

# 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.

|  |   |  |   |
|--|---|--|---|
| 1/00   | Treatment of fused masses in the ladle or the supply runners before casting {(for continuous casting <a href="#">B22D 11/10</a> ; metallurgical processing, e.g. refining of iron or other metal <a href="#">C21</a> , <a href="#">C22</a> , <a href="#">C25C</a> )}                    | <u>Casting of ingots, i.e. metal castings suitable for subsequently rolling or forging</u> |   |
| 1/002  | . {Treatment with gases ( <a href="#">C21C 7/072</a> , <a href="#">C22B 9/05</a> take precedence)}  | 7/00   | Casting ingots, {e.g. from ferrous metals}(equipment for conveying molten metal <a href="#">B22D 35/00</a> )            |
| 1/005  | . . {Injection assemblies therefor (features relating to gas injection, provided on closures of the sliding gate type <a href="#">B22D 41/42</a> ; provided on pouring nozzles <a href="#">B22D 41/58</a> ; provided on closures of the stopper-rod type <a href="#">B22D 41/186</a> )} | 7/005  | . {from non-ferrous metals}   |
|  |   | 7/02   | . Casting compound ingots of two or more different metals in the molten state, i.e. integrally cast                     |
|  |   | 7/04   | . Casting hollow ingots   |
|  |   | 7/06   | . Ingot moulds or their manufacture   |
| 1/007  | . {Treatment of the fused masses in the supply runners ( <a href="#">B22D 1/002</a> , <a href="#">B22D 1/005</a> take precedence)}  | 7/062  | . . {Stools for ingot moulds}   |
|  |   | 7/064  | . . {Cooling the ingot moulds}  |
|  |   | 7/066  | . . {Manufacturing, repairing or reinforcing ingot moulds}  |
| 2/00   | Arrangement of indicating or measuring devices, e.g. for temperature or viscosity of the fused mass   | 7/068  | . . . {characterised by the materials used therefor}  |
| 2/001  | . {for the slag appearance in a molten metal stream}  | 7/08   | . . Divided ingot moulds  |
| 2/003  | . {for the level of the molten metal ( <a href="#">B22D 11/181</a> and <a href="#">B22D 11/201</a> take precedence; level indicators in general <a href="#">G01F 23/00</a> )}   | 7/10   | . . Hot tops therefor {(heating the top discard of ingots <a href="#">B22D 27/06</a> )}                                 |
|  |   | 7/102  | . . . {from refractorial material only}   |
| 2/005  | . {for the thickness of a frozen shell ( <a href="#">B22D 11/188</a> and <a href="#">B22D 11/207</a> take precedence)}  | 7/104  | . . . {from exothermic material only}   |
| 2/006  | . {for the temperature of the molten metal (measuring temperature in general <a href="#">G01K</a> )}  | 7/106  | . . . {Configuration of hot tops}   |
|  |   | 7/108  | . . . {Devices for making or fixing hot tops}   |
| 2/008  | . {for the viscosity of the molten metal (measuring viscosity in general <a href="#">G01N 11/00</a> )}  | 7/12   | . Appurtenances, e.g. for sintering, for preventing splashing   |
| <u>Casting of pigs, i.e. metal castings suitable for subsequently melting; similar casting</u> |   | 9/00   | Machines or plants for casting ingots   |
|  |   | 9/003  | . {for top casting}   |
|  |   | 9/006  | . {for bottom casting}  |
| 3/00   | Pig or like casting (equipment for conveying molten metal <a href="#">B22D 35/00</a> )  | <u>Particular casting processes; Machines or apparatus therefor</u>                        |   |
| 3/02   | . Moulding of beds  | 11/00  | Continuous casting of metals, i.e. casting in indefinite lengths (metal drawing, metal extruding <a href="#">B21C</a> ) |
| 5/00   | Machines or plants for pig or like casting  | 11/001   | . {of specific alloys}  |
| 5/005  | . {Devices for stacking pigs; Pigforms to be stacked}   | 11/002   | . . {Stainless steels}  |
| 5/02   | . with rotary casting tables  | 11/003   | . . {Aluminium alloys}  |
| 5/04   | . with endless casting conveyors  | 11/004   | . . {Copper alloys}   |
|  |   | 11/005   | . {of wire (casting on wire <a href="#">B22D 19/14</a> )}   |
|  |   | 11/006   | . {of tubes}  |

- 11/007 . {of composite ingots, i.e. two or more molten metals of different compositions being used to integrally cast the ingots ([casting of composite ingots in definite lengths B22D 7/02](#))}
- 11/008 . {of clad ingots, i.e. the molten metal being cast against a continuous strip forming part of the cast product}
- 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 upwardly 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](#) take precedence)
- 11/118 . . . . by circulating the metal under, over or around weirs ([B22D 11/119](#) takes precedence)
- 11/119 . . . . by filtering
- 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 . . . {by transporting the cast stock through a liquid medium bath or a fluidized bed}
- 11/1243 . . . {by 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, linings therefor, 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 [B22C 9/067](#))}
- 17/16 . specially adapted for casting slide fasteners or elements 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; alumino-thermic welding [B23K 23/00](#); coating by casting molten material 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](#))



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|--------|--|---|--|
| 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} | 27/09   | . by using pressure  |
| 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}  | 27/11   | . . making use of mechanical pressing devices  |
| 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}  | 27/13   | . . making use of gas pressure   |
| 21/04  | . . Casting aluminium or magnesium {(no material; see B22D 21/007)}  | 27/15   | . by using vacuum  |
| 21/06  | . Casting non-ferrous metals with a high melting point, e.g. metallic carbides (B22D 21/02 takes precedence)   | 27/18   | . Measures for using chemical processes for influencing the surface composition of castings, e.g. for increasing resistance to acid attack   |
| 23/00  | <b>Casting processes not provided for in groups B22D 1/00 - B22D 21/00</b> (making metallic powder by casting B22F 9/08; alumino-thermic welding B23K 23/00; remelting metals C22B 9/16)                             | 27/20   | . Measures not previously mentioned for influencing the grain structure or texture; Selection of compositions therefor   |
| 23/003 | . {Moulding by spraying metal on a surface}  | <b>Final measures after casting</b> (cleaning of castings by sand-blasting B24C)              |  |
| 23/006 | . {Casting by filling the mould through rotation of the mould together with a molten metal holding recipient, about a common axis}   | 29/00   | <b>Removing castings from moulds, not restricted to casting processes covered by a single main group; Removing cores; Handling ingots</b> {(B22D 13/10, B22D 11/124, B22D 17/00 take precedence)}  |
| 23/02  | . Top casting  | 29/001  | . {Removing cores}   |
| 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)  | 29/002  | . . {by leaching, washing or dissolving}   |
| 23/06  | . Melting-down metal, e.g. metal particles, in the mould   | 29/003  | . . {using heat}   |
| 23/10  | . . Electroslag casting {(electroslag remelting C22B 9/18)}  | 29/005  | . . {by vibrating or hammering}  |
| 25/00  | <b>Special casting characterised by the nature of the product</b> (B22D 15/02, B22D 17/16, B22D 19/00 take precedence; casting stereotype plates B41D 3/00)  | 29/006  | . . {by abrasive, water or air blasting}   |
| 25/005 | . {Casting metal foams}  | 29/007  | . . {by using explosive shock waves}   |
| 25/02  | . by its peculiarity of shape; of works of art {(cylinders, pistons B22D 15/02)}   | 29/008  | . . . {in a liquid medium}   |
| 25/023 | . . {Casting chains or the like}   | 29/02   | . Vibratory apparatus specially designed for shaking out flasks  |
| 25/026 | . . {Casting jewelry articles (B22D 13/063 takes precedence)}  | 29/04   | . Handling or stripping castings or ingots (grippers in general, see the relevant subclasses, e.g. B66C)   |
| 25/04  | . . Casting metal electric battery plates or the like (manufacture thereof by multi-step processes H01M 4/82)  | 29/06   | . . Strippers actuated by fluid pressure   |
| 25/06  | . by its physical properties (B22D 27/00 takes precedence)   | 29/08   | . . Strippers actuated mechanically  |
| 25/08  | . . by uniform hardness (B22D 15/00 takes precedence)  | 30/00   | <b>Cooling castings, not restricted to casting processes covered by a single main group</b> (accessories for cooling cast stock in continuous casting of metals B22D 11/124; controlling or regulating processes or operations for cooling cast stock or mould in continuous casting of metals B22D 11/22; chill casting B22D 15/00) |
| 27/00  | <b>Treating the metal in the mould while it is molten or ductile</b> (B22D 7/12, B22D 11/10, B22D 43/00 take precedence); {Pressure or vacuum casting (B22D 17/00 takes precedence)}                                 | 31/00   | <b>Cutting-off surplus material, e.g. gates; {Cleaning and working on castings</b> (B22D 17/2076 takes precedence)}  |
| 27/003 | . {by using inert gases}   | 31/002  | . {Cleaning, working on castings}  |
| 27/006 | . {by using reactive gases}  | 31/005  | . . {Sealing or impregnating porous castings}  |
| 27/02  | . Use of electric or magnetic effects {(for continuous casting B22D 11/015, B22D 11/11)}   | 31/007  | . . {Tumbling mills}   |
| 27/04  | . Influencing the temperature of the metal, e.g. by heating or cooling the mould   | <b>Other equipment for casting</b> (arrangement of indicating or measuring devices B22D 2/00) |  |
| 27/045 | . . {Directionally solidified castings}  | 33/00   | <b>Equipment for handling moulds</b>   |
| 27/06  | . . Heating the top discard of ingots (hot tops for ingot moulds B22D 7/10)  | 33/005  | . {Transporting flaskless moulds}  |
| 27/08  | . Shaking, vibrating, or turning of moulds   | 33/02   | . Turning or transposing moulds  |
|        |  | 33/04   | . Bringing together or separating moulds   |
|        |  | 33/06   | . Burdening or relieving moulds  |
|        |  | 35/00   | <b>Equipment for conveying molten metal into beds or moulds</b> (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   |

|              |   |              |  |
|--------------|---|--------------|--|
| <b>37/00</b> | <b>Controlling or regulating the pouring of molten metal from a casting melt-holding vessel</b><br>( <a href="#">B22D 11/18</a> takes precedence) <a href="#">B22D 39/00</a> , <a href="#">B22D 41/00</a> take precedence; specially adapted to particular processes or machines, <a href="#">see</a> the relevant groups of this subclass) | 41/28        | . . . Plates therefor ( <a href="#">B22D 41/38</a> - <a href="#">B22D 41/42</a> take precedence)   |
| 37/005       | . {Shielding the molten metal stream ( <a href="#">B22D 11/106</a> , <a href="#">B22D 41/50</a> take precedence)}   | 41/30        | . . . . Manufacturing or repairing thereof   |
| <b>39/00</b> | <b>Equipment for supplying molten metal in rations</b><br>(specially adapted to particular processes or machines, <a href="#">see</a> the relevant groups of this subclass)   | 41/32        | . . . . characterised by the materials used therefor   |
| 39/003       | . {using electromagnetic field}   | 41/34        | . . . . Supporting, fixing or centering means therefor   |
| 39/006       | . . {Electromagnetic conveyors}   | 41/36        | . . . . Treating the plates, e.g. lubricating, heating ( <a href="#">ladles, cups or the like with heating means B22D 41/01</a> )  |
| 39/02        | . having means for controlling the amount of molten metal by volume   | 41/38        | . . . Means for operating the sliding gate   |
| 39/023       | . . {using a displacement member}   | 41/40        | . . . Means for pressing the plates together   |
| 39/026       | . . {using a ladler}  | 41/42        | . . . Features relating to gas injection   |
| 39/04        | . having means for controlling the amount of molten metal by weight   | 41/44        | . . Consumable closure means, i.e. closure means being used only once  |
| 39/06        | . having means for controlling the amount of molten metal by controlling the pressure above the molten metal  | 41/46        | . . . Refractory plugging masses   |
| <b>41/00</b> | <b>Casting melt-holding vessels, e.g. ladles, tundishes, cups or the like</b> ( <a href="#">B22D 39/00</a> , <a href="#">B22D 43/00</a> take precedence)  | 41/465       | . . . . {Unplugging a vessel discharge port}   |
| 41/001       | . {devices for cleaning ladles (cleaning in general <a href="#">B08B</a> )}   | 41/48        | . . . Meltable closures  |
| 41/003       | . {with impact pads}  | 41/50        | . Pouring-nozzles  |
| 41/005       | . with heating or cooling means   | 41/502       | . . {Connection arrangements; Sealing means therefor}  |
| 41/01        | . . Heating means   | 41/505       | . . {Rings, inserts or other means preventing external nozzle erosion by the slag}   |
| 41/015       | . . . with external heating, i.e. the heat source not being a part of the ladle   | 41/507       | . . {giving a rotating motion to the issuing molten metal}   |
| 41/02        | . Linings   | 41/52        | . . Manufacturing or repairing thereof   |
| 41/023       | . . {Apparatus used for making or repairing linings (equipment used for making or repairing converter linings <a href="#">C21C 5/441</a> )}   | 41/54        | . . . characterised by the materials used therefor   |
| 41/026       | . . {Apparatus used for fracturing and removing of linings}   | 41/56        | . . Means for supporting, manipulating or changing a pouring-nozzle  |
| 41/04        | . tiltable  | 41/58        | . . with gas injecting means   |
| 41/05        | . . Tea-pot spout ladles  | 41/60        | . . with heating or cooling means  |
| 41/06        | . Equipment for tilting   | 41/62        | . . with stirring or vibrating means   |
| 41/08        | . for bottom pouring ( <a href="#">B22D 41/14</a> , <a href="#">B22D 41/50</a> take precedence)   | <b>43/00</b> | <b>Mechanical cleaning, e.g. skimming of molten metals</b>   |
| 41/12        | . Travelling ladles or similar containers; Cars for ladles ( <a href="#">casting cranes B66C</a> )  | 43/001       | . {Retaining slag during pouring molten metal}   |
| 41/13        | . . Ladle turrets   | 43/002       | . . {by using floating means}  |
| 41/14        | . Closures  | 43/004       | . . {by using filtering means ( <a href="#">B22C 9/086</a> takes precedence)}  |
| 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  | 43/005       | . {Removing slag from a molten metal surface}  |
| 41/18        | . . . Stopper-rods therefor   | 43/007       | . . {by using scrapers}  |
| 41/183       | . . . . {with cooling means}  | 43/008       | . . {by suction}   |
| 41/186       | . . . . {with means for injecting a fluid into the melt}  | <b>45/00</b> | <b>Equipment for casting, not otherwise provided for</b>   |
| 41/20        | . . . Stopper-rod operating equipment   | 45/005       | . {Evacuation of fumes, dust or waste gases during manipulations in the foundry ( <a href="#">during steel manufacture C21C 5/38</a> ; evacuation from furnaces <a href="#">F27D 17/001</a> )} |
| 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  | <b>46/00</b> | <b>Controlling, supervising, not restricted to casting covered by a single main group, e.g. for safety reasons</b> ( <a href="#">controlling or regulating in general G05</a> )                |
| 41/24        | . . . characterised by a rectilinearly movable plate ( <a href="#">B22D 41/38</a> - <a href="#">B22D 41/42</a> take precedence)   | <b>47/00</b> | <b>Casting plants</b>  |
| 41/26        | . . . characterised by a rotatively movable plate ( <a href="#">B22D 41/38</a> - <a href="#">B22D 41/42</a> take precedence)  | 47/02        | . for both moulding and casting  |