

# 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](#), [C10I](#), 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](#).

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| <b>1/00</b>      | <b>Casings; Linings; Walls; Roofs</b> (refractory materials <a href="#">C04B</a> ; firebridges for combustion chambers <a href="#">F23M 3/00</a> ) | <b>2001/0053</b> | . . {Furnace constructed in modules (tunnel furnaces with add-on modules <a href="#">F27B 9/029</a> )}  |
| <b>1/0003</b>    | . {Linings or walls}   | <b>2001/0056</b> | . . {Aspects of construction intended to prevent wear}  |
|                  | <b><u>NOTE</u></b><br>not used, see subgroups  | <b>2001/0059</b> | . {Construction elements of a furnace}  |
| <b>1/0006</b>    | . . {Linings or walls formed from bricks or layers with a particular composition or specific characteristics}                                      | <b>2001/0063</b> | . . {Means to strengthen a part}  |
| <b>1/0009</b>    | . . . {Comprising ceramic fibre elements}  | <b>2001/0066</b> | . . {Movable or removable parts (removable parts for replacement because of wearing <a href="#">F27D 2001/005</a> )}  |
| <b>1/0013</b>    | . . . . {the fibre elements being in the form of a folded blanket or a juxtaposition of folded blankets}   | <b>2001/0069</b> | . . {Means to prevent heat conduction (heat shields <a href="#">F27D 1/0033</a> )}  |
| <b>1/0016</b>    | . . . . . {Interleaved multiple folded blankets}   | <b>2001/0073</b> | . . . {Surrounding protection around the furnace, e.g. covers, circulation of gas}  |
| <b>1/002</b>     | . . . . {the fibre elements being composed of adjacent separate strips}  | <b>2001/0076</b> | . . {comprising a corrugated sheet}   |
| <b>1/0023</b>    | . . {Linings or walls comprising expansion joints or means to restrain expansion due to thermic flows}   | <b>2001/0079</b> | . {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 <a href="#">F27D 1/145</a> )}   |
| <b>1/0026</b>    | . . . {the expansion joint being a resilient element, e.g. a metallic plate between two bricks}  | <b>2001/0083</b> | . . {Means to assemble a moving part to a fixed one (movements due to thermal expansion <a href="#">F27D 1/0003</a> ; movements of the cover <a href="#">F27D 1/18</a> ; movements of the container or of the support of the cahrge <a href="#">F27D 2003/0085</a> )} |
| <b>1/003</b>     | . . {Linings or walls comprising porous bricks}  | <b>2001/0086</b> | . . . {the moving part being in rotation}   |
| <b>1/0033</b>    | . . {Linings or walls comprising heat shields, e.g. heat shieldsd (shields protecting the charge <a href="#">F27D 5/00</a> )}                      | <b>2001/0089</b> | . . . {the moving part being in translation}  |
| <b>1/0036</b>    | . . {Linings or walls comprising means for supporting electric resistances in the furnace}   | <b>2001/0093</b> | . . . {the moving part being hinged to the fixed one}   |
| <b>1/004</b>     | . . {Linings or walls comprising means for securing bricks}  | <b>2001/0096</b> | . . . {the moving part staying in the same plane}   |
| <b>1/0043</b>    | . {Floors, hearths}  | <b>1/02</b>      | . Crowns; Roofs   |
| <b>2001/0046</b> | . {Means to facilitate repair or replacement or prevent quick wearing (repairing linings <a href="#">F27D 1/16</a> )}                              | <b>1/021</b>     | . . {Suspended roofs}   |
| <b>2001/005</b>  | . . {Removable part or structure with replaceable elements}  | <b>1/022</b>     | . . . {Parts thereof, e.g. noses, arches}   |
|                  |  | <b>1/024</b>     | . . . {having an anchored layer of lining}  |
|                  |  | <b>1/025</b>     | . . {Roofs supported around their periphery, e.g. arched roofs}   |
|                  |  | <b>1/027</b>     | . . . {Skew backs}  |
|                  |  | <b>1/028</b>     | . . . {Means to prevent deformation of the arch}  |

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| 1/04      | . characterised by the form {, e.g. shape} of the bricks or blocks used  | 2001/1841   | . . . . {comprising means for rotating or moving the cover in a horizontal or quasi horizontal plane}   |
| 1/042     | . . {Bricks shaped for use in regenerators}  | 2001/185    | . . . . {comprising means for tilting the cover}  |
| 1/045     | . . {Bricks for lining cylindrical bodies, e.g. skids, tubes}  | 1/1858      | . . {Doors}   |
| 2001/047  | . . . {Lining of cylindrical vessels}  | 1/1866      | . . . {Door-frames}   |
| 1/06      | . . Composite bricks or blocks {, e.g. panels, modules}  | 2001/1875   | . . . {Hanging doors and walls (movable partitions <a href="#">F27D 2099/0071</a> )}  |
| 1/063     | . . . {Individual composite bricks or blocks}  | 2001/1883   | . . . . {Hanging curtains}  |
| 1/066     | . . . . {Individual composite bricks or blocks made from hollow bricks filled up with another material}                      | 2001/1891   | . . . {Doors for separating two chambers in the furnace}  |
| 1/08      | . . . Bricks or blocks with internal reinforcement or metal backing  |             |   |
| 1/10      | . Monolithic linings; Supports therefor  | <b>3/00</b> | <b>Charging; Discharging; Manipulation of charge (moving charge through a furnace <a href="#">F27B 9/14</a>)</b>  |
|           | <b>NOTE</b>  | 2003/0001   | . {Positioning the charge}  |
|           | {supports are classified in <a href="#">F27D 1/14</a> }  | 2003/0002   | . . {involving positioning devices, e.g. buffers, buffer zones (involving sensors <a href="#">F27D 2019/0071</a> ; involving sequence controllers <a href="#">F27D 2019/0059</a> ; involving spacers <a href="#">F27M 2002/016</a> )} |
| 1/12      | . incorporating cooling arrangements (constructions of tube assemblies in general <a href="#">F28</a> )                      | 2003/0003   | . . {involving a system for aligning the articles through a lateral guidance, e.g. funnel}  |
| 1/14      | . Supports for linings ( <a href="#">F27D 1/10</a> takes precedence)   | 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}               |
| 1/141     | . . {Anchors therefor}   | 2003/0006   | . . {Particulate materials}   |
| 1/142     | . . . {Anchors made from ceramic material}   | 2003/0007   | . . . {Circular distribution}   |
| 1/144     | . . {Supports for ceramic fibre materials}   | 2003/0008   | . . . {Longitudinal distribution}   |
| 1/145     | . . {Assembling elements}  | 2003/0009   | . . . {Separation of different types of fines, e.g. by a blower}  |
| 1/147     | . . . {for bricks}   | 2003/001    | . . . {Series of dispensers or separation in two or more parts}   |
| 1/148     | . . . . {Means to suspend bricks}  | 2003/0012   | . . {Working with piles}  |
| 1/16      | . Making or repairing linings {increasing the durability of linings or breaking away linings}                                | 2003/0013   | . . . {Unstacking or making stacks}   |
| 2001/1605 | . . {Repairing linings}  | 2003/0014   | . . {involving the use of magazines}  |
| 2001/161  | . . . {Hot repair}   | 2003/0015   | . . . {the magazine being vertical}   |
| 2001/1615 | . . . {through a hole in the casing, e.g. injecting refractory from outside the vessel}                                      | 2003/0016   | . . . {the magazine being a rotary device}  |
| 1/1621    | . . {Making linings by using shaped elements, e.g. bricks}   | 2003/0018   | . . {comprising means to introduce or extract the charge in series of separate containers or zones}   |
| 1/1626    | . . {Making linings by compacting a refractory mass in the space defined by a backing mould or pattern and the furnace wall} | 2003/0019   | . . . {simultaneously}  |
| 2001/1631 | . . . {using an expandable core}   | 2003/002    | . . {Transforming a single row in a multiple row}   |
| 1/1636    | . . {Repairing linings by projecting or spraying refractory materials on the lining}   | 3/0021      | . {of ceramic ware}   |
| 1/1642    | . . . {using a gunning apparatus}  | 3/0022      | . . {Disposition of the charge}   |
| 1/1647    | . . . . {the projected materials being partly melted, e.g. by exothermic reactions of metals (Al, Si) with oxygen}           | 3/0024      | . {of metallic workpieces}  |
| 1/1652    | . . . . . {Flame guniting; Use of a fuel}  | 3/0025      | . {Charging or loading melting furnaces with material in the solid state}   |
| 2001/1657 | . . . . . {Solid fuel}   | 3/0026      | . . {Introducing additives into the melt}   |
| 2001/1663 | . . . . . {Fluid fuel, e.g. gas}   | 3/0027      | . . {Charging vertically with corbs}  |
| 1/1668    | . . . . . {Plasma guniting}  | 3/0028      | . . . {Corbs}   |
| 1/1673    | . . . {applied centrifugally}  | 3/003       | . . {Charging laterally, e.g. with a charging box}  |
| 1/1678    | . . {Increasing the durability of linings; Means for protecting}   | 3/0031      | . . {Charging with tiltable dumpers}  |
| 1/1684    | . . . {by a special coating applied to the lining}   | 3/0032      | . . {using an air-lock}   |
| 2001/1689 | . . . . {obtained from materials added to the melt}  | 3/0033      | . {charging of particulate material}  |
| 1/1694    | . . {Breaking away the lining or removing parts thereof}   | 2003/0034   | . {Means for moving, conveying, transporting the charge in the furnace or in the charging facilities}   |
| 1/18      | . Door frames; Doors, lids, removable covers   | 2003/0036   | . . {comprising inflatable or extendable parts}   |
| 1/1808    | . . {Removable covers}   | 2003/0037   | . . {comprising friction surfaces}  |
| 1/1816    | . . . {Removable covers specially adapted for arc furnaces}  | 2003/0038   | . . {comprising shakers}  |
| 2001/1825 | . . . {Means for moving the cover}   | 2003/0039   | . . {comprising magnetic means}   |
| 2001/1833 | . . . . {comprising a screw mechanism}   | 2003/004    | . . . {Magnetic lifters}  |
|           |  | 2003/0042   | . . {comprising roller trains}  |
|           |  | 2003/0043   | . . . {at least one of them being driven separately}  |

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| 2003/0044 | . . . {at least one of them being removable}   | 3/024   | . . . {Details of skids, e.g. riders}   |
| 2003/0045 | . . . {Use of rollable bodies, e.g. balls}   | 3/026   | . . {transport or conveyor rolls for furnaces; roller rails ( <a href="#">conveyor rolls in general B65G</a> )} |
| 2003/0046 | . . {comprising one or more movable arms, e.g. forks}  | 3/028   | . . . {Roller rails or succession of small sized rollers}   |
| 2003/0048 | . . . {Walking beams}  | 3/04  | . Ram or pusher apparatus   |
| 2003/0049 | . . . . {comprising eccentrics or lever arms}  | 2003/045  | . . {used to pull the charge}   |
| 2003/005  | . . . . {comprising ramps}   | 3/06  | . Charging or discharging machines on travelling carriages  |
| 2003/0051 | . . {comprising means to pick up the charge and put it down}   | 3/08  | . Screw feeders; Screw dischargers  |
| 2003/0053 | . . {comprising a device for charging with the doors closed}   | 3/10  | . Charging directly from hoppers or shoots  |
| 2003/0054 | . . {Means to move molten metal, e.g. electromagnetic pump}  | 2003/105  | . . {using shutters}  |
| 2003/0055 | . . . {with flow regulation}   | 3/12  | . Travelling or movable supports or containers for the charge   |
| 2003/0056 | . . . {through a syphon in a vacuum chamber, e.g. involving aspiration or pression on the bath}  | 2003/121  | . . {Band, belt or mesh}  |
| 2003/0057 | . . {Fast-outlet or inlet means}   | 2003/122  | . . . {Band made from longitudinal wires or bars}   |
| 2003/0059 | . . {comprising tracks, e.g. rails and wagon}  | 3/123   | . . {Furnace cars}  |
| 2003/006  | . . . {with a return track}  | 2003/124  | . . {Sleds; Transport supports}   |
| 2003/0061 | . . . {with means for changing track}  | 2003/125  | . . {Charging cars, lift trolleys}  |
| 2003/0062 | . . {using devices for tilting or rocking the charge}  | 2003/126  | . . . {with long arms, charging forks}  |
| 2003/0063 | . . {comprising endless belts}   | 2003/127  | . . . {for carrying pots ( <a href="#">slag pots F27D 2099/0095</a> )}  |
| 2003/0065 | . . {Lifts, e.g. containing the bucket elevators}  | 2003/128  | . . . {for carrying stacks of articles, e.g. bricks}  |
| 2003/0066 | . . {comprising scrapers or systems to pull out}   | 3/14  | . Charging or discharging liquid or molten material   |
| 2003/0067 | . . {comprising conveyors where the translation is communicated by friction from at least one rotating element, e.g. two opposed rotations combined} | 3/145   | . . {Runners therefor}  |
| 2003/0068 | . . {comprising clamps or tongs}   | 3/15  | . Tapping equipment; Equipment for removing {or retaining} slag   |
| 2003/0069 | . . {the device being suspended, e.g. from a crane}  | 3/1509  | . . {Tapping equipment}   |
| 2003/0071 | . . {Use of a comminuting device, e.g. grinding mill}  | 3/1518  | . . . {Tapholes}  |
| 2003/0072 | . . {Use of a pinion and a rack}   | 3/1527  | . . . {Taphole forming equipment, e.g. boring machines, piercing tools}   |
| 2003/0073 | . . {the charge floating on a liquid, e.g. water}  | 3/1536  | . . . {Devices for plugging tap holes, e.g. plugs stoppers}   |
| 2003/0074 | . . . {floating on water}  | <b>NOTE</b>   |   |
| 2003/0075 | . . {Charging or discharging vertically, e.g. through a bottom opening}  | { the devices fixed permanently to the melt container are classified in <a href="#">F27D 3/1509</a> } |   |
| 2003/0077 | . . {Use of centrifugal devices}   | 3/1545  | . . {Equipment for removing or retaining slag}  |
| 2003/0078 | . . {comprising jacks, e.g. hydraulic jacks}   | 3/1554  | . . . {for removing the slag from the surface of the melt}  |
| 2003/0079 | . . {Use of cams}  | 3/1563  | . . . . {by the use of scrapers}  |
| 2003/008  | . . {comprising cross-beams or gantry cranes}  | 3/1572  | . . . . {by suction}  |
| 2003/0081 | . . {Series of little rams}  | 3/1581  | . . . . {by the use of blowers}   |
| 2003/0083 | . . {Means for stirring the charge}  | 3/159   | . . . {for retaining slag during the pouring of the metal or retaining metal during the pouring of the slag}    |
| 3/0084    | . {Charging; Manipulation of SC or SC wafers}  | 3/16  | . Introducing a fluid jet or current into the charge  |
| 2003/0085 | . {Movement of the container or support of the charge in the furnace or in the charging facilities}  | {( <a href="#">porous elements for gas flushing of molten metals B22D 1/005</a> )}                    |   |
| 2003/0086 | . . {Up or down}   | 2003/161  | . . {through a porous element}  |
| 2003/0087 | . . {Rotation about a vertical axis}   | 2003/162  | . . {the fluid being an oxidant or a fuel}  |
| 2003/0089 | . . {Rotation about a horizontal or slightly inclined axis}  | 2003/163  | . . . {the fluid being an oxidant}  |
| 2003/009  | . . . {Oscillations about a horizontal axis; Rocking}  | 2003/164  | . . . . {Oxygen}  |
| 2003/0091 | . . {Horizontally}   | 2003/165  | . . . {the fluid being a fuel}  |
| 2003/0092 | . . . {with a reciprocating movement}  | 2003/166  | . . {the fluid being a treatment gas}   |
| 2003/0093 | . . {Movement on a slope}  | 2003/167  | . . {the fluid being a neutral gas}   |
| 2003/0095 | . . {the advancement being step by step}   | 2003/168  | . . {through a lance}   |
| 2003/0096 | . . {Advancement along the longitudinal axis of the workpiece}   | 2003/169  | . . . {Construction of the lance, e.g. lances for injecting particles}  |
| 2003/0097 | . . {Advancement along an axis perpendicular to the axis of the workpiece}   | 3/18  | . Charging particulate material using a fluid carrier   |
| 2003/0098 | . . . {Workpiece rolling on its support}   | 2003/185  | . . {Conveying particles in a conduct using a fluid}  |
| 3/02      | . Skids or tracks for heavy objects  |   |   |
| 3/022     | . . {Skids}  |   |   |

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| <b>5/00</b> | <b>Supports, screens, or the like for the charge within the furnace (<a href="#">travelling or movable supports F27D 3/12</a>)</b> | 2009/0048    | . . . {incorporating conduits for the medium}  |
| 5/0006      | . {Composite supporting structures}  | 2009/0051    | . . {comprising use of studs to transfer heat or retain the liner}   |
| 5/0012      | . . {Modules of the sagger or setter type; Supports built up from them}  | 2009/0054    | . . . {adapted to retain formed bricks}  |
| 5/0018      | . . {Separating elements}  | 2009/0056    | . . {Use of high thermoconductive elements}  |
| 5/0025      | . . {Assembled to present a three-point support}   | 2009/0059    | . . . {made mostly from graphite}  |
| 5/0031      | . {Treatment baskets for ceramic articles ( <a href="#">for metallic articles C21D 9/0025</a> )}                                   | 2009/0062    | . . . {made from copper or copper alloy}   |
| 5/0037      | . {Supports specially adapted for semi-conductors}   | 2009/0064    | . . {Cooling of furnace arches}  |
| 5/0043      | . {Supports specially adapted for dental prosthesis}   | 2009/0067    | . . {Cooling element inlet and outlet tubes}   |
| 5/005       | . {Supports specially adapted for holding elongated articles in an upright position, e.g. sparking plugs}                          | 2009/007     | . {Cooling of charges therein}   |
| 5/0056      | . {Hangers}  | 2009/0072    | . . {the cooling medium being a gas}   |
| 5/0062      | . {Shields for the charge ( <a href="#">shields for the lining F27D 1/0033</a> )}  | 2009/0075    | . . . {in direct contact with the charge}  |
| 5/0068      | . {Containers}   | 2009/0078    | . . . {in indirect contact with the charge}  |
| 2005/0075   | . . {Pots, e.g. slag pots, ladles}   | 2009/0081    | . . {the cooling medium being a fluid (other than a gas in direct or indirect contact with the charge)}  |
| 2005/0081   | . {Details}  | 2009/0083    | . . . {the fluid being water}  |
| 2005/0087   | . . {Means to prevent the adherence of the charge}   | 2009/0086    | . . . . {applied in spray form}  |
| 2005/0093   | . . {Means to maintain the form of the article}  | 2009/0089    | . . {Quenching}  |
| <b>7/00</b> | <b>Forming, maintaining, or circulating atmospheres in heating chambers</b>  | 2009/0091    | . . {in a fluidised bed of cooling elements}   |
| 7/02        | . Supplying steam, vapour, gases, or liquids   | 2009/0094    | . . {making use of already cooled material, e.g. forming a layer}  |
| 2007/023    | . . {Conduits}   | 2009/0097    | . . . {the charge being used as a coolant}   |
| 2007/026    | . . {Dampers ( <a href="#">registers for granular flows F27D 2099/0071</a> )}  | <b>11/00</b> | <b>Arrangement of elements for electric heating in or on furnaces (<a href="#">electric heating per se H05B</a>)</b>   |
| 7/04        | . Circulating atmospheres by mechanical means  | 11/02        | . Ohmic resistance heating   |
| 2007/045    | . . {Fans}   | 11/04        | . . with direct passage of current through the material being heated   |
| 7/06        | . Forming or maintaining special atmospheres or vacuum within heating chambers ( <a href="#">F27D 7/02 takes precedence</a> )      | 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   |
| 2007/063    | . . {Special atmospheres, e.g. high pressure atmospheres}  | 11/08        | . Heating by electric discharge, e.g. arc discharge  |
| 2007/066    | . . {Vacuum}   | 11/10        | . . Disposition of electrodes ( <a href="#">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</a> ) |
| <b>9/00</b> | <b>Cooling of furnaces or of charges therein (<a href="#">F27D 1/00, F27D 3/00 take precedence</a>)</b>                            | 11/12        | . with electromagnetic fields acting directly on the material being heated   |
| 2009/0002   | . {Cooling of furnaces}  | <b>13/00</b> | <b>Apparatus for preheating charges; Arrangements for preheating charges</b>   |
| 2009/0005   | . . {the cooling medium being a gas}   | 13/002       | . {Preheating scrap ( <a href="#">preheating of scrap for steel making C21C 5/565</a> )}   |
| 2009/0008   | . . . {Ways to inject gases against surfaces}  | 13/005       | . {Drying of green clay prior to baking}   |
| 2009/001    | . . {the cooling medium being a fluid other than a gas}  | 2013/007     | . {using a rotary furnace}   |
| 2009/0013   | . . . {the fluid being water}  | <b>15/00</b> | <b>Handling or treating discharged material; Supports or receiving chambers therefor</b>   |
| 2009/0016   | . . . . {Water-spray}  | 15/02        | . Cooling  |
| 2009/0018   | . . {the cooling medium passing through a pattern of tubes}  | 15/0206      | . . {with means to convey the charge}  |
| 2009/0021   | . . . {with the parallel tube parts close to each other, e.g. a serpentine}  | 15/0213      | . . . {comprising a cooling grate}   |
| 2009/0024   | . . . . {with contiguous tubes, which may be separately welded one to the other}   | 15/022       | . . . . {grate plates}   |
| 2009/0027   | . . . . {linked by elements}   | 2015/0226    | . . . . . {Support, fixation of the grate}   |
| 2009/0029   | . . . . {fixed, e.g. welded to a supporting surface}   | 2015/0233    | . . . . . {with gas, e.g. air, supply to the grate}  |
| 2009/0032   | . . . {integrated with refractories in a panel}  | 2015/024     | . . . . . {Multiple grates}  |
| 2009/0035   | . . . {arranged for the covering of a cylindrical surface}   | 2015/0246    | . . . . . {Combination of fixed and movable grates}  |
| 2009/0037   | . . {the cooling medium passing a radiator}  | 2015/0253    | . . . . . {Gratin grates}  |
| 2009/004    | . . {the cooling medium passing a waterbox}  | 2015/026     | . . . . . {Means to discharge the fines}   |
| 2009/0043   | . . . {Insert type waterbox, e.g. cylindrical or flat type}  | 15/0266      | . . . {on an endless belt}   |
| 2009/0045   | . . {the cooling medium passing a block, e.g. metallic}  | 15/0273      | . . . {on a rotary hearth}   |
|             |  | 15/028       | . . . {comprising a rotary drum}   |



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| 15/0286      | . . {in a vertical, e.g. annular, shaft ( <a href="#">shafts including rotating parts F27D 15/0273</a> )}  | 2019/0081    | . {Controlling an air-lock chamber}  |
| 2015/0293    | . . . {including rotating parts}   | 2019/0084    | . {Controlling closure systems, e.g. doors}  |
| <b>17/00</b> | <b>Arrangements for using waste heat (<a href="#">heat-exchangers per se F28</a>); Arrangements for using, or disposing of, waste gases</b>                                | 2019/0087    | . {Automatisation of the whole plant or activity}  |
| 17/001       | . {Extraction of waste gases, collection of fumes and hoods used therefor ( <a href="#">in general B08B 15/00</a> )}   | 2019/009     | . . {Use of codes, e.g. bar codes}   |
| 17/002       | . . {Details of the installations, e.g. fume conduits or seals}  | 2019/0093    | . {Maintaining a temperature gradient}   |
| 17/003       | . . {of waste gases emanating from an electric arc furnace}  | 2019/0096    | . {involving simulation means, e.g. of the treating or charging step}  |
| 17/004       | . {Systems for reclaiming waste heat}  | <b>21/00</b> | <b>Arrangements of monitoring devices; Arrangements of safety devices</b>  |
| 2017/005     | . . {including pyrolysing the waste gases}   | 2021/0007    | . {Monitoring the presson}   |
| 2017/006     | . . {using a boiler}   | 21/0014      | . {Devices for monitoring temperature}   |
| 2017/007     | . . {including regenerators}   | 21/0021      | . {Devices for monitoring linings for wear}  |
| 17/008       | . {cleaning gases}   | 21/0028      | . {Devices for monitoring the level of the melt}   |
| 2017/009     | . {Cyclone for separating fines from gas}  | 21/0035      | . {Devices for monitoring the weight of quantities added to the charge}  |
| <b>19/00</b> | <b>Arrangements of controlling devices</b>   | 2021/0042    | . . {Monitoring the level of the solid charge}   |
| 2019/0003    | . {Monitoring the temperature or a characteristic of the charge and using it as a controlling value}   | 2021/005     | . {Devices for monitoring thermal expansion}   |
| 2019/0006    | . {Monitoring the characteristics (composition, quantities, temperature, presson) of at least one of the gases of the kiln atmosphere and using it as a controlling value} | 2021/0057    | . {Security or safety devices, e.g. for protection against heat, noise, pollution or too much duress; Ergonomic aspects}   |
| 2019/0009    | . . {Monitoring the presson in an enclosure or kiln zone}  | 2021/0064    | . . {against noises}   |
| 2019/0012    | . . {Monitoring the composition of the atmosphere or of one of their components}   | 2021/0071    | . . {against explosions}   |
| 2019/0015    | . . . {Monitoring the composition of the exhaust gases or of one of its components}  | 2021/0078    | . . {against the presence of an undesirable element in the atmosphere of the furnace}  |
| 2019/0018    | . . {Monitoring the temperature of the atmosphere of the kiln}   | 2021/0085    | . . {against molten metal, e.g. leakage or splashes}   |
| 2019/0021    | . . . {Monitoring the temperature of the exhaust gases}  | 2021/0092    | . . {against a jam in the transport line or a production interruption}   |
| 2019/0025    | . . {Monitoring the temperature of a part or of an element of the furnace structure}   | 21/02        | . Observation or illuminating devices  |
| 2019/0028    | . {Regulation}   | 2021/023     | . . {Closable inserting openings, e.g. for the introduction of lances, sensors or burners}   |
| 2019/0031    | . . {through control of the flow of the exhaust gases}   | 2021/026     | . . {using a video installation}   |
| 2019/0034    | . . {through control of a heating quantity such as fuel, oxidant or intensity of current}  | 21/04        | . Arrangements of indicators or alarms   |
| 2019/0037    | . . . {Quantity of electric current}   | <b>25/00</b> | <b>Devices {or methods} for removing incrustations{, e.g. slag, metal deposits, dust; Devices or methods for preventing the adherence of slag}</b>                                     |
| 2019/004     | . . . {Fuel quantity}  | 25/001       | . {comprising breaking tools, e.g. hammers, drills, scrapers ( <a href="#">breaking away linings F27D 1/1694</a> ; <a href="#">boring machines for forming tapholes F27D 3/1527</a> )} |
| 2019/0043    | . . . . {Amount of air or O <sub>2</sub> to the burner}  | 25/003       | . . {used for punching tuyeres}  |
| 2019/0046    | . . . . {Amount of secondary air to the burner}  | 25/005       | . . {used for cleaning the channels of induction furnaces}   |
| 2019/005     | . . . {Amount of heat given to the charge via a controlled heat exchanger}   | 25/006       | . {using explosives}   |
| 2019/0053    | . . . . {involving heating the charge in a fluid or fluidised medium}  | 25/008       | . {using fluids or gases, e.g. blowers, suction units}   |
| 2019/0056    | . . {Regulation involving cooling}   | <b>27/00</b> | <b>Stirring devices for molten material (<a href="#">F27D 3/14 takes precedence</a>)</b>   |
| 2019/0059    | . . {Regulation involving the control of the conveyor movement, e.g. speed or sequences}   | 2027/002     | . {Gas stirring}   |
| 2019/0062    | . . . {control of the workpiece stay in different zones}   | 27/005       | . {Pumps}  |
| 2019/0065    | . . {Regulation involving controlled section modification}   | 27/007       | . . {Pulsating pumps}  |
| 2019/0068    | . . {Regulation involving a measured inflow of a particular gas in the enclosure}  | <b>99/00</b> | <b>Subject matter not provided for in other groups of this subclass</b>  |
| 2019/0071    | . . {Regulation using position sensors}  | 99/0001      | . {Heating elements or systems}  |
| 2019/0075    | . . {Regulation of the charge quantity}  | 99/0003      | . . {with particulate fuel, e.g. aspects relating to the feeding}  |
| 2019/0078    | . . {Regulation of the speed of the gas through the charge}  | 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}                      | 2099/0095 | . . | {Means to collect the slag or spilled metal, e.g. vessels ( <a href="#">cars to carry the pots F27D 2003/127</a> )} |
| 2099/0018 | . . . . | {Relative movement of the coil and the charge during the heat treatment}   | 2099/0096 | . . | {Presses}   |
| 2099/002  | . . . . | {Core heating}   | 2099/0098 | . . | {Means for moving the furnace}  |
| 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 ( <a href="#">manufacture of steel in an electric arc furnace equipped with burners C21C 5/5217</a> )}  |           |     |   |
| 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 ( <a href="#">use of air-locks for charging smelt furnaces F27D 3/0032</a> )}   |           |     |   |
| 2099/0081 | . .     | {Joint}  |           |     |   |
| 2099/0083 | . .     | {Drives; Auxilliary 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}   |           |     |   |

**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](#)