## CPC COOPERATIVE PATENT CLASSIFICATION

**B** PERFORMING OPERATIONS; TRANSPORTING

*(NOTES omitted)*

### SHAPING

**B22** CASTING; POWDER METALLURGY

#### B22D CASTING OF METALS; CASTING OF OTHER SUBSTANCES BY THE SAME PROCESSES OR DEVICES (shaping of plastics or substances in a plastic state **B29C**; metallurgical processing, selection of substances to be added to metal **C21, C22**)

**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.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1/00</td>
<td>Treatment of fused masses in the ladle or the supply runners before casting *(for continuous casting <strong>B22D 11/10</strong>; metallurgical processing, e.g. refining of iron or other metal *<em>C21, C22, C25C)</em></td>
</tr>
<tr>
<td>1/002</td>
<td><em>(Treatment with gases (<strong>C21C 7/072, C22B 9/05</strong> take precedence))</em></td>
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<td>1/005</td>
<td><em>(Injection assemblies therefor (features relating to gas injection, provided on closures of the sliding gate type <strong>B22D 41/42</strong>; provided on pouring nozzles <strong>B22D 41/58</strong>; provided on closures of the stopper-rod type <strong>B22D 41/186</strong>))</em></td>
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<td>1/007</td>
<td><em>(Treatment of the fused masses in the supply runners (<strong>B22D 1/002, B22D 1/005</strong> take precedence))</em></td>
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<td>2/00</td>
<td>Arrangement of indicating or measuring devices, e.g. for temperature or viscosity of the fused mass</td>
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<td>2/001</td>
<td><em>(for the slag appearance in a molten metal stream)</em></td>
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<td>2/003</td>
<td><em>(for the level of the molten metal (<strong>B22D 11/181 and B22D 11/201</strong> take precedence; level indicators in general <strong>G01F 23/00</strong>))</em></td>
</tr>
<tr>
<td>2/005</td>
<td><em>(for the thickness of a frozen shell (<strong>B22D 11/188 and B22D 11/207</strong> take precedence))</em></td>
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<tr>
<td>2/006</td>
<td><em>(for the temperature of the molten metal (measuring temperature in general <strong>G01K</strong>))</em></td>
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<td>2/008</td>
<td><em>(for the viscosity of the molten metal (measuring viscosity in general <strong>G01N 11/00</strong>))</em></td>
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### Casting of pigs, i.e. metal castings suitable for subsequently melting; similar casting

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### Casting of ingots, i.e. metal castings suitable for subsequently rolling or forging

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Particular casting processes; Machines or apparatus therefor

11/009 . . . . {of work of special cross-section, e.g. I-beams, U-profiles}
11/01 . . . . without moulds, e.g. on molten surfaces
11/015 . . . . {using magnetic field for conformation, i.e. the metal is not in contact with a mould}
11/04 . . . . into open-ended moulds (B22D 11/06, B22D 11/07 take precedence; plants for continuous casting, e.g. for upwardly drawing the strand B22D 11/14)
11/0401 . . . . {Moulds provided with a feed head}
11/0403 . . . . {Multiple moulds}
11/0405 . . . . {Rotating moulds}
11/0406 . . . . {Moulds with special profile}
11/0408 . . . . {Moulds for casting thin slabs}
11/041 . . . . for vertical casting (B22D 11/043, B22D 11/049 - B22D 11/059 take precedence)
11/043 . . . . Curved moulds (B22D 11/049 - B22D 11/059 take precedence)
11/045 . . . . for horizontal casting (B22D 11/049 - B22D 11/059 take precedence)
11/0455 . . . . {Bidirectional horizontal casting}
11/047 . . . . {Means for joining tundish to mould
11/0475 . . . . . . {characterised by use of a break ring}
11/049 . . . . for direct chill casting, e.g. electromagnetic casting
11/05 . . . . into moulds having adjustable walls
11/051 . . . . into moulds having oscillating walls
11/053 . . . . Means for oscillating the moulds
11/0535 . . . . . . {in a horizontal plane}
11/055 . . . . Cooling the moulds ((B22D 11/04 takes precedence))
11/057 . . . . Manufacturing or calibrating the moulds
11/059 . . . . Mould materials or platings
11/06 . . . . into moulds with travelling walls, e.g. with rolls, plates, belts, caterpillars
11/0602 . . . . {formed by a casting wheel and belt, e.g. Properzi-process}
11/0605 . . . . {formed by two belts, e.g. Hazelett-process}
11/0608 . . . . {formed by caterpillars}
11/0611 . . . . {formed by a single casting wheel, e.g. for casting amorphous metal strips or wires}
11/0614 . . . . {the casting wheel being immersed in a molten metal bath, and drawing out upwards the casting strip}
11/0617 . . . . {the casting wheel having its axis vertical and a casting strip formed in a peripheral groove of the wheel}
11/062 . . . . {the metal being cast on the inside surface of the casting wheel}
11/0622 . . . . {formed by two casting wheels}
11/0625 . . . . {the two casting wheels being immersed in a molten metal bath and drawing out upwardly the casting strip}
11/0628 . . . . {formed by more than two casting wheels}
11/0631 . . . . {formed by a travelling straight surface, e.g. through-like moulds, a belt}
11/0634 . . . . {formed by a casting wheel and a co-operating shoe}
11/0637 . . . . {Accessories therefor}
11/064 . . . . {for supplying molten metal (supplying molten metal to open-ended moulds B22D 11/10)}
11/0642 . . . . {Nozzles (nozzles used in open-ended moulds B22D 41/50)}
11/0645 . . . . {Sealing means for the nozzle between the travelling surfaces}
11/0648 . . . . {Casting surfaces}
11/0651 . . . . {Casting wheels (B22D 11/0682 takes precedence)}
11/0654 . . . . {Casting belts (B22D 11/0685 takes precedence)}
11/0657 . . . . {Caterpillars (B22D 11/0688 takes precedence)}
11/066 . . . . {Side dams (B22D 11/0691 takes precedence)
11/0662 . . . . {having electromagnetic confining means}
11/0665 . . . . {for treating the casting surfaces, e.g. calibrating, cleaning, dressing, preheating}
11/0668 . . . . {for dressing, coating or lubricating}
11/0671 . . . . {for heating or drying}
11/0674 . . . . {for machining}
11/0677 . . . . {for guiding, supporting or tensioning the casting belts}
11/068 . . . . {for cooling the cast product during its passage through the mould surfaces (cooling open-ended moulds B22D 11/04; secondary cooling B22D 11/124)}
11/0682 . . . . {by cooling the casting wheel}
11/0685 . . . . {by cooling the casting belts (B22D 11/0677 takes precedence)}
11/0688 . . . . {by cooling the caterpillars}
11/0691 . . . . {by cooling the side dams}
11/0694 . . . . {for peeling-off or removing the cast product}
11/0697 . . . . {for casting in a protected atmosphere}
11/07 . . . . Lubricating the moulds
11/08 . . . . Accessories for starting the casting procedure
11/081 . . . . {Starter bars}
11/083 . . . . {Starter bar head; Means for connecting or detaching starter bars and ingots}
11/085 . . . . {Means for storing or introducing the starter bars in the moulds}
11/086 . . . . {Means for connecting cast ingots of different sizes or compositions}
11/088 . . . . {Means for sealing the starter bar head in the moulds}
11/10 . . . . Supplying or treating molten metal (B22D 41/00 takes precedence)
11/103 . . . . Distributing the molten metal, e.g. using runners, floats, distributors
11/106 . . . . Shielding the molten jet ((B22D 41/50 takes precedence)
11/108 . . . . Feeding additives, powders, or the like
11/11 . . . . Treating the molten metal
11/111 . . . . by using protecting powders
11/112 . . . . by accelerated cooling
11/113 . . . . by vacuum treating
11/114 . . . . by using agitating or vibrating means (B22D 11/117 takes precedence)
11/115 . . . . by using magnetic fields
11/116 . . . . Refining the metal
11/117 . . . . by treating with gases (B22D 11/118, B22D 11/119 takes precedence)
11/118 . . . . by circulating the metal under, over or around weirs (B22D 11/119 takes precedence)
11/119 . . . . by filtering
Particular casting processes; Machines or apparatus therefor

11/12 . . . Accessories for subsequent treating or working cast stock in situ (rolling immediately subsequent to continuous casting B21B 1/46, B21B 13/22)

11/1206 . . . (for plastic shaping of strands (rolling mills B21B 1/46))

11/1213 . . . (for heating or insulating strands)

11/122 . . . (using magnetic fields)

11/1226 . . . (for straightening strands)

11/1233 . . . (for marking strands)

11/124 . . . for cooling

11/1241 . . . (for transporting the cast stock through a liquid medium bath or a fluidized bed)

11/1243 . . . (for using cooling grids or cooling plates)

11/1245 . . . (using specific cooling agents)

11/1246 . . . (Nozzles; Spray heads)

11/1248 . . . (Means for removing cooling agent from the surface of the cast stock)

11/126 . . . for cutting

11/1265 . . . (having auxiliary devices for deburring)

11/128 . . . for removing

11/1281 . . . (Vertical removing)

11/1282 . . . (Vertical casting and curving the cast stock to the horizontal)

11/1284 . . . (Horizontal removing)

11/1285 . . . (Segment changing devices for supporting or guiding frames)

11/1287 . . . (Rolls; Lubricating, cooling or heating rolls while in use)

11/1288 . . . (Walking bar members)

11/14 . . . Plants for continuous casting

11/141 . . . (for vertical casting)

11/142 . . . (for curved casting)

11/143 . . . (for horizontal casting)

11/144 . . . (with a rotating mould)

11/145 . . . (for upward casting)

11/146 . . . (for inclined casting)

11/147 . . . (Multi-strand plants)

11/148 . . . (Safety arrangements)

11/16 . . . Controlling or regulating processes or operations

11/161 . . . (for automatic starting the casting process)

11/163 . . . (for cutting cast stock)

11/165 . . . (for the supply of casting powder)

11/166 . . . (for mould oscillation)

11/168 . . . (for adjusting the mould size or mould taper)

11/18 . . . for pouring (B22D 11/20 takes precedence)

11/181 . . . (responsive to molten metal level or slag level)

11/182 . . . (by measuring temperature)

11/183 . . . (by measuring molten metal weight)

11/185 . . . (by using optical means)

11/186 . . . (by using electric, magnetic, sonic or ultrasonic means)

11/187 . . . (by using X-rays or nuclear radiation)

11/188 . . . (responsive to thickness of solidified shell)

11/20 . . . for removing cast stock

11/201 . . . (responsive to molten metal level or slag level)

11/202 . . . (by measuring temperature)

11/203 . . . (by measuring molten metal weight)

11/204 . . . (by using optical means)

11/205 . . . (by using electric, magnetic, sonic or ultrasonic means)

11/206 . . . (by using X-rays or nuclear radiation)

11/207 . . . (responsive to thickness of solidified shell)

11/208 . . . (for aligning the guide rolls)

11/22 . . . for cooling cast stock or mould

11/225 . . . (for secondary cooling)

13/00 Centrifugal casting; Casting by using centrifugal force

13/02 . . . of elongated solid or hollow bodies, e.g. pipes, in moulds rotating around their longitudinal axis

13/023 . . . (the longitudinal axis being horizontal)

13/026 . . . (the longitudinal axis being vertical)

13/04 . . . of shallow solid or hollow bodies, e.g. wheels or rings, in moulds rotating around their axis of symmetry

13/06 . . . of solid or hollow bodies in moulds rotating around an axis arranged outside the mould

13/063 . . . (for dentistry or jewellery)

13/066 . . . (several moulds being disposed in a circle)

13/08 . . . in which a stationary mould is fed from a rotating mass of liquid metal

13/10 . . . Accessories for centrifugal casting apparatus, e.g. moulds, liners therefrom, means for feeding molten metal, cleansing moulds, removing castings (making or lining moulds B22C)

13/101 . . . (Moulds)

13/102 . . . (Linings for moulds (making or lining moulds B22C))

13/104 . . . (Cores)

13/105 . . . (Cooling for moulds or cores)

13/107 . . . (Means for feeding molten metal)

13/108 . . . (Removing of casting)

13/12 . . . Controlling, supervising, specially adapted to centrifugal casting, e.g. for safety reasons (controlling or regulating in general G05)

15/00 Casting using a mould or core of which a part significant to the process is of high thermal conductivity, e.g. chill casting; Moulds or accessories specially adapted therefor

15/005 . . . (of rolls, wheels or the like (B22D 19/16 takes precedence))

15/02 . . . of cylinders, pistons, bearing shells or like thin-walled objects

15/04 . . . Machines or apparatus for chill casting ((B22D 15/005). B22D 15/02 take precedence)

17/00 Pressure die casting or injection die casting, i.e. casting in which the metal is forced into a mould under high pressure

17/002 . . . (using movable moulds (for plastics B29C 45/04))

17/005 . . . (using two or more fixed moulds (for plastics B29C 45/12))

17/007 . . . (Semi-solid pressure die casting)

17/02 . . . Hot chamber machines, i.e. with heated press chamber in which metal is melted

17/04 . . . Plunger machines

17/06 . . . Air injection machines

17/08 . . . Cold chamber machines, i.e. with unheated press chamber into which molten metal is ladled

17/10 . . . with horizontal press motion

17/12 . . . with vertical press motion

17/14 . . . Machines with evacuated die cavity

17/145 . . . (Venting means therefor (for permanent moulds B29C 9/067))

17/16 . . . specially adapted for casting slide fasteners or elements therefor
Particular casting processes; Machines or apparatus therefor

17/18 . Machines built up from units providing for different combinations
17/20 . Accessories: Details
17/2007 . [Methods or apparatus for cleaning or lubricating moulds]
17/2015 . [Means for forcing the molten metal into the die (for plastics B29C 45/46)]
17/2023 . [Nozzles or shot sleeves]
17/203 . [Injection pistons (B22D 17/2053 takes precedence; for plastics B29C 45/53)]
17/2038 . [Heating, cooling or lubricating the injection unit (for plastics B29C 45/74, B29C 45/83)]
17/2046 . [with provisions for damping the pressure peak]
17/2053 . [using two or more cooperating injection pistons]
17/2061 . [using screws]
17/2069 . [Exerting after-pressure on the moulding material]
17/2076 . [Cutting-off equipment for sprues or ingates (for plastics B29C 45/38)]
17/2084 . [Manipulating or transferring devices for evacuating cast pieces]
17/2092 . [Safety devices (for plastics B29C 45/84)]
17/22 . [Dies (manufacture, see the appropriate class, e.g. B23P 15/24); Die plates; Die supports; Cooling equipment for dies; Accessories for loosening and ejecting castings from dies]
17/2209 . [Selection of die materials (for permanent moulds B22C 9/061)]
17/2218 . [Cooling or heating equipment for dies (for permanent moulds B22C 9/065; for plastics B29C 45/73)]
17/2227 . [Die seals (for plastics B29C 45/2608)]
17/2236 . [Equipment for loosening or ejecting castings from dies (for plastics B29C 45/40)]
17/2245 . [having walls provided with means for marking or patterning]
17/2254 . [having screw-threaded die walls]
17/2263 . [having tubular die cavities]
17/2272 . [Sprue channels]
17/2281 . [Closure devices therefor]
17/229 . [with exchangeable die part (B22D 17/2245 takes precedence)]
17/24 . Accessories for locating and holding cores or inserts
17/26 . [Mechanisms or devices for locking or opening dies]
17/263 . [mechanically]
17/266 . [hydraulically]
17/28 . [Melting pots]
17/30 . [Accessories for supplying molten metal, e.g. in rations (supplying molten metal in ration in general B22D 39/00)]
17/32 . [Controlling equipment]
18/00 . Pressure casting; Vacuum casting (B22D 17/00 takes precedence; treating the metal in the mould by using pressure or vacuum B22D 27/00)
18/02 . Pressure casting making use of mechanical pressure devices, e.g. cast-forging (B22D 18/04 takes precedence)
18/04 . Low pressure casting, i.e. making use of pressures up to a few bars to fill the mould
18/06 . Vacuum casting, i.e. making use of vacuum to fill the mould
18/08 . Controlling, supervising, e.g. for safety reasons (controlling or regulating in general G05)
19/00 . Casting in, on, or around objects which form part of the product (B22D 23/04 takes precedence; aluminio-thermic welding B23K 23/00; coating by casting molten metal on the substrate C23C 6/00)
19/0009 . [Cylinders, pistons]
19/0018 . [cylinders with fins]
19/0027 . [pistons]
19/0036 . [gears]
19/0045 . [household utensils]
19/0054 . [rotors, stators for electrical motors]
19/0063 . [finned exchangers (cylinders B22D 19/0018)]
19/0072 . [for making objects with integrated channels]
19/0081 . [pretreatment of the insert, e.g. for enhancing the bonding between insert and surrounding cast metal]
19/009 . [for casting objects the members of which can be separated afterwards]
19/02 . [for making reinforced articles (B22D 19/14 takes precedence)]
19/04 . [for joining parts]
19/045 . [for joining tubes]
19/06 . [for manufacturing or repairing tools]
19/08 . [for building-up linings or coverings, e.g. of anti-frictional metal]
19/085 . [of anti-frictional metal]
19/10 . Repairing defective or damaged objects by metal casting procedures (by other procedures B23P 6/04; ingot mould B22D 7/06; B22D 19/06 takes precedence)
19/12 . [for making objects, e.g. hinges, with parts which are movable relatively to one another]
19/14 . the objects being filamentary or particulate in form (making alloys containing fibres or filaments by contacting the fibres or filaments with molten metal C22C 47/08)
19/16 . [for making compound objects cast of two or more different metals, e.g. for making rolls for rolling mills (casting compound ingots B22D 7/02)]
21/00 . Casting non-ferrous metals or metallic compounds so far as their metallurgical properties are of importance for the casting procedure; Selection of compositions therefor ([non-ferrous ingots B22D 7/005])
21/002 . [Castings of light metals]
21/005 . [with high melting point, e.g. Be 1280 degrees C, Ti 1725 degrees C]
21/007 . [with low melting point, e.g. Al 659 degrees C, Mg 650 degrees C]
21/02 . Casting exceedingly oxidisable non-ferrous metals, e.g. in inert atmosphere (use of inert atmosphere in casting metals in general B22D 23/00; apparatus for vacuum casting B22D 27/15)
21/022 . [Casting heavy metals, with exceedingly high melting points, i.e. more than 1600 degrees C, e.g. W 3380 degrees C, Ta 3000 degrees C, Mo 2620 degrees C, Zr 1860 degrees C, Cr 1765 degrees C, V 1715 degrees C]
Particular casting processes; Machines or apparatus therefor

B22D

21/025 . . . (Casting heavy metals with high melting point, i.e. 1000 - 1600 degrees C, e.g. Co 1490 degrees C, Ni 1450 degrees C, Mn 1240 degrees C, Cu 1083 degrees C)
21/027 . . . (Casting heavy metals with low melting point, i.e. less than 1000 degrees C, e.g. Zn 419 degrees C, Pb 327 degrees C, Sn 232 degrees C)
21/04 . . . Casting aluminium or magnesium { (no material; see B22D 21/007)
21/06 . . . Casting non-ferrous metals with a high melting point, e.g. metallic carbides (B22D 21/02 takes precedence)

23/00 Casting processes not provided for in groups B22D 1/00 - B22D 21/00 (making metallic powder by casting B22F 9/08; aluminothermic welding B23K 23/00; remelting metals C22B 9/16)
23/003 . . . (Moulding by spraying metal on a surface)
23/006 . . . (Casting by filling the mould through rotation of the mould together with a molten metal holding recipient, about a common axis)
23/02 . . . Top casting
23/04 . . . Casting by dipping (hot-dipping or immersion processes for applying coating material in the molten state without affecting the shape C23C 2/00)
23/06 . . . Melting-down metal, e.g. metal particles, in the mould
23/10 . . . Electroslag casting (electroslag remelting C22B 9/18)

25/00 Special casting characterised by the nature of the product (B22D 15/02, B22D 17/16, B22D 19/00 take precedence; casting stereotype plates B41D 3/00)
25/005 . . . (Casting metal foams)
25/02 . . . by its peculiarity of shape; of works of art (cylinders, pistons B22D 15/02)
25/023 . . . (Casting chains or the like)
25/026 . . . (Casting jewelry articles (B22D 13/063 takes precedence))
25/04 . . . Casting metal electric battery plates or the like (manufacture thereof by multi-step processes H01M 4/82)
25/06 . . . by its physical properties (B22D 27/00 takes precedence)
25/08 . . . by uniform hardnes (B22D 15/00 takes precedence)

27/00 Treating the metal in the mould while it is molten or ductile (B22D 7/12, B22D 11/10, B22D 43/00 take precedence); {Pressure or vacuum casting (B22D 17/00 takes precedence)}
27/003 . . . (by using inert gases)
27/006 . . . (by using reactive gases)
27/02 . . . Use of electric or magnetic effects { (for continuous casting B22D 11/015, B22D 11/11)}
27/04 . . . Influencing the temperature of the metal, e.g. by heating or cooling the mould
27/045 . . . {Directionally solidified castings}
27/06 . . . Heating the top discard of ingots (hot tops for ingot moulds B22D 7/10)
27/08 . . . Shaking, vibrating, or turning of moulds
27/09 . . . by using pressure
27/11 . . . making use of mechanical pressing devices
27/13 . . . making use of gas pressure
27/15 . . . by using vacuum

27/18 . . . Measures for using chemical processes for influencing the surface composition of castings, e.g. for increasing resistance to acid attack
27/20 . . . Measures not previously mentioned for influencing the grain structure or texture; Selection of compositions therefor

Final measures after casting (cleaning of castings by sand-blasting B24C)

29/00 Removing castings from moulds, not restricted to casting processes covered by a single main group; Removing cores; Handling ingots (B22D 13/10, B22D 1/124, B22D 17/00 take precedence)
29/001 . . . (Removing cores)
29/002 . . . (by leaching, washing or dissolving)
29/003 . . . (using heat)
29/005 . . . (by vibrating or hammering)
29/006 . . . (by abrasive, water or air blasting)
29/007 . . . (by using explosive shock waves)
29/008 . . . (in a liquid medium)
29/02 . . . Vibratory apparatus specially designed for shaking out flasks
29/04 . . . Handling or stripping castings or ingots (grippers in general, see the relevant subclasses, e.g. B66C)
29/06 . . . Strippers actuated by fluid pressure
29/08 . . . Strippers actuated mechanically

30/00 Cooling castings, not restricted to casting processes covered by a single main group (accessories for cooling cast stock in continuous casting of metals B22D 1/124; controlling or regulating processes or operations for cooling cast stock or mould or continuous casting of metals B22D 11/22; chill casting B22D 15/00)
31/00 Cutting-off surplus material, e.g. gates; {Cleaning and working on castings (B22D 17/2076 takes precedence)}
31/002 . . . (Cleaning, working on castings)
31/005 . . . (Sealing or impregnating porous castings)
31/007 . . . (Tumbling mills)

Other equipment for casting (arrangement of indicating or measuring devices B22D 2/00)

33/00 Equipment for handling moulds
33/005 . . . (Transporting flaskless moulds)
33/02 . . . Turning or transposing moulds
33/04 . . . Bringing together or separating moulds
33/06 . . . Burdening or relieving moulds

35/00 Equipment for conveying molten metal into beds or moulds (B22D 37/00 - B22D 41/00 take precedence; specially adapted to particular processes or machines, see the relevant groups)
35/02 . . . into beds
35/04 . . . into moulds, e.g. base plates, runners
35/045 . . . (Runner base plates for bottom casting ingots)
35/06 . . . Heating or cooling equipment

37/00 Controlling or regulating the pouring of molten metal from a casting melt-holding vessel (B22D 11/18 takes precedence) B22D 39/00, B22D 41/00 take precedence; specially adapted to particular processes or machines, see the relevant groups of this subclass)
Other equipment for casting  

B22D

37/005 . [Shielding the molten metal stream (B22D 11/106, B22D 41/50 take precedence)]

39/00 Equipment for supplying molten metal in rations  
(specially adapted to particular processes or machines, see the relevant groups of this subclass)

39/003 . [using electromagnetic field]
39/006 . [Electromagnetic conveyors]
39/02 . having means for controlling the amount of molten metal by volume
39/023 . [using a displacement member]
39/026 . [using a ladle]
39/04 . having means for controlling the amount of molten metal by weight
39/06 . having means for controlling the amount of molten metal by controlling the pressure above the molten metal

41/00 Casting melt-holding vessels, e.g. ladles, tundishes, cups or the like (B22D 39/00, B22D 43/00 take precedence)

41/001 . [devices for cleaning ladles (cleaning in general B08B)]
41/003 . [with impact pads]
41/005 . with heating or cooling means
41/01 . Heating means
41/015 . . . with external heating, i.e. the heat source not being a part of the ladle
41/02 . Linings
41/023 . . . (Apparatus used for making or repairing linings (equipment used for making or repairing converter linings C21C 5/441)]
41/026 . . . (Apparatus used for fracturing and removing of linings)
41/04 . tiltable
41/05 . . . Tea-pot spout ladles
41/06 . Equipment for tilting
41/08 . . . for bottom pouring (B22D 41/14, B22D 41/50 take precedence)
41/12 . Travelling ladles or similar containers; Cars for ladles (casting cranes B66C)
41/13 . . . Ladle turrets
41/14 . . . Closures
41/16 . . . stopper-rod type, i.e. a stopper-rod being positioned downwardly through the vessel and the metal therein, for selective registry with the pouring opening
41/18 . . . Stopper-rods therefor
41/183 . . . . . . [with cooling means]
41/186 . . . . . . [with means for injecting a fluid into the melt]
41/20 . . . Stopper-rod operating equipment
41/22 . . . sliding-gate type, i.e. having a fixed plate and a movable plate in sliding contact with each other for selective registry of their openings
41/24 . . . characterised by a rectilinearly movable plate (B22D 41/38 - B22D 41/42 take precedence)
41/26 . . . characterised by a rotatively movable plate (B22D 41/38 - B22D 41/42 take precedence)
41/28 . . . Plates therefor (B22D 41/38 - B22D 41/42 take precedence)
41/30 . . . Manufacturing or repairing thereof
41/32 . . . characterised by the materials used therefor

41/34 . . . . Supporting, fixing or centering means therefor
41/36 . . . . Treating the plates, e.g. lubricating, heating (ladles, cups or the like with heating means B22D 41/01)
41/38 . . . Means for operating the sliding gate
41/40 . . . Means for pressing the plates together
41/42 . . . Features relating to gas injection
41/44 . . . Consumable closure means, i.e. closure means being used only once
41/46 . . . Refractory plugging masses
41/465 . . . . [Unplugging a vessel discharge port]
41/48 . . . Meltable closures
41/50 . . . Pouring-nozzles
41/502 . . . . [Connection arrangements; Sealing means therefor]
41/505 . . . . [Rings, inserts or other means preventing external nozzle erosion by the slag]
41/507 . . . . [giving a rotating motion to the issuing molten metal]
41/52 . . . Manufacturing or repairing thereof
41/54 . . . characterised by the materials used therefor
41/56 . . . Means for supporting, manipulating or changing a pouring-nozzle
41/58 . . . . with gas injecting means
41/60 . . . . with heating or cooling means
41/62 . . . . with stirring or vibrating means

43/00 Mechanical cleaning, e.g. skimming of molten metals

43/001 . . . [Retaining slag during pouring molten metal]
43/002 . . . . [by using floating means]
43/004 . . . . [by using filtering means (B22C 9/086 takes precedence)]
43/005 . . . [Removing slag from a molten metal surface]
43/007 . . . . [by using scrapers]
43/008 . . . . . [by suction]

45/00 Equipment for casting, not otherwise provided for

45/005 . . . . . [Evacuation of fumes, dust or waste gases during manipulations in the foundry (during steel manufacture C21C 5/38; evacuation from furnaces F27D 17/001)]

46/00 Controlling, supervising, not restricted to casting covered by a single main group, e.g. for safety reasons (controlling or regulating in general G05)

47/00 Casting plants

47/02 . . . . for both moulding and casting