

## B22 CASTING; POWDER METALLURGY

### B22C FOUNDRY MOULDING (moulding refractory materials in general B28B)

#### Note

This subclass covers:

- the making of moulds for casting metals or of other refractory moulds;
- selection or preparation of materials therefor;
- the necessary patterns, processes, machines, accessory devices or tools.

#### Subclass Index

|  |                  |  |                    |
|--|------------------|--|--------------------|
| PATTERNS, MANUFACTURE THEREOF .....  | 7/00, 3/00       | MOULDING MACHINES, PROCESSES INVOLVING THESE MACHINES..... | 11/00 to 19/00     |
| MOULDS, CORES, GENERAL MOULDING PROCESSES; COMPOSITIONS FOR MOULDS AND CORES ..... | 9/00; 1/00, 3/00 | MOULDING PLANTS .....                                      | 25/00              |
|  |                  | TOOLS OR OTHER DEVICES .....                               | 5/00, 21/00, 23/00 |

|             |   |   |  |
|-------------|---|---|--|
| <b>1/00</b> | <b>Compositions of refractory mould or core materials; Grain structures thereof</b> (refractory materials in general C04B 35/00); <b>Chemical or physical features in the formation or manufacture of moulds</b>  | <b>5/16</b>   | . . with conveyers or other equipment for feeding the material   |
| <b>1/02</b> | . characterised by additives for special purposes, e.g. indicators, breakdown additives   | <b>5/18</b>   | . Plants for preparing mould materials   |
| <b>1/04</b> | . . for protection of the casting, e.g. against decarbonisation   | <b>7/00</b>   | <b>Patterns; Manufacture thereof so far as not provided for in other classes</b>   |
| <b>1/06</b> | . . . for casting extremely oxidisable metals   | <b>7/02</b>   | . Lost patterns  |
| <b>1/08</b> | . . for decreasing shrinkage of the mould, e.g. for investment casting  | <b>7/04</b>   | . Pattern plates   |
| <b>1/10</b> | . . for influencing the hardening tendency of the mould material (influencing the hardening tendency of the binding agent only B22C 1/16)   | <b>7/05</b>   | . . for vacuum-sealed moulding [6]   |
| <b>1/12</b> | . . for manufacturing permanent moulds or cores   | <b>7/06</b>   | . Core boxes   |
| <b>1/14</b> | . . for separating the pattern from the mould   | <b>9/00</b>   | <b>Moulds or cores</b> (uniquely adapted to particular casting processes B22D); <b>Moulding processes</b> (processes involving the use of particular moulding machines, <u>see</u> the relevant groups for these machines) |
| <b>1/16</b> | . characterised by the use of binding agents; Mixtures of binding agents  | <b>9/02</b>   | . Sand moulds or like moulds for shaped castings   |
| <b>1/18</b> | . . of inorganic agents   | <b>9/03</b>   | . . formed by vacuum-sealed moulding [6]   |
| <b>1/20</b> | . . of organic agents   | <b>9/04</b>   | . . Use of lost patterns   |
| <b>1/22</b> | . . . of resins or rosins   | <b>9/06</b>   | . Permanent moulds for shaped castings (moulds for ingots B22D 7/06)   |
| <b>1/24</b> | . . . of oily or fatty substances; of distillation residues therefrom   | <b>9/08</b>   | . Features with respect to supply of molten metal, e.g. ingates, circular gates, skim gates  |
| <b>1/26</b> | . . . of carbohydrates; of distillation residues therefrom  | <b>9/10</b>   | . Cores; Manufacture or installation of cores  |
| <b>3/00</b> | <b>Selection of compositions for coating the surfaces of moulds, cores, or patterns</b>   | <b>9/11</b>   | . . for vacuum-sealed moulding [6]   |
| <b>3/02</b> | . specially adapted for vacuum-sealed moulding [6]  | <b>9/12</b>   | . Treating moulds or cores, e.g. drying, hardening   |
| <b>5/00</b> | <b>Machines or devices specially designed for dressing or handling the mould material so far as specially adapted for that purpose</b> (of general applicability, <u>see</u> the relevant places, e.g. for material with water-setting properties B28C) | <b>9/14</b>   | . . Equipment or plant specially adapted for drying moulds or cores (B22C 13/08 takes precedence)  |
| <b>5/02</b> | . Dressing by centrifuging essentially or additionally  | <b>9/16</b>   | . . . Movable drying equipment   |
| <b>5/04</b> | . by grinding, blending, mixing, kneading, or stirring  | <b>9/18</b>   | . Finishing  |
| <b>5/06</b> | . by sieving or magnetic separating   | <b>9/20</b>   | . Stack moulds, i.e. arrangement of multiple moulds or flasks  |
| <b>5/08</b> | . by sprinkling, cooling, or drying   | <b>9/22</b>   | . Moulds for peculiarly-shaped castings  |
| <b>5/10</b> | . by dust separating  | <b>9/24</b>   | . . for hollow articles  |
| <b>5/12</b> | . for filling flasks (in combination with compacting B22C 15/20 to B22C 15/28)  | <b>9/26</b>   | . . . for ribbed tubes; for radiators  |
| <b>5/13</b> | . . during vacuum-sealed moulding [6]   | <b>9/28</b>   | . . for wheels, rolls, or rollers  |
| <b>5/14</b> | . Equipment for storing or handling the dressed mould material, forming part of a plant for preparing such material   | <b>9/30</b>   | . . for chains   |
|             |   | <b>Moulding machines for making moulds or cores</b> |  |
|             |   | <b>11/00</b>  | <b>Moulding machines characterised by the relative arrangement of the parts of same</b>  |
|             |   | <b>11/02</b>  | . Machines in which the moulds are moved during a cycle of successive operations   |
|             |   | <b>11/04</b>  | . . by a horizontal rotary table or carrier  |
|             |   | <b>11/06</b>  | . . by a vertical rotary carrier   |

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|--------------|---|--------------|--|
| 11/08        | . . by non-rotary conveying means, e.g. by travelling platforms   | 15/30        | . . by both pressing and jarring devices   |
| 11/10        | . with one or more flasks forming part of the machine, from which only the sand moulds made by compacting are removed   | 15/32        | . . . involving mechanical gearing only  |
| 11/12        | . Moulding machines able to travel  | 15/34        | . . . involving pneumatic or hydraulic mechanisms only   |
| <b>13/00</b> | <b>Moulding machines for making moulds or cores of particular shapes</b>  | <b>17/00</b> | <b>Moulding machines characterised by the mechanism for separating the pattern from the mould or for turning over the flask or the pattern plate</b> |
| 13/02        | . equipped with templates, e.g. for sweeping operation  | 17/02        | . Moulding machines with pin lifting arrangement   |
| 13/04        | . . with rotary templates, e.g. arranged on a pillar  | 17/04        | . Drop-plate moulding machines   |
| 13/06        | . . with non-rotary template and rotary flask   | 17/06        | . Moulding machines using stripping plates; Stripping plates   |
| 13/08        | . for shell moulds or shell cores   | 17/08        | . Moulding machines with mechanisms to turn over the pattern plate or the mould around a horizontal axis   |
| 13/10        | . for pipes or elongated hollow articles  | 17/10        | . . Turning-over pattern plate and flask only (B22C 17/14 takes precedence)  |
| 13/12        | . for cores   | 17/12        | . . Turning-over pattern plate, flask, and compacting device as a unit (B22C 17/14 takes precedence)   |
| 13/14        | . . by sweeping, turning, or coating  | 17/14        | . . arranged to one side of the mould table, so-called roll-over table moulding machines   |
| 13/16        | . . by pressing through a die   |              |  |
| <b>15/00</b> | <b>Moulding machines characterised by the compacting mechanism; Accessories therefor</b>                                | <b>19/00</b> | <b>Components or accessories for moulding machines</b>   |
| 15/02        | . Compacting by pressing devices only   | 19/01        | . Devices for applying sealing coating [6]   |
| 15/04        | . . involving muscle power, e.g. hand-operated levers   | 19/02        | . Mould tables   |
| 15/06        | . . involving mechanical gearings, e.g. crank gears (B22C 15/04 takes precedence)                                       | 19/04        | . Controlling devices specially designed for moulding machines   |
| 15/08        | . . involving pneumatic or hydraulic mechanisms   | 19/06        | . Devices for rapping or loosening the pattern   |
| 15/10        | . Compacting by jarring devices only  | <b>21/00</b> | <b>Flasks; Accessories therefor</b> (stripping plates B22C 17/06)  |
| 15/12        | . . involving mechanical gearings   | 21/01        | . for vacuum-sealed moulding [6]   |
| 15/14        | . . involving pneumatic or hydraulic mechanisms   | 21/02        | . Sectional flasks, i.e. with divided, articulated, or interchangeable side sections   |
| 15/16        | . . . the machine having special provision for reducing shock to its frame  | 21/04        | . Upset frames; Bottom boards or mould boards (pattern plates B22C 7/04)   |
| 15/18        | . . . . by means of separate shock-absorbers  | 21/06        | . . Bottom boards or mould boards  |
| 15/20        | . Compacting by centrifugal forces only, e.g. in sand slingers  | 21/08        | . Clamping equipment   |
| 15/23        | . Compacting by gas pressure or vacuum [6]  | 21/10        | . Guiding equipment  |
| 15/24        | . . involving blowing devices in which the mould material is supplied in the form of loose particles                    | 21/12        | . Accessories  |
| 15/26        | . . involving propulsion devices in which the mould material is supplied in the shape of a compacted column or the like | 21/14        | . . for reinforcing or securing moulding materials or cores, e.g. gagers, chaplets, pins, bars   |
| 15/264       | . . Compacting after charge of the mould material [6]   | <b>23/00</b> | <b>Tools; Devices not mentioned before for moulding</b>  |
| 15/268       | . . . involving explosive combustion [6]  | 23/02        | . Devices for coating moulds or cores  |
| 15/272       | . . . involving the storage of gas under pressure [6]   | <b>25/00</b> | <b>Foundry moulding plants</b> (for preparing mould materials B22C 5/18; in combination with casting plants B22D 47/02)                              |
| 15/276       | . . . by vacuum, e.g. vacuum-sealed moulding processes [6]  |              |  |
| 15/28        | . Compacting by different means acting simultaneously or successively, e.g. preliminary blowing and finally pressing    |              |  |

**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)

**Note**

In this subclass, any material to be cast is referred to as metal.

**Subclass Index**

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|  |              |
|--|--------------|
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|  |       |
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## OTHER EQUIPMENT

|                                  |   |
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| For handling, for supplying..... | 29/00, 33/00,<br>35/00, 37/00, 39/00, 41/00 |
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| CONTROLLING OR SUPERVISING ..... | 46/00                                       |
| CASTING PLANTS.....              | 47/00                                       |

- 1/00 Treatment of fused masses in the ladle or the supply runners before casting** (features relating to gas injection, provided on closures of the sliding-gate type B22D 41/42, provided on pouring-nozzles B22D 41/58)
- 2/00 Arrangement of indicating or measuring devices, e.g. for temperature or viscosity of the fused mass [3]**

**Casting of pigs, i.e. metal castings suitable for subsequent melting; Similar casting**

- 3/00 Pig or like casting** (equipment for conveying molten metal B22D 35/00)
- 3/02 . Moulding of beds
- 5/00 Machines or plants for pig or like casting**
- 5/02 . with rotary casting tables
- 5/04 . with endless casting conveyers

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

- 7/00 Casting ingots** (equipment for conveying molten metal B22D 35/00)
- 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
- 7/08 . . Divided ingot moulds
- 7/10 . . Hot tops therefor
- 7/12 . Accessories, e.g. for sintering, for preventing splashing
- 9/00 Machines or plants for casting ingots**

**Particular casting processes; Machines or apparatus therefor**

- 11/00 Continuous casting of metals, i.e. casting in indefinite lengths** (metal drawing, metal extruding B21C)
- 11/01 . without moulds, e.g. on molten surfaces [2]
- 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) [3]
- 11/041 . . for vertical casting (B22D 11/043, B22D 11/049 to B22D 11/059 take precedence) [7]
- 11/043 . . Curved moulds (B22D 11/049 to B22D 11/059 take precedence) [7]
- 11/045 . . for horizontal casting (B22D 11/049 to B22D 11/059 take precedence) [7]
- 11/047 . . . Means for joining tundish to mould [7]
- 11/049 . . for direct chill casting, e.g. electromagnetic casting [7]
- 11/05 . . into moulds having adjustable walls [7]
- 11/051 . . into moulds having oscillating walls [7]
- 11/053 . . Means for oscillating the moulds [7]
- 11/055 . . Cooling the moulds [7]

- 11/057 . . Manufacturing or calibrating the moulds [7]
- 11/059 . . Mould materials or platings [7]
- 11/06 . into moulds with travelling walls, e.g. with rolls, plates, belts, caterpillars (B22D 11/07 takes precedence) [3]
- 11/07 . Lubricating the moulds [3]
- 11/08 . Accessories for starting the casting procedure
- 11/10 . Supplying or treating molten metal (B22D 41/00 takes precedence) [1,7]
- 11/103 . . Distributing the molten metal, e.g. using runners, floats, distributors [7]
- 11/106 . . Shielding the molten jet [7]
- 11/108 . . Feeding additives, powders, or the like [7]
- 11/11 . . Treating the molten metal [7]
- 11/111 . . . by using protecting powders [7]
- 11/112 . . . by accelerated cooling [7]
- 11/113 . . . by vacuum treating [7]
- 11/114 . . . by using agitating or vibrating means (B22D 11/117 takes precedence) [7]
- 11/115 . . . . by using magnetic fields [7]
- 11/116 . . . Refining the metal [7]
- 11/117 . . . . by treating with gases (B22D 11/118, B22D 11/119 take precedence) [7]
- 11/118 . . . . by circulating the metal under, over or around weirs (B22D 11/119 takes precedence) [7]
- 11/119 . . . . by filtering [7]
- 11/12 . Accessories for subsequent treating or working cast stock in situ (rolling immediately subsequent to continuous casting B21B 1/46, B21B 13/22) [3]
- 11/124 . . for cooling [2]
- 11/126 . . for cutting [2]
- 11/128 . . for removing [2]
- 11/14 . Plants for continuous casting, e.g. for upwardly drawing the strand
- 11/16 . Controlling or regulating processes or operations [2]
- 11/18 . . for pouring (B22D 11/20 takes precedence) [4]
- 11/20 . . for removing cast stock [4]
- 11/22 . . for cooling cast stock or mould [4]

**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
- 13/04 . 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 of the mould
- 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)
- 13/12 . Controlling, supervising, specially adapted to centrifugal casting, e.g. for safety reasons [3]
- 15/00 **Casting using a mould or core of which a part significant to the process of high thermal conductivity, e.g. chill casting; Moulds or accessories specially adapted therefor** (continuous casting of metals into open-ended moulds for direct chill casting B22D 11/049) [1,7]
- 15/02 . of cylinders, pistons, bearing shells or like thin-walled objects
- 15/04 . Machines or apparatus for chill casting (B22D 15/02 takes 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** [3]
- 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
- 17/16 . specially adapted for casting slide fasteners or elements therefor
- 17/18 . Machines built up from units providing for different combinations
- 17/20 . Accessories; Details
- 17/22 . . 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
- 17/24 . . . Accessories for locating and holding cores or inserts
- 17/26 . . Mechanisms or devices for locking or opening dies
- 17/28 . . Melting pots
- 17/30 . . Accessories for supplying molten metal, e.g. in rations
- 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) [3]
- 18/02 . Pressure casting making use of mechanical pressing devices, e.g. cast-forging (B22D 18/04 takes precedence) [3]
- 18/04 . Low pressure casting, i.e. making use of pressures up to a few bars to fill the mould [3]
- 18/06 . Vacuum casting, i.e. making use of vacuum to fill the mould [3]
- 18/08 . Controlling, supervising, e.g. for safety reasons [3]
- 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)
- 19/02 . for making reinforced articles (B22D 19/14 takes precedence) [3]
- 19/04 . for joining parts
- 19/06 . for manufacturing or repairing tools
- 19/08 . for building up linings or coverings, e.g. of anti-frictional metal
- 19/10 . Repairing defective or damaged objects by metal casting techniques (by other techniques B23P 6/04)
- 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) [3]
- 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) [3]
- 21/00 **Casting non-ferrous metals or metallic compounds so far as their metallurgical properties are of importance for the casting procedure** (apparatus for vacuum casting B22D 18/00); **Selection of compositions therefor**
- 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)
- 21/04 . . Casting aluminium or magnesium
- 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 to B22D 21/00** (making metallic powder by casting B22F 9/08; alumino-thermic welding B23K 23/00; remelting metals C22B 9/16)
- 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 [5]
- 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) [2]
- 25/02 . by its peculiarity of shape; of works of art
- 25/04 . . Casting metal electric battery plates or the like (manufacture thereof by multi-step processes H01M 4/82) [2]
- 25/06 . by its physical properties (B22D 27/00 takes precedence)
- 25/08 . . by uniform hardness (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 18/00, B22D 43/00 take precedence) [3]
- 27/02 . Use of electric or magnetic effects
- 27/04 . Influencing the temperature of the metal, e.g. by heating or cooling the mould (cooling of open-ended moulds in continuous casting B22D 11/055) [1,7]
- 27/06 . . Heating the top discard of ingots (hot tops for ingot moulds B22D 7/10)
- 27/08 . Shaking, vibrating, or turning of moulds (B22D 11/051, B22D 11/053 take precedence) [1,7]
- 27/09 . by using pressure [3]
- 27/11 . . making use of mechanical pressing devices [3]
- 27/13 . . making use of gas pressure [3]
- 27/15 . by using vacuum [3]

- 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 [2]**
  - 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 [2]
- 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 11/24; 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) [5]
- 31/00 Cutting-off surplus material, e.g. gates**

**Other equipment for casting** (arrangement of indicating or measuring devices B22D 2/00) [3]

- 33/00 Equipment for handling 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 to 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
  - 35/06 . Heating or cooling equipment
- 37/00 Controlling or regulating the pouring of molten metal from a casting melt-holding vessel** (B22D 39/00, B22D 41/00 take precedence; specially adapted to particular processes or machines, see the relevant groups of this subclass) [3,5]
- 39/00 Equipment for supplying molten metal in rations** (specially adapted to particular processes or machines, see the relevant groups of this subclass)
  - 39/02 . having means for controlling the amount of molten metal by volume [3]
  - 39/04 . having means for controlling the amount of molten metal by weight [3]
  - 39/06 . having means for controlling the amount of molten metal by controlling the pressure above the molten metal [3]
- 41/00 Casting melt-holding vessels, e.g. ladles, tundishes, cups or the like** (B22D 39/00, B22D 43/00 take precedence) [5]
  - 41/005 . with heating or cooling means [5]
  - 41/01 . . Heating means [5]

- 41/015 . . . with external heating, i.e. the heat source not being a part of the ladle [5]
- 41/02 . Linings
- 41/04 . tiltable
- 41/05 . . Tea-pot spout ladles [5]
- 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 [7]
- 41/14 . Closures [5]
- 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 [5]
  - 41/18 . . . Stopper-rods therefor [5]
  - 41/20 . . . Stopper-rod operating equipment [5]
  - 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 [5]
- 41/24 . . . characterised by a rectilinearly movable plate (B22D 41/38 to B22D 41/42 take precedence) [5]
- 41/26 . . . characterised by a rotatively movable plate (B22D 41/38 to B22D 41/42 take precedence) [5]
- 41/28 . . . Plates therefor (B22D 41/38 to B22D 41/42 take precedence) [5]
  - 41/30 . . . . Manufacturing or repairing thereof [5]
  - 41/32 . . . . characterised by the materials used therefor [5]
- 41/34 . . . . Supporting, fixing or centering means therefor [5]
- 41/36 . . . . Treating the plates, e.g. lubricating, heating (ladles, cups or the like with heating means B22D 41/01) [5]
- 41/38 . . . Means for operating the sliding gate [5]
- 41/40 . . . Means for pressing the plates together [5]
- 41/42 . . . Features relating to gas injection [5]
- 41/44 . . Consumable closure means, i.e. closure means being used only once [5]
  - 41/46 . . . Refractory plugging masses [5]
  - 41/48 . . . Meltable closures [5]
- 41/50 . Pouring-nozzles [5]
  - 41/52 . . Manufacturing or repairing thereof [5]
  - 41/54 . . . characterised by the materials used therefor [5]
  - 41/56 . . Means for supporting, manipulating or changing a pouring-nozzle [5]
    - 41/58 . . with gas injecting means [5]
    - 41/60 . . with heating or cooling means [5]
    - 41/62 . . with stirring or vibrating means [5]

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

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

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**46/00 Controlling, supervising, not restricted to casting covered by a single main group, e.g. for safety reasons [3]**

**47/00 Casting plants**

- 47/02 . for both moulding and casting

**B22F WORKING METALLIC POWDER; MANUFACTURE OF ARTICLES FROM METALLIC POWDER; MAKING METALLIC POWDER** (processes or devices for granulating materials in general B01J 2/00; making ceramics by compacting or sintering C04B, e.g. C04B 35/64; for the production of metals as such, see class C22; reduction or decomposition of metal compounds in general C22B; making alloys by powder metallurgy C22C; electrolytic production of metal powder C25C 5/00)

### Notes

- (1) This subclass covers the making of metallic powder only insofar as powder with specific physical characteristics is made. [6]  
 (2) In this subclass, the following terms or expressions are used with the meanings indicated:  
 – “metallic powder” covers powders containing a substantial proportion of non-metallic material;  
 – “powder” includes somewhat larger particles which are worked, obtained or behave in a manner similar to powder, e.g. fibres.

|       |  |      |  |
|-------|--|------|--|
| 1/00  | <b>Special treatment of metallic powder, e.g. to facilitate working, to improve properties; Metallic powders <u>per se</u>, e.g. mixtures of particles of different composition</b> (C04, C08 take precedence) | 5/04 | . of turbine blades  |
| 1/02  | . comprising coating of the powder [2]   | 5/06 | . of threaded articles, e.g. nuts  |
| 3/00  | <b>Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefor</b>   | 5/08 | . of toothed articles, e.g. gear wheels; of cam discs  |
| 3/02  | . Compacting only  | 5/10 | . of articles with cavities or holes, not otherwise provided for in the preceding subgroups [6]  |
| 3/03  | . . Press-moulding apparatus therefor [6]  | 5/12 | . of tubes or wires [6]  |
| 3/035 | . . . with one or more of the parts thereof being pivotally mounted [6]  | 7/00 | <b>Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting</b>                       |
| 3/04  | . . by applying fluid pressure   | 7/02 | . of composite layers  |
| 3/06  | . . by centrifugal forces  | 7/04 | . . with one or more layers not made from powder, e.g. made from solid metal   |
| 3/08  | . . by explosive forces  | 7/06 | . of composite workpieces or articles from parts, e.g. to form tipped tools  |
| 3/087 | . . using high energy impulses, e.g. magnetic field impulses [6]   | 7/08 | . . with one or more parts not made from powder  |
| 3/093 | . . using vibration [6]  | 8/00 | <b>Manufacture of articles from scrap or waste metal particles [6]</b>   |
| 3/10  | . Sintering only   | 9/00 | <b>Making metallic powder or suspensions thereof</b>   |
| 3/105 | . . by using electric current, laser radiation or plasma (B22F 3/11 takes precedence) [6]  | 9/02 | . using physical processes [3]   |
| 3/11  | . . Making porous workpieces or articles [6]   | 9/04 | . . starting from solid material, e.g. by crushing, grinding or milling (crushing, grinding or milling, in general, <u>see</u> the relevant subclasses, e.g. B02C) [3] |
| 3/115 | . by spraying molten metal, i.e. spray sintering, spray casting [6]  | 9/06 | . . starting from liquid material [3]  |
| 3/12  | . Both compacting and sintering (by forging B22F 3/17) [6]   | 9/08 | . . . by casting, e.g. through sieves or in water, by atomising or spraying (using electric discharge B22F 9/14) [3]   |
| 3/14  | . . simultaneously   | 9/10 | . . . . using centrifugal force [3]  |
| 3/15  | . . . Hot isostatic pressing [6]   | 9/12 | . . starting from gaseous material [3]   |
| 3/16  | . . in successive or repeated steps  | 9/14 | . . using electric discharge [3]   |
| 3/17  | . by forging [6]   | 9/16 | . using chemical processes [3]   |
| 3/18  | . by using pressure rollers [6]  | 9/18 | . . with reduction of metal compounds [3]  |
| 3/20  | . by extruding   | 9/20 | . . . starting from solid metal compounds [3]  |
| 3/22  | . for producing castings from a slip   | 9/22 | . . . . using gaseous reductors [3]  |
| 3/23  | . involving a self-propagating high-temperature synthesis or reaction sintering step [6]   | 9/24 | . . . starting from liquid metal compounds, e.g. solutions [3]   |
| 3/24  | . After-treatment of workpieces or articles  | 9/26 | . . . . using gaseous reductors [3]  |
| 3/26  | . . Impregnating   | 9/28 | . . . starting from gaseous metal compounds [3]  |
| 5/00  | <b>Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product</b>  | 9/30 | . . with decomposition of metal compounds, e.g. by pyrolysis [3]   |
| 5/02  | . of piston rings  |      |  |