**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 **B22D 11/10**; metallurgical processing, e.g. refining of iron or other metal **C21, C22, C25C)*  
1/002  
1/005  
1/007

2/00 Arrangement of indicating or measuring devices, e.g. for temperature or viscosity of the fused mass  
2/001  
2/003  
2/005  
2/006  
2/008

Casting of pigs, i.e. metal castings suitable for subsequently melting; similar casting  
3/00 Pig or like casting *(equipment for conveying molten metal **B22D 35/00**)*  
3/02  
5/00 Machines or plants for pig or like casting  
5/005  
5/02  
5/04

Casting of ingots, i.e. metal castings suitable for subsequently rolling or forging  
7/00 Casting ingots, *(e.g. from ferrous metals)* *(equipment for conveying molten metal **B22D 35/00**)*

7/005  
7/02  
7/04  
7/06  
7/062  
7/064  
7/066  
7/068  
7/08  
7/10  
7/102  
7/104  
7/106  
7/108  
7/102  
9/00 Machines or plants for casting ingots  
9/003  
9/006

Particular casting processes; Machines or apparatus therefor  
11/00 Continuous casting of metals, i.e. casting in indefinite lengths *(metal drawing, metal extruding **B21C**)*  
11/001  
11/002  
11/003  
11/004  
11/005  
11/006  
11/007  
11/008
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 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
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 . . . (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 heated 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 45/65)]

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; aluminothermic 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 . [Casting 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

23/00 Casting processes not provided for in groups B22D 1/00 - B22D 21/00 (making metallic powder by casting B22E 9/08; alumino-thermic 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 200)

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 hardmess (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 11/124, B22D 17/00 (take precedence))

29/001 Removing cores

29/002 (by leaching, washing or dissolving)

29/003 (by 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 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)

31/00 Cutting-off surplus material, e.g. gates; Cleaning and working on castings (B22D 17/2076 (take 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)
Equipment for supplying molten metal in rations

Casting melt-holding vessels, e.g. ladles, tundishes, cups or the like

Linings

Tea-pot spout ladles

Equipment for tilting

Stopper-rod operating equipment

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

Stopper-rods therefor

Stopper-rod erosion by the slag

Meltable closures

Refractory plugging masses

Features relating to gas injection

Means for injecting a fluid into the melt

for both moulding and casting

Supporting, fixing or centering means therefor

Treating the plates, e.g. lubricating, heating (ladles, cups or the like with heating means therefor)

Means for operating the sliding gate

Means for pressing the plates together

Features relating to gas injection

Consumable closure means, i.e. closure means being used only once

Refractory plugging masses

[Unplugging a vessel discharge port]

Meltable closures

Pouring-nozzles

[Connection arrangements; Sealing means therefor]

[Rings, inserts or other means preventing external nozzle erosion by the slag]

[giving a rotating motion to the issuing molten metal]

Manufacturing or repairing thereof

characterised by the materials used therefor

Means for supporting, manipulating or changing a pouring-nozzle

with gas injecting means

with heating or cooling means

with stirring or vibrating means

Mechanical cleaning, e.g. skimming of molten metals

Retaining slag during pouring molten metal

(by using floating means)

(by using filtering means (B22C 9/086 takes precedence))

Removing slag from a molten metal surface

(by using scrapers)

(by suction)

Equipment for casting, not otherwise provided for

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

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