

CPC COOPERATIVE PATENT CLASSIFICATION

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

LIGHTING; HEATING

F27 FURNACES; KILNS; OVENS; RETORTS (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

NOTE

Attention is drawn to the Notes following the title of class [F27](#).

1/00	Casings; Linings; Walls; Roofs	2001/0079	. {Means to assemble at least two parts of a furnace or of any device or accessory associated to its use}
1/0003	. {Linings or walls}	2001/0083	. . {Means to assemble a moving part to a fixed one}
	<u>NOTE</u>	2001/0086	. . . {the moving part being in rotation}
	not used, see subgroups	2001/0089	. . . {the moving part being in translation}
1/0006	. . {Linings or walls formed from bricks or layers with a particular composition or specific characteristics}	2001/0093	. . . {the moving part being hinged to the fixed one}
1/0009	. . . {Comprising ceramic fibre elements}	2001/0096	. . . {the moving part staying in the same plane}
1/0013	. . . . {the fibre elements being in the form of a folded blanket or a juxtaposition of folded blankets}	1/02	. Crowns; Roofs
1/0016	. . . . . {Interleaved multiple folded blankets}	1/021	. . {Suspended roofs}
1/002	. . . . {the fibre elements being composed of adjacent separate strips}	1/022	. . . {Parts thereof, e.g. noses, arches}
1/0023	. . {Linings or walls comprising expansion joints or means to restrain expansion due to thermic flows}	1/024	. . . {having an anchored layer of lining}
1/0026	. . . {the expansion joint being a resilient element, e.g. a metallic plate between two bricks}	1/025	. . {Roofs supported around their periphery, e.g. arched roofs}
1/003	. . {Linings or walls comprising porous bricks}	1/027	. . . {Skew backs}
1/0033	. . {Linings or walls comprising heat shields, e.g. heat shields}	1/028	. . . {Means to prevent deformation of the arch}
1/0036	. . {Linings or walls comprising means for supporting electric resistances in the furnace}	1/04	. characterised by the form {, e.g. shape} of the bricks or blocks used
1/004	. . {Linings or walls comprising means for securing bricks}	1/042	. . {Bricks shaped for use in regenerators}
1/0043	. {Floors, hearths}	1/045	. . {Bricks for lining cylindrical bodies, e.g. skids, tubes}
2001/0046	. {Means to facilitate repair or replacement or prevent quick wearing}	2001/047	. . . {Lining of cylindrical vessels}
2001/005	. . {Removable part or structure with replaceable elements}	1/06	. . Composite bricks or blocks {, e.g. panels, modules}
2001/0053	. . {Furnace constructed in modules}	1/063	. . . {Individual composite bricks or blocks}
2001/0056	. . {Aspects of construction intended to prevent wear}	1/066	. . . . {Individual composite bricks or blocks made from hollow bricks filled up with another material}
2001/0059	. {Construction elements of a furnace}	1/08	. . . Bricks or blocks with internal reinforcement or metal backing
2001/0063	. . {Means to strengthen a part}	1/10	. Monolithic linings; Supports therefor
2001/0066	. . {Movable or removable parts}		<u>NOTE</u>
2001/0069	. . {Means to prevent heat conduction}		{supports are classified in F27D 1/14 }
2001/0073	. . . {Surrounding protection around the furnace, e.g. covers, circulation of gas}	1/12	. incorporating cooling arrangements
2001/0076	. . {comprising a corrugated sheet}	1/14	. Supports for linings (supports for monolithic linings F27D 1/10)
		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}	2003/001	. . . {Series of dispensers or separation in two or more parts}
1/16	. Making or repairing linings {; Increasing the durability of linings; Breaking away linings}	2003/0012	. . {Working with piles}
2001/1605	. . {Repairing linings}	2003/0013	. . . {Unstacking or making stacks}
2001/161	. . . {Hot repair}	2003/0014	. . {involving the use of magazines}
2001/1615	. . . {through a hole in the casing, e.g. injecting refractory from outside the vessel}	2003/0015	. . . {the magazine being vertical}
1/1621	. . {Making linings by using shaped elements, e.g. bricks}	2003/0016	. . . {the magazine being a rotary device}
1/1626	. . {Making linings by compacting a refractory mass in the space defined by a backing mould or pattern and the furnace wall}	2003/0018	. . {comprising means to introduce or extract the charge in series of separate containers or zones}
2001/1631	. . . {using an expandable core}	2003/0019	. . . {simultaneously}
1/1636	. . {Repairing linings by projecting or spraying refractory materials on the lining}	2003/002	. . {Transforming a single row in a multiple row}
1/1642	. . . {using a gunning apparatus}	3/0021	. {of ceramic ware}
1/1647	. . . . {the projected materials being partly melted, e.g. by exothermic reactions of metals (Al, Si) with oxygen}	3/0022	. . {Disposition of the charge}
1/1652	. . . . . {Flame guniting; Use of a fuel}	3/0024	. {of metallic workpieces}
2001/1657	. . . . . {Solid fuel}	3/0025	. {Charging or loading melting furnaces with material in the solid state}
2001/1663	. . . . . {Fluid fuel, e.g. gas}	3/0026	. . {Introducing additives into the melt}
1/1668	. . . . . {Plasma guniting}	3/0027	. . {Charging vertically with corbs}
1/1673	. . . {applied centrifugally}	3/0028	. . . {Corbs}
1/1678	. . {Increasing the durability of linings; Means for protecting}	3/003	. . {Charging laterally, e.g. with a charging box}
1/1684	. . . {by a special coating applied to the lining}	3/0031	. . {Charging with tiltable dumpers}
2001/1689	. . . . {obtained from materials added to the melt}	3/0032	. . {using an air-lock}
1/1694	. . {Breaking away the lining or removing parts thereof}	3/0033	. {charging of particulate material}
1/18	. Door frames; Doors, lids or removable covers	2003/0034	. {Means for moving, conveying, transporting the charge in the furnace or in the charging facilities}
1/1808	. . {Removable covers}	2003/0036	. . {comprising inflatable or extendable parts}
1/1816	. . . {Removable covers specially adapted for arc furnaces}	2003/0037	. . {comprising friction surfaces}
2001/1825	. . . {Means for moving the cover}	2003/0038	. . {comprising shakers}
2001/1833	. . . . {comprising a screw mechanism}	2003/0039	. . {comprising magnetic means}
2001/1841	. . . . {comprising means for rotating or moving the cover in a horizontal or quasi horizontal plane}	2003/004	. . . {Magnetic lifters}
2001/185	. . . . {comprising means for tilting the cover}	2003/0042	. . {comprising roller trains}
1/1858	. . {Doors}	2003/0043	. . . {at least one of them being driven separately}
1/1866	. . . {Door-frames}	2003/0044	. . . {at least one of them being removable}
2001/1875	. . . {Hanging doors and walls}	2003/0045	. . . {Use of rollable bodies, e.g. balls}
2001/1883	. . . . {Hanging curtains}	2003/0046	. . {comprising one or more movable arms, e.g. forks}
2001/1891	. . . {Doors for separating two chambers in the furnace}	2003/0048	. . . {Walking beams}
3/00	Charging; Discharging; Manipulation of charge	2003/0049	. . . . {comprising eccentrics or lever arms}
2003/0001	. {Positioning the charge}	2003/005	. . . . {comprising ramps}
2003/0002	. . {involving positioning devices, e.g. buffers, buffer zones}	2003/0051	. . {comprising means to pick up the charge and put it down}
2003/0003	. . {involving a system for aligning the articles through a lateral guidance, e.g. funnel}	2003/0053	. . {comprising a device for charging with the doors closed}
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}	2003/0054	. . {Means to move molten metal, e.g. electromagnetic pump}
2003/0006	. . {Particulate materials}	2003/0055	. . . {with flow regulation}
2003/0007	. . . {Circular distribution}	2003/0056	. . . {through a syphon in a vacuum chamber, e.g. involving aspiration or pressure on the bath}
2003/0008	. . . {Longitudinal distribution}	2003/0057	. . {Fast-outlet or inlet means}
2003/0009	. . . {Separation of different types of fines, e.g. by a blower}	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}	3/1536	. . . {Devices for plugging tap holes, e.g. plugs stoppers}
2003/0072	. . {Use of a pinion and a rack}	NOTE	
2003/0073	. . {the charge floating on a liquid, e.g. water}	{ the devices fixed permanently to the melt container are classified in F27D 3/1509 }	
2003/0074	. . . {floating on water}		
2003/0075	. . {Charging or discharging vertically, e.g. through a bottom opening}	3/1545	. . {Equipment for removing or retaining slag}
2003/0077	. . {Use of centrifugal devices}	3/1554	. . . {for removing the slag from the surface of the melt}
2003/0078	. . {comprising jacks, e.g. hydraulic jacks}	3/1563	. . . . {by the use of scrapers}
2003/0079	. . {Use of cams}	3/1572	. . . . {by suction}
2003/008	. . {comprising cross-beams or gantry cranes}	3/1581	. . . . {by the use of blowers}
2003/0081	. . {Series of little rams}	3/159	. . . {for retaining slag during the pouring of the metal or retaining metal during the pouring of the slag}
2003/0083	. . {Means for stirring the charge}	3/16	. Introducing a fluid jet or current into the charge (F27D 3/18 takes precedence)
3/0084	. {Charging; Manipulation of SC or SC wafers}	2003/161	. . {through a porous element}
2003/0085	. {Movement of the container or support of the charge in the furnace or in the charging facilities}	2003/162	. . {the fluid being an oxidant or a fuel}
2003/0086	. . {Up or down}	2003/163	. . . {the fluid being an oxidant}
2003/0087	. . {Rotation about a vertical axis}	2003/164	. . . . {Oxygen}
2003/0089	. . {Rotation about a horizontal or slightly inclined axis}	2003/165	. . . . {the fluid being a fuel}
2003/009	. . . {Oscillations about a horizontal axis; Rocking}	2003/166	. . {the fluid being a treatment gas}
2003/0091	. . {Horizontally}	2003/167	. . {the fluid being a neutral gas}
2003/0092	. . . {with a reciprocating movement}	2003/168	. . {through a lance}
2003/0093	. . {Movement on a slope}	2003/169	. . . {Construction of the lance, e.g. lances for injecting particles}
2003/0095	. . {the advancement being step by step}	3/18	. Charging particulate material using a fluid carrier
2003/0096	. . {Advancement along the longitudinal axis of the workpiece}	2003/185	. . {Conveying particles in a conduct using a fluid}
2003/0097	. . {Advancement along an axis perpendicular to the axis of the workpiece}	5/00	Supports, screens or the like for the charge within the furnace
2003/0098	. . . {Workpiece rolling on its support}	5/0006	. {Composite supporting structures}
3/02	. Skids or tracks for heavy objects	5/0012	. . {Modules of the sagger or setter type; Supports built up from them}
3/022	. . {Skids}	5/0018	. . {Separating elements}
3/024	. . . {Details of skids, e.g. riders}	5/0025	. . {assembled to present a three-point support}
3/026	. . {transport or conveyor rolls for furnaces; roller rails}	5/0031	. {Treatment baskets for ceramic articles}
3/028	. . . {Roller rails or succession of small sized rollers}	5/0037	. {Supports specially adapted for semi-conductors}
3/04	. Ram or pusher apparatus	5/0043	. {Supports specially adapted for dental prosthesis}
2003/045	. . {used to pull the charge}	5/005	. {Supports specially adapted for holding elongated articles in an upright position, e.g. sparking plugs}
3/06	. Charging or discharging machines on travelling carriages	5/0056	. {Hangers}
3/08	. Screw feeders; Screw dischargers	5/0062	. {Shields for the charge}
3/10	. Charging directly from hoppers or shoots	5/0068	. {Containers}
2003/105	. . {using shutters}	2005/0075	. . {Pots, e.g. slag pots, ladles}
3/12	. Travelling or movable supports or containers for the charge	2005/0081	. {Details}
2003/121	. . {Band, belt or mesh}	2005/0087	. . {Means to prevent the adherence of the charge}
2003/122	. . . {Band made from longitudinal wires or bars}	2005/0093	. . {Means to maintain the form of the article}
3/123	. . {Furnace cars}	7/00	Forming, maintaining or circulating atmospheres in heating chambers
2003/124	. . {Sleds; Transport supports}	7/02	. Supplying steam, vapour, gases or liquids
2003/125	. . {Charging cars, lift trolleys}	2007/023	. . {Conduits}
2003/126	. . . {with long arms, charging forks}	2007/026	. . {Dampers}
2003/127	. . . {for carrying pots}	7/04	. Circulating atmospheres by mechanical means
2003/128	. . . {for carrying stacks of articles, e.g. bricks}	2007/045	. . {Fans}
3/14	. Charging or discharging liquid or molten material	7/06	. Forming or maintaining special atmospheres or vacuum within heating chambers (supplying steam, vapour, gases or liquids F27D 7/02)
3/145	. . {Runners therefor}	2007/063	. . {Special atmospheres, e.g. high pressure atmospheres}
3/15	. Tapping equipment; Equipment for removing {or retaining} slag	2007/066	. . {Vacuum}
3/1509	. . {Tapping equipment}		
3/1518	. . . {Tapholes}		
3/1527	. . . {Taphole forming equipment, e.g. boring machines, piercing tools}		

9/00	Cooling of furnaces or of charges therein (casings, linings, walls or roofs incorporating cooling arrangements F27D 1/12)
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
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
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}
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}
2015/0293	. . . {including rotating parts}
17/00	Arrangements for using waste heat; Arrangements for using, or disposing of, waste gases
	<u>WARNING</u>
	Group F27D 17/00 is impacted by reclassification into groups F27D 17/20 , F27D 17/22 , F27D 17/25 and F27D 17/28 .
	All groups listed in this Warning should be considered in order to perform a complete search.
17/10	. Arrangements for using waste heat
	<u>WARNING</u>
	Group F27D 17/10 is impacted by reclassification into groups F27D 17/12 , F27D 17/15 , F27D 17/17 and F27D 17/18 .
	All groups listed in this Warning should be considered in order to perform a complete search.
17/102	. . {including pyrolysing the waste gases}
17/12	. . using heat storage
	<u>WARNING</u>
	Group F27D 17/12 is incomplete pending reclassification of documents from group F27D 17/10 .
	Groups F27D 17/10 and F27D 17/12 should be considered in order to perform a complete search.
17/13	. . . using regenerative heat exchangers
17/15	. . using boilers
	<u>WARNING</u>
	Group F27D 17/15 is incomplete pending reclassification of documents from group F27D 17/10 .
	Groups F27D 17/10 and F27D 17/15 should be considered in order to perform a complete search.

17/17	<ul style="list-style-type: none"> for preheating fluids, e.g. air or gases <p>WARNING</p> <p>Group F27D 17/17 is incomplete pending reclassification of documents from group F27D 17/10.</p> <p>Groups F27D 17/10 and F27D 17/17 should be considered in order to perform a complete search.</p>	2019/0006	<ul style="list-style-type: none"> {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}
17/18	<ul style="list-style-type: none"> for preheating solid materials <p>WARNING</p> <p>Group F27D 17/18 is incomplete pending reclassification of documents from group F27D 17/10.</p> <p>Groups F27D 17/10 and F27D 17/18 should be considered in order to perform a complete search.</p>	2019/0009	<ul style="list-style-type: none"> {Monitoring the pressure in an enclosure or kiln zone}
17/20	<ul style="list-style-type: none"> Arrangements for treatment or cleaning of waste gases <p>WARNING</p> <p>Group F27D 17/20 is incomplete pending reclassification of documents from group F27D 17/00.</p> <p>Group F27D 17/20 is also impacted by reclassification into groups F27D 17/22, F27D 17/25 and F27D 17/28.</p> <p>All groups listed in this Warning should be considered in order to perform a complete search.</p>	2019/0012	<ul style="list-style-type: none"> {Monitoring the composition of the atmosphere or of one of their components}
17/22	<ul style="list-style-type: none"> for removing solid constituents <p>WARNING</p> <p>Groups F27D 17/22 and F27D 17/25 are incomplete pending reclassification of documents from groups F27D 17/00 and F27D 17/20.</p> <p>All groups listed in this warning should be considered in order to perform a complete search.</p>	2019/0015	<ul style="list-style-type: none"> {Monitoring the composition of the exhaust gases or of one of its components}
17/25	<ul style="list-style-type: none"> using cyclones 	2019/0018	<ul style="list-style-type: none"> {Monitoring the temperature of the atmosphere of the kiln}
17/28	<ul style="list-style-type: none"> for cooling waste gases <p>WARNING</p> <p>Group F27D 17/28 is incomplete pending reclassification of documents from groups F27D 17/00 and F27D 17/20.</p> <p>Groups F27D 17/00, F27D 17/20 and F27D 17/28 should be considered in order to perform a complete search.</p>	2019/0021	<ul style="list-style-type: none"> {Monitoring the temperature of the exhaust gases}
17/30	<ul style="list-style-type: none"> Arrangements for extraction or collection of waste gases; Hoods therefor 	2019/0025	<ul style="list-style-type: none"> {Monitoring the temperature of a part or of an element of the furnace structure}
17/302	<ul style="list-style-type: none"> {Constructional details of ancillary components, e.g. waste gas conduits or seals} 	2019/0028	<ul style="list-style-type: none"> {Regulation}
17/304	<ul style="list-style-type: none"> {specially adapted for electric arc furnaces} 	2019/0031	<ul style="list-style-type: none"> {through control of the flow of the exhaust gases}
19/00	Arrangements of controlling devices	2019/0034	<ul style="list-style-type: none"> {through control of a heating quantity such as fuel, oxidant or intensity of current}
2019/0003	<ul style="list-style-type: none"> {Monitoring the temperature or a characteristic of the charge and using it as a controlling value} 	2019/0037	<ul style="list-style-type: none"> {Quantity of electric current}
		2019/004	<ul style="list-style-type: none"> {Fuel quantity}
		2019/0043	<ul style="list-style-type: none"> {Amount of air or O₂ to the burner}
		2019/0046	<ul style="list-style-type: none"> {Amount of secondary air to the burner}
		2019/005	<ul style="list-style-type: none"> {Amount of heat given to the charge via a controlled heat exchanger}
		2019/0053	<ul style="list-style-type: none"> {involving heating the charge in a fluid or fluidised medium}
		2019/0056	<ul style="list-style-type: none"> {Regulation involving cooling}
		2019/0059	<ul style="list-style-type: none"> {Regulation involving the control of the conveyor movement, e.g. speed or sequences}
		2019/0062	<ul style="list-style-type: none"> {control of the workpiece stay in different zones}
		2019/0065	<ul style="list-style-type: none"> {Regulation involving controlled section modification}
		2019/0068	<ul style="list-style-type: none"> {Regulation involving a measured inflow of a particular gas in the enclosure}
		2019/0071	<ul style="list-style-type: none"> {Regulation using position sensors}
		2019/0075	<ul style="list-style-type: none"> {Regulation of the charge quantity}
		2019/0078	<ul style="list-style-type: none"> {Regulation of the speed of the gas through the charge}
		2019/0081	<ul style="list-style-type: none"> {Controlling an air-lock chamber}
		2019/0084	<ul style="list-style-type: none"> {Controlling closure systems, e.g. doors}
		2019/0087	<ul style="list-style-type: none"> {Automatisation of the whole plant or activity}
		2019/009	<ul style="list-style-type: none"> {Use of codes, e.g. bar codes}
		2019/0093	<ul style="list-style-type: none"> {Maintaining a temperature gradient}
		2019/0096	<ul style="list-style-type: none"> {involving simulation means, e.g. of the treating or charging step}
		21/00	Arrangement of monitoring devices; Arrangement of safety devices
		2021/0007	<ul style="list-style-type: none"> {Monitoring the pressure}
		21/0014	<ul style="list-style-type: none"> {Devices for monitoring temperature}
		21/0021	<ul style="list-style-type: none"> {Devices for monitoring linings for wear}
		21/0028	<ul style="list-style-type: none"> {Devices for monitoring the level of the melt}
		21/0035	<ul style="list-style-type: none"> {Devices for monitoring the weight of quantities added to the charge}
		2021/0042	<ul style="list-style-type: none"> {Monitoring the level of the solid charge}
		2021/005	<ul style="list-style-type: none"> {Devices for monitoring thermal expansion}
		2021/0057	<ul style="list-style-type: none"> {Security or safety devices, e.g. for protection against heat, noise, pollution or too much duress; Ergonomic aspects}
		2021/0064	<ul style="list-style-type: none"> {against noises}
		2021/0071	<ul style="list-style-type: none"> {against explosions}

2021/0078	. . {against the presence of an undesirable element in the atmosphere of the furnace}	2099/0046	. . . {with incomplete combustion, e.g. reducing atmosphere}
2021/0085	. . {against molten metal, e.g. leakage or splashes}	2099/0048	. . . . {Post- combustion}
2021/0092	. . {against a jam in the transport line or a production interruption}	2099/005	. . . {Catalytic burner}
21/02	. Observation or illuminating devices	2099/0051	. . . {Burning waste as a fuel}
2021/023	. . {Closable inserting openings, e.g. for the introduction of lances, sensors or burners}	2099/0053	. . . {Burner fed with preheated gases}
2021/026	. . {using a video installation}	2099/0055	. . . . {Fuel}
21/04	. Arrangement of indicators or alarms	2099/0056	. . . . {Oxidant}
25/00	Devices {or methods} for removing incrustations {, e.g. slag, metal deposits, dust; Devices or methods for preventing the adherence of slag}	2099/0058	. . {Means for heating the charge locally}
25/001	. {comprising breaking tools, e.g. hammers, drills, scrapers}	2099/006	. . {Auxiliary heating, e.g. in special conditions or at special times}
25/003	. . {used for punching tuyeres}	2099/0061	. . {Indirect heating}
25/005	. . {used for cleaning the channels of induction furnaces}	2099/0063	. . . {Liquid}
25/006	. {using explosives}	2099/0065	. . . {Gas}
25/008	. {using fluids or gases, e.g. blowers, suction units}	2099/0066	. . . {Particles or solid bodies, e.g. bed of particles}
27/00	Stirring devices for molten material (charging or discharging liquid or molten material F27D 3/14)	2099/0068	. . {Heating directly by circulation of a fluid other than a gas or by particles}
2027/002	. {Gas stirring}	99/007	. {Partitions}
27/005	. {Pumps}	2099/0071	. . {Partitions used as registers}
27/007	. . {Pulsating pumps}	99/0073	. {Seals}
99/00	Subject matter not provided for in other groups of this subclass	99/0075	. . {Gas curtain seals}
99/0001	. {Heating elements or systems}	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}
99/0003	. . {with particulate fuel, e.g. aspects relating to the feeding}	2099/0078	. . {Means to minimize the leakage of the furnace atmosphere during charging or discharging}
99/0005	. . {Injecting liquid fuel}	2099/008	. . . {Using an air-lock}
99/0006	. . {Electric heating elements or system}	2099/0081	. . {Joint}
2099/0008	. . . {Resistor heating}	2099/0083	. {Drives; Auxiliary drives}
2099/001	. . . . {the container being the resistor}	2099/0085	. {Accessories}
2099/0011	. . . . {The resistor heats a radiant tube or surface}	2099/0086	. . {Filters, e.g. for molten metals}
2099/0013	. . . . . {immersed in the charge}	2099/0088	. . {Apparatus to cut metal, e.g. logs, in billets}
2099/0015	. . . {Induction heating}	2099/009	. . {Bumpers}
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}	2099/0091	. . {Means to grease or oil}
2099/0018	. . . . {Relative movement of the coil and the charge during the heat treatment}	2099/0093	. . {Means to collect ashes or dust, e.g. vessels}
2099/002	. . . . {Core heating}	2099/0095	. . {Means to collect the slag or spilled metal, e.g. vessels}
2099/0021	. . . {Arc heating}	2099/0096	. . {Presses}
2099/0023	. . . . {DC arc heating}	2099/0098	. . {Means for moving the furnace}
2099/0025	. . . {Currents through the charge}		
2099/0026	. . . {with a generator of electromagnetic radiations}	2201/00	Manipulation of furnace parts
2099/0028	. . . {Microwave heating}		NOTE
2099/003	. . . {Bombardment heating, e.g. with ions or electrons}		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.
2099/0031	. . . {Plasma-torch heating}		Example: F27D 2201/00 + F27D 2003/0036
99/0033	. . {using burners}		
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}		