

CPC**COOPERATIVE PATENT CLASSIFICATION****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).

B22D 1/00

Treatment of fused masses in the ladle or the supply runners before casting {(for continuous casting [B22D 11/10](#); metallurgical processing, e.g. refining of iron or other metal C21, C22, C25C)}

B22D 1/002

. {Treatment with gases ([C21C 7/072](#), [C22B 9/05](#) take precedence)}

B22D 1/005

. . {Injection assemblies therefor (features relating to gas injection, provided on closures of the sliding gate type [B22D 41/42](#); provided on pouring nozzles [B22D 41/58](#); provided on closures of the stopper-rod type [B22D 41/186](#))}

B22D 1/007

. {Treatment of the fused masses in the supply runners ([B22D 1/002](#), [B22D 1/005](#) take precedence)}

B22D 2/00

Arrangement of indicating or measuring devices, e.g. for temperature or viscosity of the fused mass.

B22D 2/001

. {for the slag appearance in a molten metal stream}

B22D 2/003

. {for the level of the molten metal ([B22D 11/181](#) and [B22D 11/201](#) take precedence; level indicators in general G01F23)}

B22D 2/005

. {for the thickness of a frozen shell ([B22D 11/188](#) and [B22D 11/207](#) take precedence)}

B22D 2/006

. {for the temperature of the molten metal (measuring temperature in general G01K)}

B22D 2/008

. {for the viscosity of the molten metal (measuring viscosity in general G01N11)}

Casting of pigs, i.e. metal castings suitable for subsequently melting; similar casting

B22D 3/00

Pig or like casting (equipment for conveying molten metal [B22D 35/00](#))

B22D 3/02

. Moulding of beds

B22D 5/00

Machines or plants for pig or like casting

B22D 5/005

. {Devices for stacking pigs; Pigforms to be stacked}

B22D 5/02

. with rotary casting tables

- B22D 5/04 . with endless casting conveyers

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

B22D 7/00 **Casting ingots, {e.g. from ferrous metals}(equipment for conveying molten metal [B22D 35/00](#)).**

- B22D 7/005 . {from non-ferrous metals}
- B22D 7/02 . Casting compound ingots of two or more different metals in the molten state, i.e. integrally cast
- B22D 7/04 . Casting hollow ingots
- B22D 7/06 . Ingot moulds or their manufacture
 - B22D 7/062 .. {Stools for ingot moulds}
 - B22D 7/064 .. {Cooling the ingot moulds}
 - B22D 7/066 .. {Manufacturing, repairing or reinforcing ingot moulds}
 - B22D 7/068 ... {characterised by the materials used therefor}
 - B22D 7/08 .. Divided ingot moulds
 - B22D 7/10 .. Hot tops therefor {heating the top discard of ingots [B22D 27/06](#) 06}
 - B22D 7/102 ... {from refractorial material only}
 - B22D 7/104 ... {from exothermic material only}
 - B22D 7/106 ... {Configuration of hot tops}
 - B22D 7/108 ... {Devices for making or fixing hot tops}
- B22D 7/12 . Appurtenances, e.g. for sintering, for preventing splashing

B22D 9/00 **Machines or plants for casting ingots**

- B22D 9/003 . {for top casting}
- B22D 9/006 . {for bottom casting}

Particular casting processes; Machines or apparatus therefor

B22D 11/00 **Continuous casting of metals, i.e. casting in indefinite lengths (metal drawing, metal extruding [B21C](#))**

- B22D 11/001 . {of specific alloys}
- B22D 11/002 .. {Stainless steels}
- B22D 11/003 .. {Aluminium alloys}
- B22D 11/004 .. {Copper alloys}

- B22D 11/005 . {of wire (casting on wire [B22D 19/14](#))}
- B22D 11/006 . {of tubes}
- B22D 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](#))}
- B22D 11/008 . {of clad ingots, i.e. the molten metal being cast against a continuous strip forming part of the cast product}
- B22D 11/009 . {of work of special cross-section, e.g. I-beams, U-profiles}
- B22D 11/01 . without moulds, e.g. on molten surfaces
- B22D 11/015 .. {using magnetic field for conformation, i.e. the metal is not in contact with a mould}
- B22D 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](#))
- B22D 11/0401 .. {Moulds provided with a feed head}
- B22D 11/0403 .. {Multiple moulds}
- B22D 11/0405 .. {Rotating moulds}
- B22D 11/0406 .. {Moulds with special profile}
- B22D 11/0408 .. {Moulds for casting thin slabs}
- B22D 11/041 .. for vertical casting ([B22D 11/043](#), [B22D 11/049](#) to [B22D 11/059](#) take precedence)
- B22D 11/043 .. Curved moulds ([B22D 11/049](#) to [B22D 11/059](#) take precedence)
- B22D 11/045 .. for horizontal casting ([B22D 11/049](#) to [B22D 11/059](#) take precedence)
- B22D 11/0455 ... {Bidirectional horizontal casting}
- B22D 11/047 ... Means for joining tundish to mould
- B22D 11/0475 {characterised by use of a break ring}
- B22D 11/049 .. for direct chill casting, e.g. electromagnetic casting
- B22D 11/05 .. into moulds having adjustable walls
- B22D 11/051 .. into moulds having oscillating walls
- B22D 11/053 .. Means for oscillating the moulds
- B22D 11/0535 ... {in a horizontal plane}
- B22D 11/055 .. Cooling the moulds ({[B22D 11/04](#) takes precedence})
- B22D 11/057 .. Manufacturing or calibrating the moulds
- B22D 11/059 .. Mould materials or platings
- B22D 11/06 . into moulds with travelling walls, e.g. with rolls, plates, belts, caterpillars
- B22D 11/0602 .. {formed by a casting wheel and belt, e.g. Properzi-process}
- B22D 11/0605 .. {formed by two belts, e.g. Hazelett-process}
- B22D 11/0608 .. {formed by caterpillars}
- B22D 11/0611 .. {formed by a single casting wheel, e.g. for casting amorphous metal strips or wires}
- B22D 11/0614 ... {the casting wheel being immersed in a molten metal bath, and drawing out upwardly the casting strip}

- B22D 11/0617 . . . {the casting wheel having its axis vertical and a casting strip formed in a peripheral groove of the wheel}
- B22D 11/062 . . . {the metal being cast on the inside surface of the casting wheel}
- B22D 11/0622 . . {formed by two casting wheels}
- B22D 11/0625 . . . {the two casting wheels being immersed in a molten metal bath and drawing out upwardly the casting strip}
- B22D 11/0628 . . {formed by more than two casting wheels}
- B22D 11/0631 . . {formed by a travelling straight surface, e.g. through-like moulds, a belt}
- B22D 11/0634 . . {formed by a casting wheel and a co-operating shoe}
- B22D 11/0637 . . {Accessories therefor}
- B22D 11/064 . . . { for supplying molten metal (supplying molten metal to open-ended moulds [B22D 11/10](#))}
- B22D 11/0642 {Nozzles (nozzles used in open-ended moulds [B22D 41/50](#))}
- B22D 11/0645 {Sealing means for the nozzle between the travelling surfaces}
- B22D 11/0648 . . . {Casting surfaces}
- B22D 11/0651 {Casting wheels ([B22D 11/0682](#) takes precedence)}
- B22D 11/0654 {Casting belts ([B22D 11/0685](#) takes precedence)}
- B22D 11/0657 {Caterpillars ([B22D 11/0688](#) takes precedence)}
- B22D 11/066 {Side dams ([B22D 11/0691](#) takes precedence)}
- B22D 11/0662 {having electromagnetic confining means}
- B22D 11/0665 . . . {for treating the casting surfaces, e.g. calibrating, cleaning, dressing, preheating}
- B22D 11/0668 {for dressing, coating or lubricating}
- B22D 11/0671 {for heating or drying}
- B22D 11/0674 {for machining}
- B22D 11/0677 . . . {for guiding, supporting or tensioning the casting belts}
- B22D 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](#))}
- B22D 11/0682 {by cooling the casting wheel}
- B22D 11/0685 {by cooling the casting belts ([B22D 11/0677](#) takes precedence)}
- B22D 11/0688 {by cooling the caterpillars}
- B22D 11/0691 {by cooling the side dams}
- B22D 11/0694 . . . {for peeling-off or removing the cast product}
- B22D 11/0697 . . . {for casting in a protected atmosphere}

- B22D 11/07 . . Lubricating the moulds

- B22D 11/08 . . Accessories for starting the casting procedure
- B22D 11/081 . . {Starter bars}
- B22D 11/083 . . . {Starter bar head; Means for connecting or detaching starter bars and ingots}
- B22D 11/085 . . {Means for storing or introducing the starter bars in the moulds}
- B22D 11/086 . . {Means for connecting cast ingots of different sizes or compositions}
- B22D 11/088 . . {Means for sealing the starter bar head in the moulds}

- B22D 11/10 . Supplying or treating molten metal ([B22D 41/00](#) takes precedence)
- B22D 11/103 .. Distributing the molten metal, e.g. using runners, floats, distributors
- B22D 11/106 .. Shielding the molten jet ([B22D 41/50](#) takes precedence)
- B22D 11/108 .. Feeding additives, powders, or the like
- B22D 11/11 .. Treating the molten metal
- B22D 11/111 ... by using protecting powders
- B22D 11/112 ... by accelerated cooling
- B22D 11/113 ... by vacuum treating
- B22D 11/114 ... by using agitating or vibrating means ([B22D 11/117](#) takes precedence)
- B22D 11/115 by using magnetic fields
- B22D 11/116 ... Refining the metal
- B22D 11/117 by treating with gases ([B22D 11/118](#), [B22D 11/119](#) take precedence)
- B22D 11/118 by circulating the metal under, over or around weirs ([B22D 11/119](#) takes precedence)
- B22D 11/119 by filtering

- B22D 11/12 . Accessories for subsequent treating or working cast stock in situ([rolling immediately subsequent to continuous casting](#) [B21B 1/46](#), [B22D 13/22](#))
- B22D 11/1206 .. {for plastic shaping of strands ([rolling mills](#) [B21B 1/46](#))}
- B22D 11/1213 .. {for heating or insulating strands}
- B22D 11/122 .. {using magnetic fields}
- B22D 11/1226 .. {for straightening strands}
- B22D 11/1233 .. {for marking strands}
- B22D 11/124 .. for cooling
- B22D 11/1241 ... {by transporting the cast stock through a liquid medium bath or a fluidized bed}
- B22D 11/1243 ... {by using cooling grids or cooling plates}
- B22D 11/1245 ... {using specific cooling agents}
- B22D 11/1246 ... {Nozzles; Spray heads}
- B22D 11/1248 ... {Means for removing cooling agent from the surface of the cast stock}
- B22D 11/126 .. for cutting
- B22D 11/1265 ... {having auxiliary devices for deburring}
- B22D 11/128 .. for removing
- B22D 11/1281 ... {Vertical removing}
- B22D 11/1282 ... {Vertical casting and curving the cast stock to the horizontal}
- B22D 11/1284 ... {Horizontal removing}
- B22D 11/1285 ... {Segment changing devices for supporting or guiding frames}
- B22D 11/1287 ... {Rolls; Lubricating, cooling or heating rolls while in use}
- B22D 11/1288 ... {Walking bar members}

- B22D 11/14 . Plants for continuous casting
- B22D 11/141 .. {for vertical casting}
- B22D 11/142 .. {for curved casting}

- B22D 11/143 .. {for horizontal casting}
- B22D 11/144 .. {with a rotating mould}
- B22D 11/145 .. {for upward casting}
- B22D 11/146 .. {for inclined casting}
- B22D 11/147 .. {Multi-strand plants}
- B22D 11/148 .. {Safety arrangements}

- B22D 11/16 . Controlling or regulating processes or operations
- B22D 11/161 .. {for automatic starting the casting process}
- B22D 11/163 .. {for cutting cast stock}
- B22D 11/165 .. {for the supply of casting powder}
- B22D 11/166 .. {for mould oscillation}
- B22D 11/168 .. {for adjusting the mould size or mould taper}
- B22D 11/18 .. for pouring ([B22D 11/20](#) takes precedence)
- B22D 11/181 ... {responsive to molten metal level or slag level}
- B22D 11/182 {by measuring temperature}
- B22D 11/183 {by measuring molten metal weight}
- B22D 11/185 {by using optical means}
- B22D 11/186 {by using electric, magnetic, sonic or ultrasonic means}
- B22D 11/187 {by using X-rays or nuclear radiation}
- B22D 11/188 ... {responsive to thickness of solidified shell}
- B22D 11/20 .. for removing cast stock
- B22D 11/201 ... {responsive to molten metal level or slag level}
- B22D 11/202 {by measuring temperature}
- B22D 11/203 {by measuring molten metal weight}
- B22D 11/204 {by using optical means}
- B22D 11/205 {by using electric, magnetic, sonic or ultrasonic means}
- B22D 11/206 {by using X-rays or nuclear radiation}
- B22D 11/207 ... {responsive to thickness of solidified shell}
- B22D 11/208 ... {for aligning the guide rolls}
- B22D 11/22 .. for cooling cast stock or mould
- B22D 11/225 ... {for secondary cooling}

- B22D 13/00 Centrifugal casting; Casting by using centrifugal force**

- B22D 13/02 . of elongated solid or hollow bodies, e.g. pipes, in moulds rotating around their longitudinal axis
- B22D 13/023 .. {the longitudinal axis being horizontal}
- B22D 13/026 .. {the longitudinal axis being vertical}

- B22D 13/04 . of shallow solid or hollow bodies, e.g. wheels or rings, in moulds rotating around their axis of symmetry

- B22D 13/06 . of solid or hollow bodies in moulds rotating around an axis arranged outside the mould

- B22D 13/063 .. {for dentistry or jewellery}
- B22D 13/066 .. {several moulds being disposed in a circle}

- B22D 13/08 . in which a stationary mould is fed from a rotating mass of liquid metal

- B22D 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](#))
- B22D 13/101 .. {Moulds}
- B22D 13/102 ... {Linings for moulds ([making or lining moulds B22C](#))}
- B22D 13/104 ... {Cores}
- B22D 13/105 ... {Cooling for moulds or cores}
- B22D 13/107 .. {Means for feeding molten metal}
- B22D 13/108 .. {Removing of casting}

- B22D 13/12 . Controlling, supervising, specially adapted to centrifugal casting, e.g. for safety reasons ([controlling or regulating in general G05](#))

- B22D 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**

- B22D 15/005 . {of rolls, wheels or the like ([B22D 19/16 takes precedence](#))}
- B22D 15/02 . of cylinders, pistons, bearing shells or like thin-walled objects
- B22D 15/04 . Machines or apparatus for chill casting ([B22D 15/005](#), [B22D 15/02 take precedence](#))

- B22D 17/00 Pressure die casting or injection die casting, i.e. casting in which the metal is forced into a mould under high pressure**

- B22D 17/002 . {using movable moulds ([for plastics B29C 45/04](#))}
- B22D 17/005 . {using two or more fixed moulds ([for plastics B29C 45/12](#))}
- B22D 17/007 . {Semi-solid pressure die casting}
- B22D 17/02 . Hot chamber machines, i.e. with heated press chamber in which metal is melted
- B22D 17/04 .. Plunger machines
- B22D 17/06 .. air injection machines
- B22D 17/08 . Cold chamber machines, i.e. with unheated press chamber into which molten metal is ladled
- B22D 17/10 .. with horizontal press motion
- B22D 17/12 .. with vertical press motion
- B22D 17/14 . Machines with evacuated die cavity
- B22D 17/145 .. {Venting means therefor ([for permanent moulds B22C 9/067](#))}

- B22D 17/16 . specially adapted for casting slide fasteners or elements therefor
- B22D 17/18 . Machines built up from units providing for different combinations
- B22D 17/20 . Accessories: Details
- B22D 17/2007 .. {Methods or apparatus for cleaning or lubricating moulds}
- B22D 17/2015 .. {Means for forcing the molten metal into the die (for plastics [B29C 45/46](#))}
- B22D 17/2023 ... {Nozzles or shot sleeves}
- B22D 17/203 ... {Injection pistons ([B22D 17/2053](#) takes precedence; for plastics [B29C 45/53](#))}
- B22D 17/2038 ... {Heating, cooling or lubricating the injection unit (for plastics [B29C 45/74](#), [B29C 45/83](#))}
- B22D 17/2046 ... {with provisions for damping the pressure peak}
- B22D 17/2053 ... {using two or more cooperating injection pistons}
- B22D 17/2061 ... {using screws}
- B22D 17/2069 ... {Exerting after-pressure on the moulding material}
- B22D 17/2076 .. {Cutting-off equipment for sprues or ingates (for plastics [B29C 45/38](#))}
- B22D 17/2084 .. {Manipulating or transferring devices for evacuating cast pieces}
- B22D 17/2092 .. {Safety devices (for plastics [B29C 45/84](#))}
- B22D 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
- B22D 17/2209 ... {Selection of die materials (for permanent moulds [B22C 9/061](#))}
- B22D 17/2218 ... {Cooling or heating equipment for dies (for permanent moulds [B22C 9/065](#); for plastics [B29C 45/73](#))}
- B22D 17/2227 ... {Die seals (for plastics [B29C 45/2608](#))}
- B22D 17/2236 ... {Equipment for loosening or ejecting castings from dies (for plastics [B29C 45/40](#))}
- B22D 17/2245 ... {having walls provided with means for marking or patterning}
- B22D 17/2254 ... {having screw-threaded die walls}
- B22D 17/2263 ... {having tubular die cavities}
- B22D 17/2272 ... {Sprue channels}
- B22D 17/2281 {closure devices therefor}
- B22D 17/229 ... {with exchangeable die part ([B22D 17/2245](#) takes precedence)}
- B22D 17/24 ... Accessories for locating and holding cores or inserts
- B22D 17/26 .. Mechanisms or devices for locking or opening dies
- B22D 17/263 ... {mechanically}
- B22D 17/266 ... {hydraulically}
- B22D 17/28 .. Melting pots
- B22D 17/30 .. Accessories for supplying molten metal, e.g. in rations (supplying molten metal in ration in general [B22D 39/00](#))
- B22D 17/32 .. Controlling equipment
- B22D 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](#))

- B22D 18/02 . Pressure casting making use of mechanical pressure devices, e.g. cast-forging ([B22D 18/04](#) takes precedence)
- B22D 18/04 . Low pressure casting, i.e. making use of pressures up to a few bars to fill the mould
- B22D 18/06 . Vacuum casting, i.e. making use of vacuum to fill the mould
- B22D 18/08 . Controlling, supervising, e.g. for safety reasons ([controlling or regulating in general G05](#))

- B22D 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](#))

- B22D 19/0009 . {Cylinders, pistons}
- B22D 19/0018 . . {cylinders with fins}
- B22D 19/0027 . . {pistons}

- B22D 19/0036 . {gears}

- B22D 19/0045 . {household utensils}

- B22D 19/0054 . {rotors, stators for electrical motors}

- B22D 19/0063 . {finned exchangers ([cylinders B22D 19/0018](#))}

- B22D 19/0072 . {for making objects with integrated channels}

- B22D 19/0081 . {pretreatment of the insert, e.g. for enhancing the bonding between insert and surrounding cast metal}

- B22D 19/009 . {for casting objects the members of which can be separated afterwards}

- B22D 19/02 . for making reinforced articles ([B22D 19/14](#) takes precedence)

- B22D 19/04 . for joining parts
- B22D 19/045 . . {for joining tubes}

- B22D 19/06 . for manufacturing or repairing tools

- B22D 19/08 . for building-up linings or coverings, e.g. of anti-frictional metal
- B22D 19/085 . . {of anti-frictional metal}

- B22D 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)

- B22D 19/12 . for making objects, e.g. hinges, with parts which are movable relatively to one another

- B22D 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](#))

- B22D 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](#))
- B22D 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** [{\(non-ferrous ingots B22D 7/005\)}](#)
- B22D 21/002 . {Castings of light metals}
- B22D 21/005 .. {with high melting point, e.g. Be 1280 degrees C, Ti 1725 degrees C}
- B22D 21/007 .. {with low melting point, e.g. Al 659 degrees C, Mg 650 degrees C}
- B22D 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 27/16](#))
- B22D 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}
- 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}
- B22D 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}
- B22D 21/04 .. Casting aluminium or magnesium {no material; see [B22D 21/007](#)}
- B22D 21/06 . Casting non-ferrous metals with a high melting point, e.g. metallic carbides ([B22D 21/02](#) takes precedence)
- B22D 23/00** **Casting processes not provided for in groups [B22D 1/00](#) to [B22D 21/00](#)**([making metallic powder by casting B22F 9/08](#); [alumino-thermic welding B23K 23/00](#); [remelting metals C22B 9/16](#))
- B22D 23/003 . {Moulding by spraying metal on a surface}
- B22D 23/006 . {Casting by filling the mould through rotation of the mould together with a molten metal holding recipient, about a common axis}
- B22D 23/02 . Top casting
- B22D 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](#))
- B22D 23/06 . Melting-down metal, e.g. metal particles, in the mould
- B22D 23/10 .. Electroslag casting [{\(electroslag remelting C22B 9/18\)}](#)
- B22D 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](#))
- B22D 25/005 . {Casting metal foams}
- B22D 25/02 . by its peculiarity of shape; of works of art [{\(cylinders, pistons B22D 15/02\)}](#)

- B22D 25/023 .. {Casting chains or the like}
- B22D 25/026 .. {Casting jewelry articles ([B22D 13/063](#) takes precedence)}
- B22D 25/04 .. Casting metal electric battery plates or the like (manufacture thereof by multi-step processes [H01M 4/82](#))

- B22D 25/06 . by its physical properties ([B22D 27/00](#) takes precedence)
- B22D 25/08 .. by uniform hardness ([B22D 15/00](#) takes precedence)

- B22D 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)}

- B22D 27/003 . {by using inert gases}
- B22D 27/006 . {by using reactive gases}
- B22D 27/02 . Use of electric or magnetic effects {(for continuous casting [B22D 11/015](#), [B22D 11/11](#))}
- B22D 27/04 . Influencing the temperature of the metal, e.g. by heating or cooling the mould
- B22D 27/045 .. {Directionally solidified castings}
- B22D 27/06 .. Heating the top discard of ingots (hot tops for ingot moulds [B22D 7/10](#))
- B22D 27/08 . Shaking, vibrating, or turning of moulds
- B22D 27/09 . by using pressure
- B22D 27/11 .. making use of mechanical pressing devices
- B22D 27/13 .. making use of gas pressure
- B22D 27/15 . by using vacuum
- B22D 27/18 . Measures for using chemical processes for influencing the surface composition of castings, e.g. for increasing resistance to acid attack
- B22D 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](#))

- B22D 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 11/124](#), [B22D 17/00](#) take precedence)}

- B22D 29/001 . {Removing cores}
- B22D 29/002 .. {by leaching, washing or dissolving}
- B22D 29/003 .. {using heat}
- B22D 29/005 .. {by vibrating or hammering}
- B22D 29/006 .. {by abrasive, water or air blasting}

- B22D 29/007 . . {by using explosive shock waves}
- B22D 29/008 . . . {in a liquid medium}

- B22D 29/02 . Vibratory apparatus specially designed for shaking out flasks

- B22D 29/04 . Handling or stripping castings or ingots (grippers in general, [see the relevant subclasses, e.g. B66C](#))
- B22D 29/06 . . Strippers actuated by fluid pressure
- B22D 29/08 . . Strippers actuated mechanically

- B22D 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 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](#))

- B22D 31/00** **Cutting-off surplus material, e.g. gates; {Cleaning and working on castings ([B22D 17/2076](#) takes precedence)}**

- B22D 31/002 . {Cleaning, working on castings}
- B22D 31/005 . . {Sealing or impregnating porous castings}
- B22D 31/007 . . {Tumbling mills}

- Other equipment for casting** (arrangement of indicating or measuring devices [B22D 2/00](#))

- B22D 33/00** **Equipment for handling moulds**

- B22D 33/005 . {Transporting flaskless moulds}
- B22D 33/02 . Turning or transposing moulds
- B22D 33/04 . Bringing together or separating moulds
- B22D 33/06 . Burdening or relieving moulds

- B22D 35/00** **Equipment for conveying molten metal into beds or moulds** ([B22D 37/00](#) to [B22D 41/00](#) take precedence; specially adapted to particular processes or machines, see the relevant groups)

- B22D 35/02 . into beds
- B22D 35/04 . into moulds, e.g. base plates, runners
- B22D 35/045 . . {Runner base plates for bottom casting ingots}
- B22D 35/06 . Heating or cooling equipment

- B22D 37/00** **Controlling or regulating the pouring of molten metal from a casting melt-holding**

vessel ([B22D 39/00](#), [B22D 41/00T](#) take precedence; specially adapted to particular processes or machines, see the relevant groups of this subclass){[B22D 11/18](#) takes precedence}

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

- B22D 39/00** **Equipment for supplying molten metal in rations** (specially adapted to particular processes or machines, see the relevant groups of this subclass)

- B22D 39/003 . {using electromagnetic field}
- B22D 39/006 .. {Electromagnetic conveyers}

- B22D 39/02 . having means for controlling the amount of molten metal by volume
- B22D 39/023 .. {using a displacement member}
- B22D 39/026 .. {using a ladler}

- B22D 39/04 . having means for controlling the amount of molten metal by weight

- B22D 39/06 . having means for controlling the amount of molten metal by controlling the pressure above the molten metal

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

- B22D 41/001 . {devices for cleaning ladles (cleaning in general [B08B](#))}

- B22D 41/003 . {with impact pads}

- B22D 41/005 . with heating or cooling means
- B22D 41/01 .. Heating means
- B22D 41/015 ... with external heating, i.e. the heat source not being a part of the ladle

- B22D 41/02 . Linings
- B22D 41/023 .. {Apparatus used for making or repairing linings (equipment used for making or repairing converter linings [C21C 5/441](#))}
- B22D 41/026 .. {Apparatus used for fracturing and removing of linings}

- B22D 41/04 . tiltable
- B22D 41/05 .. Tea-pot spout ladles

- B22D 41/06 . Equipment for tilting

- B22D 41/08 . for bottom pouring ([B22D 41/14](#), [B22D 41/50](#) take precedence)

- B22D 41/12 . Travelling ladles or similar containers; Cars for ladles (casting cranes [B66C](#))
- B22D 41/13 .. Ladle turrets

- B22D 41/14 . Closures
- B22D 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
- B22D 41/18 ... Stopper-rods therefor
- B22D 41/183 {with cooling means}
- B22D 41/186 {with means for injecting a fluid into the melt}
- B22D 41/20 ... Stopper-rod operating equipment
- B22D 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
- B22D 41/24 ... characterised by a rectilinearly movable plate ([B22D 41/38](#) to [B22D 41/42](#) take precedence)
- B22D 41/26 ... characterised by a rotatively movable plate ([B22D 41/38](#) to [B22D 41/42](#) take precedence)
- B22D 41/28 ... Plates therefor ([B22D 41/38](#) to [B22D 41/42](#) take precedence)
- B22D 41/30 Manufacturing or repairing thereof
- B22D 41/32 characterised by the materials used therefor
- B22D 41/34 Supporting, fixing or centering means therefor
- B22D 41/36 Treating the plates, e.g. lubricating, heating (*ladles, cups or the like with heating means* [B22D 41/01](#))
- B22D 41/38 ... Means for operating the sliding gate
- B22D 41/40 ... Means for pressing the plates together
- B22D 41/42 ... Features relating to gas injection
- B22D 41/44 .. Consumable closure means, i.e. closure means being used only once
- B22D 41/46 ... Refractory plugging masses
- B22D 41/465 {Unplugging a vessel discharge port}
- B22D 41/48 ... Meltable closures

- B22D 41/50 . Pouring-nozzles
- B22D 41/502 .. {Connection arrangements; Sealing means therefor}
- B22D 41/505 .. {Rings, inserts or other means preventing external nozzle erosion by the slag}
- B22D 41/507 .. {giving a rotating motion to the issuing molten metal}
- B22D 41/52 .. Manufacturing or repairing thereof
- B22D 41/54 ... characterised by the materials used therefor
- B22D 41/56 .. Means for supporting, manipulating or changing a pouring-nozzle
- B22D 41/58 .. with gas injecting means
- B22D 41/60 .. with heating or cooling means
- B22D 41/62 .. with stirring or vibrating means

- B22D 43/00 **Mechanical cleaning, e.g. skimming of molten metals****

- B22D 43/001 . {Retaining slag during pouring molten metal}
- B22D 43/002 .. {by using floating means}
- B22D 43/004 .. {by using filtering means ([B22C 9/086](#) takes precedence)}

- B22D 43/005 . {Removing slag from a molten metal surface}
- B22D 43/007 .. {by using scrapers}
- B22D 43/008 .. {by suction}

B22D 45/00 Equipment for casting, not otherwise provided for

- B22D 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](#))}

B22D 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](#))

B22D 47/00 Casting plants

- B22D 47/02 . for both moulding and casting