

CPC COOPERATIVE PATENT CLASSIFICATION

F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

LIGHTING; HEATING

F27 FURNACES; KILNS; OVENS; RETORTS (specially adapted for a purpose covered by a single other class and specifically mentioned in that class, [see the class in question](#), e.g. bakery ovens [A21B](#), glass melting furnaces [C03B](#), coke or gas-making apparatus [C10B](#), [C10J](#), apparatus for cracking hydrocarbons [C10G](#), blast furnaces [C21B](#), converters for making steel [C21C](#), furnaces for heat treatment of metal [C21D](#); furnaces for electroslag or arc remelting of metals [C22B 9/00](#); enamelling ovens [C23D](#); combustion apparatus [F23](#); electric heating [H05B](#))
(NOTES omitted)

F27D DETAILS OR ACCESSORIES OF FURNACES, KILNS, OVENS, OR RETORTS, IN SO FAR AS THEY ARE OF KINDS OCCURRING IN MORE THAN ONE KIND OF FURNACE (combustion apparatus [F23](#))

NOTE

Attention is drawn to the references and Notes following the title of class [F27](#) and the Note III following the Contents of Section [H](#).

WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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|-------------|--|------------------|--|
| 1/00 | Casings; Linings; Walls; Roofs (refractory materials C04B ; firebridges for combustion chambers F23M 3/00) | 2001/0046 | . {Means to facilitate repair or replacement or prevent quick wearing (repairing linings F27D 1/16)} |
| 1/0003 | . {Linings or walls} | 2001/005 | . . {Removable part or structure with replaceable elements} |
| | NOTE | 2001/0053 | . . {Furnace constructed in modules (tunnel furnaces with add-on modules F27B 9/029)} |
| | not used, see subgroups | 2001/0056 | . . {Aspects of construction intended to prevent wear} |
| 1/0006 | . . {Linings or walls formed from bricks or layers with a particular composition or specific characteristics} | 2001/0059 | . {Construction elements of a furnace} |
| 1/0009 | . . . {Comprising ceramic fibre elements} | 2001/0063 | . . {Means to strengthen a part} |
| 1/0013 | {the fibre elements being in the form of a folded blanket or a juxtaposition of folded blankets} | 2001/0066 | . . {Movable or removable parts (removable parts for replacement because of wearing F27D 2001/005)} |
| 1/0016 | {Interleaved multiple folded blankets} | 2001/0069 | . . {Means to prevent heat conduction (heat shields F27D 1/0033)} |
| 1/002 | {the fibre elements being composed of adjacent separate strips} | 2001/0073 | . . . {Surrounding protection around the furnace, e.g. covers, circulation of gas} |
| 1/0023 | . . {Linings or walls comprising expansion joints or means to restrain expansion due to thermic flows} | 2001/0076 | . . {comprising a corrugated sheet} |
| 1/0026 | . . . {the expansion joint being a resilient element, e.g. a metallic plate between two bricks} | 2001/0079 | . {Means to assemble at least two parts of a furnace or of any device or accessory associated to its use (assembling elements for linings parts F27D 1/145)} |
| 1/003 | . . {Linings or walls comprising porous bricks} | 2001/0083 | . . {Means to assemble a moving part to a fixed one (movements due to thermal expansion F27D 1/0003 ; movements of the cover F27D 1/18 ; movements of the container or of the support of the charge F27D 2003/0085)} |
| 1/0033 | . . {Linings or walls comprising heat shields, e.g. heat shields (shields protecting the charge F27D 5/00)} | 2001/0086 | . . . {the moving part being in rotation} |
| 1/0036 | . . {Linings or walls comprising means for supporting electric resistances in the furnace} | 2001/0089 | . . . {the moving part being in translation} |
| 1/004 | . . {Linings or walls comprising means for securing bricks} | 2001/0093 | . . . {the moving part being hinged to the fixed one} |
| 1/0043 | . {Floors, hearths} | 2001/0096 | . . . {the moving part staying in the same plane} |

- 1/02 . Crowns; Roofs
- 1/021 . . {Suspended roofs}
- 1/022 . . . {Parts thereof, e.g. noses, arches}
- 1/024 . . . {having an anchored layer of lining}
- 1/025 . . {Roofs supported around their periphery, e.g. arched roofs}
 - 1/027 . . . {Skew backs}
 - 1/028 . . . {Means to prevent deformation of the arch}
- 1/04 . characterised by the form {, e.g. shape} of the bricks or blocks used
 - 1/042 . . {Bricks shaped for use in regenerators}
 - 1/045 . . {Bricks for lining cylindrical bodies, e.g. skids, tubes}
 - 2001/047 . . . {Lining of cylindrical vessels}
 - 1/06 . . Composite bricks or blocks {, e.g. panels, modules}
 - 1/063 . . . {Individual composite bricks or blocks}
 - 1/066 {Individual composite bricks or blocks made from hollow bricks filled up with another material}
 - 1/08 . . . Bricks or blocks with internal reinforcement or metal backing
 - 1/10 . Monolithic linings; Supports therefor
 - NOTE**
{supports are classified in [F27D 1/14](#)}
 - 1/12 . incorporating cooling arrangements ([constructions of tube assemblies in general F28](#))
 - 1/14 . Supports for linings ([F27D 1/10 takes precedence](#))
 - 1/141 . . {Anchors therefor}
 - 1/142 . . . {Anchors made from ceramic material}
 - 1/144 . . {Supports for ceramic fibre materials}
 - 1/145 . . {Assembling elements}
 - 1/147 . . . {for bricks}
 - 1/148 {Means to suspend bricks}
 - 1/16 . Making or repairing linings {increasing the durability of linings or breaking away linings}
 - 2001/1605 . . {Repairing linings}
 - 2001/161 . . . {Hot repair}
 - 2001/1615 . . . {through a hole in the casing, e.g. injecting refractory from outside the vessel}
 - 1/1621 . . {Making linings by using shaped elements, e.g. bricks}
 - 1/1626 . . {Making linings by compacting a refractory mass in the space defined by a backing mould or pattern and the furnace wall}
 - 2001/1631 . . . {using an expandable core}
 - 1/1636 . . {Repairing linings by projecting or spraying refractory materials on the lining}
 - 1/1642 . . . {using a gunning apparatus}
 - 1/1647 {the projected materials being partly melted, e.g. by exothermic reactions of metals (Al, Si) with oxygen}
 - 1/1652 {Flame guniting; Use of a fuel}
 - 2001/1657 {Solid fuel}
 - 2001/1663 {Fluid fuel, e.g. gas}
 - 1/1668 {Plasma guniting}
 - 1/1673 . . . {applied centrifugally}
 - 1/1678 . . {Increasing the durability of linings; Means for protecting}
 - 1/1684 . . . {by a special coating applied to the lining}
 - 2001/1689 {obtained from materials added to the melt}
 - 1/1694 . . {Breaking away the lining or removing parts thereof}
 - 1/18 . Door frames; Doors, lids, removable covers
 - 1/1808 . . {Removable covers}
 - 1/1816 . . . {Removable covers specially adapted for arc furnaces}
 - 2001/1825 {Means for moving the cover}
 - 2001/1833 {comprising a screw mechanism}
 - 2001/1841 {comprising means for rotating or moving the cover in a horizontal or quasi horizontal plane}
 - 2001/185 {comprising means for tilting the cover}
 - 1/1858 . . {Doors}
 - 1/1866 . . . {Door-frames}
 - 2001/1875 . . . {Hanging doors and walls ([movable partitions F27D 2099/0071](#))}
 - 2001/1883 {Hanging curtains}
 - 2001/1891 . . . {Doors for separating two chambers in the furnace}
 - 3/00 Charging; Discharging; Manipulation of charge ([moving charge through a furnace F27B 9/14](#))**
 - 2003/0001 . {Positioning the charge}
 - 2003/0002 . . {involving positioning devices, e.g. buffers, buffer zones ([involving sensors F27D 2019/0071](#); [involving sequence controllers F27D 2019/0059](#); [involving spacers F27M 2002/016](#))}
 - 2003/0003 . . {involving a system for aligning the articles through a lateral guidance, e.g. funnel}
 - 2003/0004 . . {involving devices for measuring the article, the stack of articles or the height of the furnace passage or for adjusting the height of the passage to the charge or for putting the articles in the same position}
 - 2003/0006 . . {Particulate materials}
 - 2003/0007 . . . {Circular distribution}
 - 2003/0008 . . . {Longitudinal distribution}
 - 2003/0009 . . . {Separation of different types of fines, e.g. by a blower}
 - 2003/001 . . . {Series of dispensers or separation in two or more parts}
 - 2003/0012 . . {Working with piles}
 - 2003/0013 . . . {Unstacking or making stacks}
 - 2003/0014 . . {involving the use of magazines}
 - 2003/0015 . . . {the magazine being vertical}
 - 2003/0016 . . . {the magazine being a rotary device}
 - 2003/0018 . . {comprising means to introduce or extract the charge in series of separate containers or zones}
 - 2003/0019 . . . {simultaneously}
 - 2003/002 . . {Transforming a single row in a multiple row}
 - 3/0021 . {of ceramic ware}
 - 3/0022 . . {Disposition of the charge}
 - 3/0024 . {of metallic workpieces}
 - 3/0025 . {Charging or loading melting furnaces with material in the solid state}
 - 3/0026 . . {Introducing additives into the melt}
 - 3/0027 . . {Charging vertically with corbs}
 - 3/0028 . . . {Corbs}
 - 3/003 . . {Charging laterally, e.g. with a charging box}
 - 3/0031 . . {Charging with tiltable dumpers}
 - 3/0032 . . {using an air-lock}
 - 3/0033 . {charging of particulate material}

- 2003/0034 . . {Means for moving, conveying, transporting the charge in the furnace or in the charging facilities}
 - 2003/0036 . . {comprising inflatable or extendable parts}
 - 2003/0037 . . {comprising friction surfaces}
 - 2003/0038 . . {comprising shakers}
 - 2003/0039 . . {comprising magnetic means}
 - 2003/004 . . . {Magnetic lifters}
 - 2003/0042 . . {comprising roller trains}
 - 2003/0043 . . . {at least one of them being driven separately}
 - 2003/0044 . . . {at least one of them being removable}
 - 2003/0045 . . . {Use of rollable bodies, e.g. balls}
 - 2003/0046 . . {comprising one or more movable arms, e.g. forks}
 - 2003/0048 . . . {Walking beams}
 - 2003/0049 {comprising eccentrics or lever arms}
 - 2003/005 {comprising ramps}
 - 2003/0051 . . {comprising means to pick up the charge and put it down}
 - 2003/0053 . . {comprising a device for charging with the doors closed}
 - 2003/0054 . . {Means to move molten metal, e.g. electromagnetic pump}
 - 2003/0055 . . . {with flow regulation}
 - 2003/0056 . . . {through a syphon in a vacuum chamber, e.g. involving aspiration or pressure on the bath}
 - 2003/0057 . . {Fast-outlet or inlet means}
 - 2003/0059 . . {comprising tracks, e.g. rails and wagon}
 - 2003/006 . . . {with a return track}
 - 2003/0061 . . . {with means for changing track}
 - 2003/0062 . . {using devices for tilting or rocking the charge}
 - 2003/0063 . . {comprising endless belts}
 - 2003/0065 . . {Lifts, e.g. containing the bucket elevators}
 - 2003/0066 . . {comprising scrapers or systems to pull out}
 - 2003/0067 . . {comprising conveyors where the translation is communicated by friction from at least one rotating element, e.g. two opposed rotations combined}
 - 2003/0068 . . {comprising clamps or tongs}
 - 2003/0069 . . {the device being suspended, e.g. from a crane}
 - 2003/0071 . . {Use of a comminuting device, e.g. grinding mill}
 - 2003/0072 . . {Use of a pinion and a rack}
 - 2003/0073 . . {the charge floating on a liquid, e.g. water}
 - 2003/0074 . . . {floating on water}
 - 2003/0075 . . {Charging or discharging vertically, e.g. through a bottom opening}
 - 2003/0077 . . {Use of centrifugal devices}
 - 2003/0078 . . {comprising jacks, e.g. hydraulic jacks}
 - 2003/0079 . . {Use of cams}
 - 2003/008 . . {comprising cross-beams or gantry cranes}
 - 2003/0081 . . {Series of little rams}
 - 2003/0083 . . {Means for stirring the charge}
 - 3/0084 . {Charging; Manipulation of SC or SC wafers}
 - 2003/0085 . {Movement of the container or support of the charge in the furnace or in the charging facilities}
 - 2003/0086 . . {Up or down}
 - 2003/0087 . . {Rotation about a vertical axis}
 - 2003/0089 . . {Rotation about a horizontal or slightly inclined axis}
 - 2003/009 . . . {Oscillations about a horizontal axis; Rocking}
 - 2003/0091 . . {Horizontally}
 - 2003/0092 . . . {with a reciprocating movement}
 - 2003/0093 . . {Movement on a slope}
 - 2003/0095 . . {the advancement being step by step}
 - 2003/0096 . . {Advancement along the longitudinal axis of the workpiece}
 - 2003/0097 . . {Advancement along an axis perpendicular to the axis of the workpiece}
 - 2003/0098 . . . {Workpiece rolling on its support}
 - 3/02 . Skids or tracks for heavy objects
 - 3/022 . . {Skids}
 - 3/024 . . . {Details of skids, e.g. riders}
 - 3/026 . . {transport or conveyor rolls for furnaces; roller rails ([conveyor rolls in general B65G](#))}
 - 3/028 . . . {Roller rails or succession of small sized rollers}
 - 3/04 . Ram or pusher apparatus
 - 2003/045 . . {used to pull the charge}
 - 3/06 . Charging or discharging machines on travelling carriages
 - 3/08 . Screw feeders; Screw dischargers
 - 3/10 . Charging directly from hoppers or shoots
 - 2003/105 . . {using shutters}
 - 3/12 . Travelling or movable supports or containers for the charge
 - 2003/121 . . {Band, belt or mesh}
 - 2003/122 . . . {Band made from longitudinal wires or bars}
 - 3/123 . . {Furnace cars}
 - 2003/124 . . {Sleds; Transport supports}
 - 2003/125 . . {Charging cars, lift trolleys}
 - 2003/126 . . . {with long arms, charging forks}
 - 2003/127 . . . {for carrying pots ([slag pots F27D 2099/0095](#))}
 - 2003/128 . . . {for carrying stacks of articles, e.g. bricks}
 - 3/14 . Charging or discharging liquid or molten material
 - 3/145 . . {Runners therefor}
 - 3/15 . Tapping equipment; Equipment for removing {or retaining} slag
 - 3/1509 . . {Tapping equipment}
 - 3/1518 . . . {Tapholes}
 - 3/1527 . . . {Taphole forming equipment, e.g. boring machines, piercing tools}
 - 3/1536 . . . {Devices for plugging tap holes, e.g. plugs stoppers}
- NOTE**
- { the devices fixed permanently to the melt container are classified in [F27D 3/1509](#) }
- 3/1545 . . {Equipment for removing or retaining slag}
 - 3/1554 . . . {for removing the slag from the surface of the melt}
 - 3/1563 {by the use of scrapers}
 - 3/1572 {by suction}
 - 3/1581 {by the use of blowers}
 - 3/159 . . . {for retaining slag during the pouring of the metal or retaining metal during the pouring of the slag}
 - 3/16 . Introducing a fluid jet or current into the charge ([porous elements for gas flushing of molten metals B22D 1/005](#))
 - 2003/161 . . {through a porous element}
 - 2003/162 . . {the fluid being an oxidant or a fuel}
 - 2003/163 . . . {the fluid being an oxidant}
 - 2003/164 {Oxygen}
 - 2003/165 . . . {the fluid being a fuel}

- 2003/166 . . {the fluid being a treatment gas}
- 2003/167 . . {the fluid being a neutral gas}
- 2003/168 . . {through a lance}
- 2003/169 . . . {Construction of the lance, e.g. lances for injecting particles}
- 3/18 . Charging particulate material using a fluid carrier
- 2003/185 . . {Conveying particles in a conduct using a fluid}
- 5/00 Supports, screens, or the like for the charge within the furnace (travelling or movable supports [F27D 3/12](#))**
- 5/0006 . {Composite supporting structures}
- 5/0012 . . {Modules of the sagger or setter type; Supports built up from them}
- 5/0018 . . {Separating elements}
- 5/0025 . . {assembled to present a three-point support}
- 5/0031 . {Treatment baskets for ceramic articles (for metallic articles [C21D 9/0025](#))}
- 5/0037 . {Supports specially adapted for semi-conductors}
- 5/0043 . {Supports specially adapted for dental prosthesis}
- 5/005 . {Supports specially adapted for holding elongated articles in an upright position, e.g. sparking plugs}
- 5/0056 . {Hangers}
- 5/0062 . {Shields for the charge (shields for the lining [F27D 1/0033](#))}
- 5/0068 . {Containers}
- 2005/0075 . . {Pots, e.g. slag pots, ladles}
- 2005/0081 . {Details}
- 2005/0087 . . {Means to prevent the adherence of the charge}
- 2005/0093 . . {Means to maintain the form of the article}
- 7/00 Forming, maintaining, or circulating atmospheres in heating chambers**
- 7/02 . Supplying steam, vapour, gases, or liquids
- 2007/023 . . {Conduits}
- 2007/026 . . {Dampers (registers for granular flows [F27D 2099/0071](#))}
- 7/04 . Circulating atmospheres by mechanical means
- 2007/045 . . {Fans}
- 7/06 . Forming or maintaining special atmospheres or vacuum within heating chambers ([F27D 7/02](#) takes precedence)
- 2007/063 . . {Special atmospheres, e.g. high pressure atmospheres}
- 2007/066 . . {Vacuum}
- 9/00 Cooling of furnaces or of charges therein ([F27D 1/00](#), [F27D 3/00](#) take precedence)**
- 2009/0002 . {Cooling of furnaces}
- 2009/0005 . . {the cooling medium being a gas}
- 2009/0008 . . . {Ways to inject gases against surfaces}
- 2009/001 . . {the cooling medium being a fluid other than a gas}
- 2009/0013 . . . {the fluid being water}
- 2009/0016 {Water-spray}
- 2009/0018 . . {the cooling medium passing through a pattern of tubes}
- 2009/0021 . . . {with the parallel tube parts close to each other, e.g. a serpentine}
- 2009/0024 {with contiguous tubes, which may be separately welded one to the other}
- 2009/0027 {linked by elements}
- 2009/0029 {fixed, e.g. welded to a supporting surface}
- 2009/0032 . . . {integrated with refractories in a panel}
- 2009/0035 {arranged for the covering of a cylindrical surface}
- 2009/0037 . . {the cooling medium passing a radiator}
- 2009/004 . . {the cooling medium passing a waterbox}
- 2009/0043 . . . {Insert type waterbox, e.g. cylindrical or flat type}
- 2009/0045 . . {the cooling medium passing a block, e.g. metallic}
- 2009/0048 . . . {incorporating conduits for the medium}
- 2009/0051 . . {comprising use of studs to transfer heat or retain the liner}
- 2009/0054 {adapted to retain formed bricks}
- 2009/0056 . . {Use of high thermoconductive elements}
- 2009/0059 {made mostly from graphite}
- 2009/0062 {made from copper or copper alloy}
- 2009/0064 . . {Cooling of furnace arches}
- 2009/0067 . . {Cooling element inlet and outlet tubes}
- 2009/007 . {Cooling of charges therein}
- 2009/0072 . . {the cooling medium being a gas}
- 2009/0075 {in direct contact with the charge}
- 2009/0078 {in indirect contact with the charge}
- 2009/0081 . . {the cooling medium being a fluid (other than a gas in direct or indirect contact with the charge)}
- 2009/0083 {the fluid being water}
- 2009/0086 {applied in spray form}
- 2009/0089 . . {Quenching}
- 2009/0091 . . {in a fluidised bed of cooling elements}
- 2009/0094 . . {making use of already cooled material, e.g. forming a layer}
- 2009/0097 {the charge being used as a coolant}
- 11/00 Arrangement of elements for electric heating in or on furnaces (electric heating per se [H05B](#))**
- 11/02 . Ohmic resistance heating
- 11/04 . . with direct passage of current through the material being heated
- 11/06 . Induction heating, i.e. in which the material being heated, or its container or elements embodied therein, form the secondary of a transformer
- 11/08 . Heating by electric discharge, e.g. arc discharge
- 11/10 . . Disposition of electrodes (automatic control of temperature [G05D 23/00](#); electric discharge apparatus [H01T](#); arrangements for feeding or guiding electrodes [H05B 7/10](#); automatic control of power by positioning of electrodes [H05B 7/144](#))
- 11/12 . with electromagnetic fields acting directly on the material being heated
- 13/00 Apparatus for preheating charges; Arrangements for preheating charges**
- 13/002 . {Preheating scrap (preheating of scrap for steel making [C21C 5/565](#))}
- 13/005 . {Drying of green clay prior to baking}
- 2013/007 . {using a rotary furnace}
- 15/00 Handling or treating discharged material; Supports or receiving chambers therefor**
- 15/02 . Cooling
- 15/0206 . . {with means to convey the charge}
- 15/0213 {comprising a cooling grate}
- 15/022 {grate plates}
- 2015/0226 {Support, fixation of the grate}
- 2015/0233 {with gas, e.g. air, supply to the grate}

- 2015/024 {Multiple grates}
- 2015/0246 {Combination of fixed and movable grates}
- 2015/0253 {Gratin grates}
- 2015/026 {Means to discharge the fines}
 - 15/0266 . . . {on an endless belt}
 - 15/0273 . . . {on a rotary hearth}
 - 15/028 . . . {comprising a rotary drum}
 - 15/0286 . . {in a vertical, e.g. annular, shaft ([shafts including rotating parts F27D 15/0273](#))}
- 2015/0293 . . . {including rotating parts}
- 17/00 Arrangements for using waste heat ([heat-exchangers per se F28](#)); Arrangements for using, or disposing of, waste gases**
- 17/001 . {Extraction of waste gases, collection of fumes and hoods used therefor ([in general B08B 15/00](#))}
- 17/002 . . {Details of the installations, e.g. fume conduits or seals}
- 17/003 . . {of waste gases emanating from an electric arc furnace}
- 17/004 . {Systems for reclaiming waste heat}
- 2017/005 . . {including pyrolysing the waste gases}
- 2017/006 . . {using a boiler}
- 2017/007 . . {including regenerators}
- 17/008 . {cleaning gases}
- 2017/009 . {Cyclone for separating fines from gas}
- 19/00 Arrangements of controlling devices**
- 2019/0003 . {Monitoring the temperature or a characteristic of the charge and using it as a controlling value}
- 2019/0006 . {Monitoring the characteristics (composition, quantities, temperature, pressure) of at least one of the gases of the kiln atmosphere and using it as a controlling value}
- 2019/0009 . . {Monitoring the pressure in an enclosure or kiln zone}
- 2019/0012 . . {Monitoring the composition of the atmosphere or of one of their components}
- 2019/0015 . . . {Monitoring the composition of the exhaust gases or of one of its components}
- 2019/0018 . . {Monitoring the temperature of the atmosphere of the kiln}
- 2019/0021 . . . {Monitoring the temperature of the exhaust gases}
- 2019/0025 . . {Monitoring the temperature of a part or of an element of the furnace structure}
- 2019/0028 . {Regulation}
- 2019/0031 . . {through control of the flow of the exhaust gases}
- 2019/0034 . . {through control of a heating quantity such as fuel, oxidant or intensity of current}
- 2019/0037 {Quantity of electric current}
- 2019/004 {Fuel quantity}
- 2019/0043 {Amount of air or O₂ to the burner}
- 2019/0046 {Amount of secondary air to the burner}
- 2019/005 {Amount of heat given to the charge via a controlled heat exchanger}
- 2019/0053 {involving heating the charge in a fluid or fluidised medium}
- 2019/0056 . . {Regulation involving cooling}
- 2019/0059 . . {Regulation involving the control of the conveyor movement, e.g. speed or sequences}
- 2019/0062 . . . {control of the workpiece stay in different zones}
- 2019/0065 . . {Regulation involving controlled section modification}
- 2019/0068 . . {Regulation involving a measured inflow of a particular gas in the enclosure}
- 2019/0071 . . . {Regulation using position sensors}
- 2019/0075 . . . {Regulation of the charge quantity}
- 2019/0078 . . . {Regulation of the speed of the gas through the charge}
- 2019/0081 . . {Controlling an air-lock chamber}
- 2019/0084 . . {Controlling closure systems, e.g. doors}
- 2019/0087 . . {Automatisation of the whole plant or activity}
- 2019/009 . . . {Use of codes, e.g. bar codes}
- 2019/0093 . . {Maintaining a temperature gradient}
- 2019/0096 . . {involving simulation means, e.g. of the treating or charging step}
- 21/00 Arrangements of monitoring devices; Arrangements of safety devices**
- 2021/0007 . {Monitoring the pressure}
 - 21/0014 . {Devices for monitoring temperature}
 - 21/0021 . {Devices for monitoring linings for wear}
 - 21/0028 . {Devices for monitoring the level of the melt}
 - 21/0035 . {Devices for monitoring the weight of quantities added to the charge}
- 2021/0042 . . {Monitoring the level of the solid charge}
- 2021/005 . . {Devices for monitoring thermal expansion}
- 2021/0057 . . {Security or safety devices, e.g. for protection against heat, noise, pollution or too much duress; Ergonomic aspects}
 - 2021/0064 . . . {against noises}
 - 2021/0071 . . . {against explosions}
 - 2021/0078 . . . {against the presence of an undesirable element in the atmosphere of the furnace}
 - 2021/0085 . . . {against molten metal, e.g. leakage or splashes}
 - 2021/0092 . . . {against a jam in the transport line or a production interruption}
 - 21/02 . Observation or illuminating devices
- 2021/023 . . . {Closable inserting openings, e.g. for the introduction of lances, sensors or burners}
- 2021/026 . . . {using a video installation}
 - 21/04 . Arrangements of indicators or alarms
- 25/00 Devices {or methods} for removing incrustations {, e.g. slag, metal deposits, dust; Devices or methods for preventing the adherence of slag}**
- 25/001 . {comprising breaking tools, e.g. hammers, drills, scrapers ([breaking away linings F27D 1/1694](#); [boring machines for forming tapholes F27D 3/1527](#))}
- 25/003 . . . {used for punching tuyeres}
- 25/005 . . . {used for cleaning the channels of induction furnaces}
- 25/006 . {using explosives}
- 25/008 . {using fluids or gases, e.g. blowers, suction units}
- 27/00 Stirring devices for molten material ([F27D 3/14 takes precedence](#))**
- 2027/002 . {Gas stirring}
- 27/005 . {Pumps}
- 27/007 . . {Pulsating pumps}
- 99/00 Subject matter not provided for in other groups of this subclass**
- 99/0001 . {Heating elements or systems}

F27D

- 99/0003 . . {with particulate fuel, e.g. aspects relating to the feeding}
 - 99/0005 . . {Injecting liquid fuel}
 - 99/0006 . . {Electric heating elements or system}
 - 2099/0008 . . . {Resistor heating}
 - 2099/001 {the container being the resistor}
 - 2099/0011 {The resistor heats a radiant tube or surface}
 - 2099/0013 {immersed in the charge}
 - 2099/0015 . . . {Induction heating}
 - 2099/0016 {Different magnetic fields, e.g. two coils, different characteristics of the same coil along its length or different parts of the same coil used}
 - 2099/0018 {Relative movement of the coil and the charge during the heat treatment}
 - 2099/002 {Core heating}
 - 2099/0021 . . . {Arc heating}
 - 2099/0023 {DC arc heating}
 - 2099/0025 . . . {Currents through the charge}
 - 2099/0026 . . . {with a generator of electromagnetic radiations}
 - 2099/0028 . . . {Microwave heating}
 - 2099/003 . . . {Bombardment heating, e.g. with ions or electrons}
 - 2099/0031 . . . {Plasma-torch heating}
 - 99/0033 . . {using burners (manufacture of steel in an electric arc furnace equipped with burners [C21C 5/5217](#))}
 - 99/0035 . . . {Heating indirectly through a radiant surface}
 - 2099/0036 . . . {immersed in the charge}
 - 2099/0038 . . . {removable}
 - 2099/004 . . . {directed upon the charge, e.g. vertically}
 - 2099/0041 {with a small angle, e.g. almost tangentially}
 - 2099/0043 . . . {Impulse burner}
 - 2099/0045 . . . {Radiant burner}
 - 2099/0046 . . . {with incomplete combustion, e.g. reducing atmosphere}
 - 2099/0048 {Post- combustion}
 - 2099/005 . . . {Catalytic burner}
 - 2099/0051 . . . {Burning waste as a fuel}
 - 2099/0053 . . . {Burner fed with preheated gases}
 - 2099/0055 {Fuel}
 - 2099/0056 {Oxidant}
 - 2099/0058 . . {Means for heating the charge locally}
 - 2099/006 . . {Auxiliary heating, e.g. in special conditions or at special times}
 - 2099/0061 . . {Indirect heating}
 - 2099/0063 . . . {Liquid}
 - 2099/0065 . . . {Gas}
 - 2099/0066 . . . {Particles or solid bodies, e.g. bed of particles}
 - 2099/0068 . . {Heating directly by circulation of a fluid other than a gas or by particles}
 - 99/007 . . {Partitions}
 - 2099/0071 . . {Partitions used as registers}
 - 99/0073 . . {Seals}
 - 99/0075 . . {Gas curtain seals}
 - 99/0076 . . {Furnace car seals, i.e. seals used in continuous furnaces or kilns for preventing gas or heat exchange between heating chamber and the area comprising driving means}
 - 2099/0078 . . {Means to minimize the leakage of the furnace atmosphere during charging or discharging}
 - 2099/008 . . . {Using an air-lock (use of air-locks for charging smelt furnaces [F27D 3/0032](#))}
 - 2099/0081 . . . {Joint}
 - 2099/0083 . . {Drives; Auxiliary drives}
 - 2099/0085 . . {Accessories}
 - 2099/0086 . . . {Filters, e.g. for molten metals}
 - 2099/0088 . . . {Apparatus to cut metal, e.g. logs, in billets}
 - 2099/009 . . . {Bumpers}
 - 2099/0091 . . . {Means to grease or oil}
 - 2099/0093 . . . {Means to collect ashes or dust, e.g. vessels}
 - 2099/0095 . . . {Means to collect the slag or spilled metal, e.g. vessels (cars to carry the pots [F27D 2003/127](#))}
 - 2099/0096 . . . {Presses}
 - 2099/0098 . . . {Means for moving the furnace}
- 2201/00 Manipulation of furnace parts**
- NOTE**
- Indexing code [F27D 2201/00](#) can be followed by additional indexing codes preceded by a + sign. These additional indexing codes are chosen from codes of subclass [F27D](#) describing similar manipulations of furnace charges.
- Example: [F27D 2201/00](#) + [F27D 2003/0036](#)