein the motor is supplied from a source of current which is separate from the current supply for the discharge electrodes.

- (1) Note. In most systems in this subclass, the current and/or potential supplied by the auxiliary current source is controlled in response to a condition of the electric discharge to control the feed motor.  
(2) Note. Continue the search in subclasses 31, 70, 72, 73, and 74 of this class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

62, for discharge devices and systems in which the initiation of the feeding of an electrode is dependent upon the speed of an electric motor, the motor being caused to operate in response to some characteristics, such as the voltage across the discharge electrode of the discharge device indicating improper interelectrode spacing.

**76 Differential wound armature and/or field:**

This subclass is indented under subclass 69. Subject matter wherein the armature or the field of the motor contains two windings differentially wound.

- (1) Note. In most of the systems in this subclass, the difference in the amount of energization of the differential windings determines the direction in which the motor operates and the speed with which it operates.

SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclass 499, and the search notes thereunder, for motor control by means of armature having plural opposed windings; and subclass 525, and the search notes thereunder, for motor control by plural opposed field windings.

**77 Pawl and ratchet:**

This subclass is indented under subclass 68. Subject matter having a pawl and ratchet mechanism for transmitting motion to the electrode.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

88, for consumable electrode discharge devices of the nonpositive feeding type in which the electrode is connected to a rotatable member, such as a gear, which is held against rotation by a brake or detent, the power necessary to rotate the rotatable member to separate the electrodes being transmitted to the rotatable member by moving the brake or detent.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 111 and indented subclasses, especially subclasses 149 and indented subclasses, 155, 167, 168, and 169 for intermittent grip mechanisms of the pawl and ratchet type.

**78 Electromagnetic operator:**

This subclass is indented under subclass 68. Subject matter wherein the means for supplying the power for moving the electrodes is an electromagnet provided with a movable armature.

- (1) Note. The armature is usually connected to an intermittent grip mechanism for transmitting motion of the armature to the electrode.
- (2) Note. Continue the search in subclasses 67 and 77 of this class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

113, for other consumable electrode discharge devices provided with an electromagnet for separating the electrodes and/or controlling the operation of the electrode feeding mechanism.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 111 and indented subclasses for intermittent grip mechanisms.

313, Electric Lamp and Discharge Devices, subclass 152 for miscellaneous discharge devices which have a movable electrode and an electromagnet for moving it.

318, Electricity: Motive Power Systems, subclass 135 for linear motor systems.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 220 for electromagnets with armatures.

361, Electricity: Electrical Systems and Devices, subclasses 139+ for electromagnet circuits.

**79 Power-transmission control:**

This subclass is indented under subclass 68. Subject matter wherein the control of the application of power to the electrodes for feeding is secured by controlling the power transmission means.

- (1) Note. This subclass includes arrangements for controlling a clutch interposed in the transmitting mechanism between the power source and the electrode.
- (2) Note. Continue the search in subclass 61 of this class.
- (3) Note. For power transmission control, generally search classes 74, Machine Element or Mechanism; 188, Brakes; and 192, Clutches and Power-Stop Control.

**80 Gear train:**

This subclass is indented under subclass 79. Subject matter wherein the mechanism for transmitting power to the electrode includes a gear train.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 41, for consumable electrode discharge devices having a power means for both rotating and feeding the consumable electrode, the feeding operation being controlled by controlling the operation of a gear train.

**81 Reversible:**

This subclass is indented under subclass 80. Subject matter provided with means for changing the engagement of the gears so as to reverse the direction of movement of the driven member, the motion of the driving member being in the same direction in both directions of movement of the driven member.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, appropriate subclasses, especially subclasses 404 and 404.5, for reversing gear arrangements of general application.

**82 ESCAPEMENT FEED CONTROL:**

This subclass is indented under the class definition. Subject matter provided with an escapement to control the rate of movement of the movable electrode.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclass 1.5 for escapement of general application.
- 185, Motors: Spring, Weight, or Animal Powered, subclasses 5 and 31 for weight operated motors controlled by escapements and subclass 38 for spring motors with escapements.

**83 DETENT OR BRAKE-CONTROLLED ROTARY FEED MEMBER OR GEAR:**

This subclass is indented under the class definition. Subject matter having a rotatable member, such as a gear, which is connected to the electrode so that by controlling the rotation of the rotatable member the feeding of the electrode may be controlled, the rotatable member being held against rotation in the direction of feeding by means of a brake, which may be a gear detent or pawl when the rotatable member is a gear, the electrode being permitted to move in the feeding direction by releasing the gear detent or brake from holding position with respect to the rotatable member.

- (1) Note. Continue the search in subclass 82 of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 77, for consumable electrode discharge devices provided with mechanisms which include a pawl and ratchet for positively feeding the electrode.
- 79, for consumable electrode discharge devices provided with mechanisms which include gear trains, for positively feeding the electrode.

**84 Movable feed frame type:**

This subclass is indented under subclass 83. Subject matter having the rotatable feed control member mounted in a movable frame and having the means for controlling the feed connected to the frame to move it, the rotatable member being brought into engagement with

the gear detent or brake when the frame is moved in one direction to prevent rotation of the rotatable member and being disengaged from the gear detent or brake when the frame is moved in the other direction thereby permitting the rotatable member to rotate and feed the electrode.

- (1) Note. In most of the devices in this subclass, when the frame is moved in the direction in which the gear detent or brake engages with the rotatable member, the gear detent or brake will prevent the periphery of the rotatable member from moving with respect to the gear-detent or brake during at least part of such frame movement, thereby (a) causing rotation of the rotatable member about its on axis, the rotary motion of the rotatable member being transmitted to the electrode to move the electrode in the separating direction and/or (b) moving the electrode in the separating direction by the lifting action of the frame movement.

**SEE OR SEARCH CLASS:**

- 74, Machine Element or Mechanism, subclass 126 for intermittent grip type mechanical movements of general application operating in an analogous manner to the subject matter of this subclass.

**85 Pivoted frame:**

This subclass is indented under subclass 84. Subject matter having the rotatable member journaled in a pivoted frame.

- (1) Note. In most of the devices in this subclass, the pivot of the frame is eccentric with respect to the axis of rotation of the rotatable member.
- (2) Note. Continue the search in subclass 82 of this class.

**86 Multiple magnet-operated:**

This subclass is indented under subclass 85. Subject matter provided with a plurality of electromagnets for moving the frame.

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

- 121, for other consumable electrode discharge devices having the separating and feed controlling mechanism controlled by a plurality of electromagnets.

**87 Locked during separating stroke:**

This subclass is indented under subclass 83. Subject matter wherein the rotary member is prevented from rotating in the direction to control the feed of the electrode by means of the gear detent or brake while the electrodes are being separated.

- (1) Note. Continue the search in subclasses 82 and 84 of this class.

**SEE OR SEARCH CLASS:**

- 74, Machine Element or Mechanism, subclass 111, particularly subclass 126, for intermittent-grip-type mechanical movements of general application which operate in an analogous manner to the subject matter of this subclass.

**88 Positive-acting brake or detent:**

This subclass is indented under subclass 87. Subject matter wherein the power necessary to rotate the rotatable member in the direction which causes the electrodes to separate is transmitted to the rotatable member by moving the gear detent or brake.

- (1) Note. Compare this class and subclass 84 of this class.

**89 THERMOSTATIC OPERATOR OR CONTROLLER:**

This subclass is indented under the class definition. Subject matter provided with (a) a thermostatic device for supplying the energy for separating the electrode, or (b) a thermostat which controls the operation of the feed controlling mechanism.

- (1) Note. Continue to search in subclass 63 of this class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

63, for consumable electrode discharge devices provided with thermostatic means for operating and/or controlling the operation of the feeding mechanism where the thermostatic means is heated by the heat radiated by the electric discharge.

SEE OR SEARCH CLASS:

313, Electric Lamp and Discharge Devices, subclass 151 for miscellaneous discharge devices which have a movable electrode and a thermostatic means for moving it.

318, Electricity: Motive Power Systems, subclass 117 for thermoelectric motor systems.

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

374, Thermal Measuring and Testing, subclasses 100+ for a thermometer.

**90 With mechanical energy-storing device:**

This subclass is indented under subclass 89. Subject matter provided with mechanical means, such as a spring or weight, for receiving and storing energy from the thermostatic device and which is connected to the electrode separating or feed controlling mechanism for moving the mechanism when the stored energy is released.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

92, for other consumable electrode discharge devices provided with a mechanical energy storing device.

**91 WITH RESILIENT OR LOST MOTION CONNECTION:**

This subclass is indented under the class definition. Subject matter provided with a resilient member, such as a spring, or a lost motion connection between (a) the source of power and the mechanism for transmitting separating motion to the electrodes, or (b) the means for operating the mechanism for releasing the electrode and the release mechanism.

(1) Note. In most of the patents in this subclass, the resilient or lost motion connection prevents small movements of the power source or the means for operating the electrode release mechanism from being transmitted to the electrode or the electrode release mechanism, thereby preventing spurious separating or feeding.

**92 WITH MECHANICAL ENERGY-STORING DEVICE:**

This subclass is indented under the class definition. Subject matter provided with mechanical means, such as spring or weight, for receiving and storing energy received from another source of energy, and which is connected to the electrode separating or feed controlling mechanism for moving the mechanism when the stored energy is released.

(1) Note. This subclass does not include consumable electrode discharge devices where the only energy storing weight is the weight of the electrode and/or the electrode supporting mechanism which is lifted against the force of gravity.

(2) Note. Continue the search in subclass 91 of this class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

37, and 59, for consumable electrode discharge devices wherein the feed of the electrode is accomplished by the consumption of the electrode material or by the destruction by the heat of the discharge of obstructions to the motion of the electrode, and having the electrode biased by means of a spring or other positively acting means so as to move the electrode or the obstructing means against a holding stop.

98, for consumable electrode discharge devices provided with means to counterbalance the weight of the movable electrode.

- SEE OR SEARCH CLASS:  
185, Motors: Spring, Weight, or Animal Powered, for spring and weight operated motors.
- 93 Rod gripper biasing type:**  
This subclass is indented under subclass 92. Subject matter provided with a releasable clutch for gripping the electrode and/or the electrode rod in one direction of its motion and for releasing the electrode and/or the electrode rod in the other direction of its motion, and an energy storing device for biasing the clutch to either its gripping or releasing position.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
101, for consumable electrode discharge devices of the releasable electrode or rod gripper type other than those provided with energy storing means.
- 94 With electric motive power:**  
This subclass is indented under subclass 92. Subject matter wherein the means for supplying the energy to the energy storing device is an electrical device of translating electrical energy into mechanical energy.
- 95 Biased lever:**  
This subclass is indented under subclass 94. Subject matter wherein the regulating mechanism includes a lever, and the energy storing device is connected to the lever so as to bias the lever to one of its positions and the electrical device moves the lever to a different position in opposition to the bias of the energy storing device.
- 96 Spring-biased:**  
This subclass is indented under subclass 95. Subject matter wherein the biasing means is a spring.
- (1) Note. Continue the search in subclass 90 of this class.
- 97 Spring-biased:**  
This subclass is indented under subclass 94. Subject matter wherein the energy storing means is a spring.
- (1) Note. Continue the search in subclasses 90 and 96 of this class.
- 98 WITH ELECTRODE COUNTERBALANCE:**  
This subclass is indented under the class definition. Subject matter provided with means to counterbalance the weight of the movable electrode.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
94, and indented subclasses, for consumable electrode space discharge devices having the electrode moving mechanism biased by means of a spring or weight in one direction of its motion.
- SEE OR SEARCH CLASS:  
248, Supports, subclasses 123.1, 280.11, 292.11, 297.11, and 325 for adjustable supports of general application provided with weight counterbalances; and subclass 264 for counterbalance weights.
- 99 WITH RETARDER:**  
This subclass is indented under the class definition. Subject matter provided with means, such as a dash-pot, for retarding the motion of the electrodes and/or the electrode separating and/or feed controlling mechanism.
- SEE OR SEARCH CLASS:  
188, Brakes, for brakes and retarding mechanisms of general application.  
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 239 for electromagnets having armatures and time delay means.
- 100 Retarded feeding type:**  
This subclass is indented under subclass 99. Subject matter having the retarder connected to the electrode holder so as to control the rate of feeding throughout the feeding movement of the electrode.
- (1) Note. In most of the patents in this subclass, during the feeding operation the electrode is released from engagement with the electrode operating mechanism,

the electrode falling under the influence of gravity, with the rate of falling being determined by the retarder.

- (2) Note. Continue the search in this class, subclass 82, for consumable electrode discharge devices wherein the rate of motion of the feeding electrode while feeding is regulated by an escapement.
- (3) Note. Continue the search in this class, subclass 68 and indented subclasses, particularly subclass 70, for consumable electrode discharge devices provided with positive acting electrode feeding mechanisms and means for controlling the rate of feed of the positively fed electrode.

**101 RELEASABLE ELECTRODE OR ROD GRIPPER TYPE:**

This subclass is indented under the class definition. Subject matter provided with a clutch mechanism interposed between the motive power mechanism and the electrode, the clutch gripping the electrode and/or the electrode holder rod during one direction of motion of the motive power means, thereby applying motive power to the electrode for moving the electrode in one direction, and releasing the electrode and/or the electrode holder from connection with the motive power means when the motive power means begins to move in the opposite direction so that the electrode is free to move in such other direction without regard to the amount of motion of the motive power means.

- (1) Note. In most of the devices in this subclass, the electrode falls under the influence of gravity during the feeding operation, consumable electrode discharge devices of the positive feed type being in subclass 68 and indented subclasses of this class.
- (2) Note. Continue the search in subclasses 3, 90, and 93 of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 83, for electrode feed control mechanism having a rotatable member, and means, such as a brake, to hold the

rotatable member from rotation in the feeding direction, especially subclass 88 where the power necessary to rotate the rotatable member in the separating direction is transmitted to the rotatable member by moving the brake or other member.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclass 111 and indented subclasses for intermittent-grip-type mechanical movements of general application, subclass 144 and indented subclasses for grip units and features, and especially subclass 162 and indented subclasses for rod grippers, per se, of general application.
- 226, Advancing Material of Indeterminate Length, subclass 120 for rod, wire, and tube feeders of the intermittent type.
- 294, Handling: Hand and Hoist-Line Implements, subclasses 86.4+ for miscellaneous devices provided with handling or hoist line terminals for grasping a rod or other load of general application.
- 318, Electricity: Motive Power Systems, subclass 119 for reciprocating electric motor systems.

**102 Plural clutches:**

This subclass is indented under subclass 101. Subject matter provided with two or more gripping devices which are separately operated.

- (1) Note. One of the clutches may grip the electrode during the separating stroke and the other holds the electrode against movement after the electric discharge has been established.

**103 With separation limit stop:**

This subclass is indented under subclass 101. Subject matter provided with means to limit the motion of the carbon moving means during the separation of the carbons without releasing the clutch from the electrode and/or the electrode holder.

- (1) Note. Continue the search in subclass 102 of this class.

**104 Magnetic clutch:**

This subclass is indented under subclass 101. Subject matter wherein the gripping members of the clutch form, at least in part, the armature of an electromagnet.

- (1) Note. The electromagnet may be the electromagnet which supplies the energy necessary to move the movable electrode.

**105 Electromagnetically operated:**

This subclass is indented under subclass 101. Subject matter wherein the means for supplying the power for controlling electrode movement is an electromagnet.

- (1) Note. Continue the search in subclasses 38, 102, 103, and 104 of this class.

**106 Plural electromagnet coils:**

This subclass is indented under subclass 105. Subject matter having two or more electromagnet coils which may be on the same or different cores. Usually one of the coils is connected in an electrical shunt with the discharge space and the other in series electrically with the discharge space.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 121, for other consumable electrode discharge devices provided with two or more electromagnet coils for controlling the electrode movement.

**107 Three or more:**

This subclass is indented under subclass 106. Subject matter wherein there are three or more electromagnet coils.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 122, for other consumable electrode discharge devices provided with three or more electromagnet coils for controlling the electrode movement.

**108 Interconnected lever systems:**

This subclass is indented under subclass 106. Subject matter having the armatures of the electromagnets connected by means of a mechanical lever system to a single device

transmitting motion to the electrode clutch or having a single lever or magnetic material acting as a common armature for two or more electromagnets.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 123, for other consumable electrode discharge devices provided with two or more electromagnet coils and an interconnected lever system for controlling the electrode movement.

**109 Common oscillating lever or armature:**

This subclass is indented under subclass 108. Subject matter having the armatures of the electromagnets connected to a common oscillating lever, or having a lever of magnetic material acting as a common armature for two or more electromagnets.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 124, for other consumable electrode discharge devices provided with two or more electromagnet coils and a common oscillating lever or armature for controlling the electrode movement.  
126, for consumable-electrode-type discharge devices with electromagnetically operated means for controlling the movable electrode wherein the armature is actuated by the resultant electromagnetic field generated by two or more magnetic coils.

**110 Coaxial coils:**

This subclass is indented under subclass 106. Subject matter having the electromagnet coils mounted upon the same axis. The coils may be concentrically mounted or placed in end-to-end relationship about the same axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 125, for other consumable-electrode discharge devices provided with two or more coaxial coils for controlling the electrode movement.

**111 Concentric magnet and electrode:**

This subclass is indented under subclass 105. Subject matter wherein the electrode and/or the electrode holder and the electromagnet are concentrically mounted.

SEE OR SEARCH THIS CLASS, SUBCLASS:

127, for other consumable electrode discharge devices provided with an electromagnet for controlling the electrode movement, the electromagnet and the electrode and/or electrode holder being concentrically mounted.

**112 SLIDING ELECTRODE TYPE:**

This subclass is indented under the class definition. Subject matter having the electrode and/or the electrode rod, and/or the electrode holding frame slidably mounted in guides so as to be movable, the electrode being held against motion by a brake mechanism, so that when the brake is released the electrode may move.

SEE OR SEARCH THIS CLASS, SUBCLASS:

82, and 83 and indented subclasses, for consumable electrode discharge devices having the electrode connected to a rotatable member, such as a gear, and having the feeding of the consumable electrode controlled by means of a gear-dented or brake which cooperates with the rotatable member to control its rotation and thereby the feeding of the electrode.

90, 93, and 10, and indented subclasses, for consumable electrode discharge devices provided with a clutch mechanism which is designed to grip the electrode and/or the electrode holder and move it in one direction under the influence of motive power means, and to release the electrode and/or electrode rod so that the electrode is free to move in the other direction without regard to the amount of motion of the motive power means.

**113 ELECTROMAGNETIC OPERATOR AND/OR FEED-CONTROLLING:**

This subclass is indented under the class definition. Subject matter provided with (a) an electromagnet for supplying the energy for separating an electrode, or (b) an electromagnet which controls the operation of the feeding mechanism.

(1) Note. Continue the search in subclasses 67, 70, 77, and 90 of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

67, 77, and 78, for consumable electrode discharge devices having an electromagnet for supplying the energy for moving the electrode in the feeding direction.

41, 61, 70, 72, 73, and 79 and indented subclasses, for consumable electrode discharge devices provided with electromagnetic means for controlling the operation of mechanism which feeds the electrode by positively moving the electrode.

82, 83 and indented subclasses, 90, 93, and 112, for consumable electrode discharge devices provided with electromagnetic means for operating mechanism to release the consumable electrode from its holding means so that the electrode may be moved in the feeding direction.

SEE OR SEARCH CLASS:

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 220 for electromagnets with and without armatures.

**114 With control of the electromagnet circuit:**

This subclass is indented under subclass 113. Subject matter provided with means (including switching arrangements not provided for by preceding subclasses) for controlling the current or voltage supplied to the electromagnet coils.

(1) Note. Where the electromagnetic operating or controlling means includes one or more coils which are in series and/or in shunt with the discharge electrodes, and

no means, other than the variations in the impedance of the electric discharge, are provided to control the flow of current in the series and/or shunt circuit, the patent is excluded from this subclass and the indented subclasses and will be found in subclass 113 or subclasses 119-128 below.

- (2) Note. Continue the search in subclasses 24, 61, 63, 67, 71, 73, 77, 78, and 79 and indented subclasses of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 10, and indented subclasses, for consumable electrode discharge devices having electromagnetic means for operating and/or controlling the operation of the feed regulating mechanism and provided with means to place a shunt about or to open the circuit of the electromagnet when the electrode is consumed or fails to maintain the discharge.

SEE OR SEARCH CLASS:

- 361, Electricity: Electrical Systems and Devices, subclasses 139+ for electromagnet circuits of general application.

**115 With current or voltage regulator:**

This subclass is indented under subclass 114. Subject matter provided with means for quantitatively regulating the current and/or voltage supplied to the electromagnet coils.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 114, 117, and 118, for mere switching systems.  
135, for miscellaneous consumable electrode discharge device systems provided with means to regulate the current and/or voltage supplied to the discharge device.

SEE OR SEARCH CLASS:

- 323, Electricity: Power Supply or Regulation Systems, subclasses 220 through 354 for systems for controlling the magnitude of the current and/or voltage in a single circuit.

- 336, Inductor Devices, appropriate subclasses for the structure of transformers and inductive reactors.

- 338, Electrical Resistors, subclass 68 for mechanically variable electric resistors.

- 361, Electricity: Electrical Systems and Devices, subclasses 139+ for miscellaneous systems of supplying current to an electromagnet.

**116 Current- or potential-responsive:**

This subclass is indented under subclass 115. Subject matter provided with means responsive to electric current and/or potential, for controlling the operation of the regulating means.

- (1) Note. Continue the search in subclass 74 of this class.

**117 Shunt magnet control:**

This subclass is indented under subclass 114. Subject matter wherein the current or voltage supplied to an electromagnet connected in shunt with the discharge electrodes is controlled.

**118 With control of series magnet:**

This subclass is indented under subclass 117. Subject matter wherein the current or voltage supplies to an electromagnet connected in series with the discharge electrodes is controlled.

**119 With electromagnetically operated separating:**

This subclass is indented under subclass 113. Subject matter provided with electromagnetically operated means for moving the electrode in the separating direction.

- (1) Note. Continue the search in subclasses 82, 83 and indented subclasses, 102, 103, 104, and 105 and indented subclasses of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 3, and 4 and indented subclasses, for consumable-electrode discharge devices having three or more electrodes and electromagnetically operated means for separating and feeding the electrodes, and having means for first

- initiating the discharge between two of the electrodes and maintaining the discharge between these electrodes until at least one of the electrodes is consumed or fails to maintain the discharge, the discharge then being shifted to another electrode or to other electrodes.
- 10, and indented subclasses, for consumable electrode discharge devices having electromagnetic operated means for separating and feeding the electrodes and provided with means either to complete a shunt about the discharge device or some part thereof, such as the electromagnets, or to open the circuit of the discharge device or some part thereof when the consumable electrode has been consumed or when the discharge is extinguished.
- 23, and 24, for consumable-electrode discharge devices for separating and feeding the electrodes and provided with means operated by the electromagnets for removing and/or penetrating deposits of electrically nonconductive material on the ends of the electrodes.
- 31, for consumable-electrodes discharge devices having electromagnetically operated means for separating and feeding the electrodes and designed for operation with polyphase alternating current.
- 33, and 36 and indented subclasses, for consumable electrode discharge devices having three or more electrodes and electromagnetically operated means for separating and feeding the electrodes.
- 44, for consumable-electrode discharge devices having disk or plate electrodes and electromagnetic operated means for separating and feeding the electrodes.
- 45, for consumable-electrode discharge devices having the electrodes either inclined or parallel with respect to each other and electromagnetic operated means for separating and feeding the electrodes.
- 51, and indented subclasses, for consumable electrode discharge devices having at least two movable electrodes and electromagnetic operated means for separating and feeding the electrodes.
- 66, for consumable-electrode discharge devices having electromagnetic means for separating the electrode and means other than the electromagnetic means which operate separately from the separating magnet for feeding the electrodes together, and subclass 67 where the feeding of the electrodes is operated by an electromagnet which operates separately from the separating magnet.
- 77, and 78, for consumable-electrode discharge devices having the electromagnetic operated means for separating and feeding the electrode, the feeding mechanism being a positively acting mechanism.
- 91, and 94 and indented subclasses, for consumable electrode discharge devices provided with electromagnetic means for separating and controlling feeding of the electrodes and having an energy storing device, such as a spring or weight, for receiving energy from the electromagnet in one direction of motion of the electromagnet and for releasing energy in the other direction of motion of the electromagnet.
- 99, for consumable-electrode discharge devices having an electromagnetic means for separating and controlling feeding of the electrodes and provided with means for retarding either the motion of the electromagnetic and/or the movable electrode.
- 120 Movable coil:**  
This subclass is indented under subclass 119. Subject matter wherein an electromagnetic coil is moveably mounted.
- 121 Plural coils:**  
This subclass is indented under subclass 119. Subject matter having two or more electromagnetic coils which may be on the same or different cores.
- (1) Note. Usually, one of the coils is connected in an electrical shunt with the discharge space and the other is connected

is series electrically with the discharge space.

- (2) Note. Continue the search in subclasses 67, 86, 106, 118, and 120 of this class.

**122 Three or more:**

This subclass is indented under subclass 121. Subject matter wherein there are three or more electromagnet coils.

- (1) Note. Continue the search in subclass 107 of this class.

**123 Interconnected lever system:**

This subclass is indented under subclass 121. Subject matter having the armatures of the electromagnets connected by means of a mechanical lever system to a single device transmitting motion to the electrode, or having a single lever of magnetic material acting as a common armature for two or more electromagnets.

- (1) Note. Continue the search in subclass 108 of this class.

**124 Common oscillating lever or armature:**

This subclass is indented under subclass 123. Subject matter having the armatures of the electromagnets connected to a common oscillating lever, or having an oscillating lever acting as a common armature for two or more electromagnets.

- (1) Note. Continue to search in subclass 109 of this class.

**125 Coaxial coils:**

This subclass is indented under subclass 121. Subject matter having the electromagnet coils mounted upon the same axis. The coils may be concentrically mounted or placed in end-to-end relationship about the same axis.

- (1) Note. Continue the search in subclass 110 of this class.

**126 Opposed magnetic flux type:**

This subclass is indented under subclass 121. Subject matter provided with a movable armature which is connected to the electrode so that the motion of the armature is transmitted to the electrode, the position of the armature being

determined by the resultant flux generated by two electromagnets, one of which generates a flux which opposes the flux of the other electromagnet.

SEE OR SEARCH THIS CLASS, SUBCLASS:

108, 109, 123, and 124, for consumable-electrode discharge devices having electromagnetically operated feed regulating mechanism with two or more electromagnet coils and having the armatures of the electromagnets connected by means of a lever system to a single device transmitting motion to or controlling motion of the electrode, or having a single lever of magnetic material acting as a common armature for two or more of the electromagnets so that the position of the feed regulating mechanism is determined by the resultant magnetic action of the electromagnetic coils.

110, and 125, for consumable-electrode discharge devices having electromagnetically operated feed regulating mechanism with two or more electromagnet coils which are mounted upon the same axis so that the armature which cooperates with the coils has its position determined by the resultant magnetic action of the coaxial coils.

**127 Concentric magnet and electrode:**

This subclass is indented under subclass 119. Subject matter wherein the electrode and/or the electrode holder and the electromagnet are concentrically mounted.

- (1) Note. Continue to search in subclasses 111 and 120 of this class.

**128 Vibration-damped electromagnet:**

This subclass is indented under subclass 113. Subject matter provided with means to suppress vibrations of the electromagnet, or its armature, the vibrations being usually due to the use of alternating current for energizing the electromagnet.

SEE OR SEARCH THIS CLASS, SUBCLASS:

82, 99, and 100, for consumable-electrode discharge devices having electromag-

netically operated feed regulating and/or controlling mechanism and an escapement or retarding mechanism for regulating the motion of the feed regulating and/or controlling mechanism.

- 91, for consumable-electrode discharge devices having electromagnetically operated feed regulating and/or controlling mechanism and having a resilient member, such as a spring, or a lost motion connection between the electromagnet and the electrode and/or electrode release mechanism to prevent small movements of the electromagnet from being transmitted to the electrode and/or the electrode release mechanism, thereby preventing spurious movements of the electrodes.

**SEE OR SEARCH CLASS:**

- 335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 243 for alternating current responsive electromagnets with armatures.

**129 WITH CURRENT-TRANSFER DEVICE:**

This subclass is indented under the class definition. Devices provided with means to transfer the electric current from the lead wires to the movable electrode.

**SEE OR SEARCH CLASS:**

- 191, Electricity: Transmission to Vehicles, appropriate subclasses for means for transmitting electrical energy between relatively movable objects; note especially subclass 1 for miscellaneous devices for transferring electrical energy from a stationary contact to a moving conductor.
- 313, Electric Lamp and Discharge Devices, see the class definition for the classification of electrodes for discharge devices where the electrode is provided with an electrical connector which is fastened to the electrode.

**130 FRAMES AND ELECTRODE SUPPORTS:**

This subclass is indented under the class definition. Devices provided with means for supporting the mechanism of the discharge device.

- (1) Note. Search this class, appropriate subclasses above for patents relating to the supporting means for the feed regulating mechanism.

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

- 20, for consumable-electrode discharge devices provided with means for supporting an electromagnet or other means near the discharge area for deflecting the electric discharge from the path it would normally occupy in the absence of the deflecting means.
- 21, for consumable-electrode discharge devices provided with means for supporting a device for supplying a material, either solid or fluent, to the discharge area between the electrodes.
- 25, for consumable-electrode discharge devices provided with means for supporting an economizer near the discharge end of at least one electrode.
- 26, for consumable-electrode discharge devices provided with means to support a ventilator, fume flow shield, fume condenser and/or temperature modifying means.
- 33, for consumable-electrode discharge devices provided with means for supporting three or more electrodes and the feed regulating mechanism therefor.
- 39, and indented subclasses, for consumable-electrode discharge devices having means for supporting the electrode for either oscillatory and/or rotary motion about its own axis.
- 44, for consumable-electrode discharge devices with frames and electrode support for supporting disk or plate shaped electrodes.
- 45, and indented subclasses, for consumable-electrode discharge devices with frames and electrode supports for supporting electrodes which have their longitudinal axes either inclined or parallel with respect to each other
- 51, and indented subclasses, for consumable-electrode discharge devices with frames and electrode supports for supporting a plurality of movable electrodes.

- 37, and 59, for consumable-electrode discharge devices with supports for supporting the electrodes of consumption-feed-type consumable-electrode discharge devices.
- 57, and 58, for consumable-electrode discharge devices of the manual feed type provided with means for supporting the electrodes and the manually operative mechanism.
- 61, for consumable-electrode discharge devices of the fluid motor operated type provided with means for supporting the electrodes and the fluid motor regulating system.
- 69, for consumable-electrode discharge devices having frames and electrode supports for supporting the electrodes and an electric motor for supplying the motive power for feeding the consumable electrode.
- 79, for consumable-electrode discharge devices having frames and supports for supporting the electrodes and the power transmission means for transmitting motion to the electrodes of consumable-electrode discharge devices of the positive feed type where the control of the feeding is secured by controlling the transmission of power to the electrode.
- 89, and 90, for consumable-electrode discharge devices provided with means for supporting thermostatically operated and/or thermostatically controlled electrode moving mechanism.
- 98, for consumable-electrode discharge devices provided with means for supporting the counterbalancing structure for counterbalancing the weight of the electrode.
- 99, for consumable-electrode discharge devices provided with means for supporting a retarding device for regulating the rate of movement of the electrode and/or the electrode regulating mechanism.
- 113, and indented subclasses, and the subclasses referred to in the notes of these subclasses, for consumable-electrode discharge devices provided with means for supporting electromagnetically operated and/or electromagnetically controlled electrode moving mechanism.
- 129, for supporting structure provided with means to transfer the current from the lead wires to the movable electrode.
- SEE OR SEARCH CLASS:
- 313, Electric Lamp and Discharge Devices, subclass 238 for miscellaneous discharge devices which are provided with means for supporting the electrodes and other parts of the discharge device. See subclasses 238, 243, 267 and 268 where the discharge device is not enclosed within a sealed envelope.
- 131 With electric switch:**  
This subclass is indented under subclass 130. Devices having an electrical switch supported by the discharge device structure.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 2, for consumable-electrode discharge devices provided with an electric switch for shifting the current to another electrode or to another discharge device or lamp when the consumable electrode has been consumed or fails to maintain the discharge.
- 11, and 17 and indented subclasses, for consumable-electrode discharge devices provided with an electric switch to either open the circuit or to close a shunt circuit about the discharge device when the consumable electrode has been consumed or fails to maintain the discharge.
- 24, for consumable-electrode discharge devices provided with an electric switch for controlling the operation of the feed regulating mechanism so that the electrodes will be repeatedly separated and brought into physical contact is made between the electrodes so that the discharge is started.
- 63, for consumable-electrode discharge device systems having the feed regulating mechanism for the discharge device controlled by an electric switch, the operation of the switch being controlled by radiant energy means, such as radiant heat or light.

70, 72, 73, and 74, for consumable-electrode discharge device systems having electric motor operated means for feeding the electrodes of the discharge device, and having the motor circuit controlled by an electric switch.

114, and indented subclasses, for consumable-electrode discharge devices provided with either an electromagnet for moving the electrode or with an electromagnet which controls the operation of the feeding mechanism and having an electric switch which controls the circuit of the electromagnet.

**SEE OR SEARCH CLASS:**

200, Electricity: Circuit Makers and Breakers, for electrical switches of general application.

315, Electric Lamp and Discharge Devices: Systems, subclass 32 and indented subclasses, especially subclasses 32, 47, 56, 63, 64, 72, 73, and 74 for all electric lamps and electric space discharge devices, other than consumable-electrode discharge devices which have structurally combined therewith an electric switch.

**132 With electric impedance:**

This subclass is indented under subclass 130. Devices having an electrical impedance supported by the discharge device structure.

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

13, and 14, for consumable-electrode discharge devices having an impedance which is placed in shunt circuit about the discharge device when the electrode is consumed or fails to maintain the discharge.

113, and indented subclasses, where the impedance is the coil of the separating and/or feed control electromagnet.

**SEE OR SEARCH CLASS:**

315, Electric Lamp and Discharge Devices: Systems, subclass 32 and indented subclasses, especially subclasses 38, 40, 41 and indented subclasses, 46 and indented subclasses, 49, 52 and indented subclasses, 58 and indented subclasses, and 71 for all

electric lamp and discharge devices which have structurally combined therewith an electrical impedance.

322, Electricity: Single Generator Systems, appropriate subclasses for electric generator regulators of general application.

323, Electricity: Power Supply or Regulation Systems, subclasses 220 through 354 for systems for controlling the magnitude of the current and/or voltage in a single circuit.

336, Inductor Devices, appropriate subclasses for the structure of transformers and inductive reactors.

338, Electrical Resistors, appropriate subclasses for electric resistor structure.

361, Electricity: Electrical Systems and Devices, subclasses 139+ for control circuits for electromagnetic devices and subclasses 271+ and 503+ for condensers.

**133 With electrode guides:**

This subclass is indented under subclass 130. Devices provided with means for guiding and maintaining the electrodes in alignment with each other or in the desired angular relation with respect to the discharge space.

(1) Note. Continue the search in subclasses 5, 21, 22, 25, 39 and indented subclasses, and 45 and indented subclasses of this class.

**SEE OR SEARCH CLASS:**

313, Electric Lamp and Discharge Devices, subclass 238 for miscellaneous discharge devices which are provided with means for supporting the electrodes in the desired position. See subclasses 238, 243, 267, and 268 where the discharge device is not enclosed in a sealed envelope.

373, Industrial Electric Heating Furnaces, subclasses 94+ for electric arc furnaces provided with guides for maintaining the furnace electrodes in proper position.

384, Bearings, subclass 7 and indented subclasses for bearings for elements which have a sliding line movement upon the supporting member, espe-

cially subclass 29 wherein the bearing is a cylinder.

**134 Adjustable electrode supports:**

This subclass is indented under subclass 130. Devices wherein the supporting structure is adjustable so that the electrodes may be placed in different positions with respect to the supporting frame.

- (1) Note. Patents claiming specific adjusting means to maintain the electrodes in spaced relationship required for the maintenance of the electric discharge are classified in the subclasses above. This subclass includes only the adjustable supports for the electrodes which permit the electrodes to be placed in different positions with respect to the supporting frame.

**SEE OR SEARCH CLASS:**

- 313, Electric Lamp and Discharge Devices, subclass 146 for miscellaneous discharge devices which have a movable electrode so that the electrodes may be placed in different positions with respect to each other.

**135 WITH CURRENT OR VOLTAGE REGULATOR:**

This subclass is indented under the class definition. Systems including means to regulate the current or voltage supplied to the discharge device.

- (1) Note. Continue the search in subclasses 115 and 116 of this class.

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

- 132, for patents relating to the means for mounting an impedance in the consumable electrodes type of discharge device structure.

**SEE OR SEARCH CLASS:**

- 315, Electric Lamp and Discharge Devices: Systems, subclass 291 and indented subclasses, and the subclasses referred to in the notes to the definitions of those subclasses, for miscellaneous systems which include regulating means for supplying elec-

tric current and/or potential to electric lamps and/or electric space discharge devices of the gas or vapor ionization type.

- 323, Electricity: Power Supply or Regulation Systems, subclasses 220 through 354 for systems for controlling the magnitude of the current and/or voltage in a single circuit.
- 336, Inductor Devices, appropriate subclasses for the structure of transformers and inductive reactors.
- 361, Electricity: Electrical Systems and Devices, subclasses 139+ for miscellaneous systems of supplying current to an electromagnet.
- 373, Industrial Electric Heating Furnaces, subclasses 102+ for control systems for controlling the operation of the current and/or potential of electric arc furnaces.

**136 MISCELLANEOUS:**

This subclass is indented under the class definition. Miscellaneous consumable electrode electric space discharge devices and such devices in combination with the circuits for supplying electric current thereto which are not provided for in any of the other subclasses in this class.

END