

31 Furnaces, kilns, ovens, retorts; casting; powder metallurgy

31a Melting furnaces, drying ovens and drying equipment

(31a (IPC: F27) Furnaces; Kilns; Ovens; Retorts

31a1 (IPC: F27B) Furnaces, kilns, ovens, or retorts in general; Open sintering or like apparatus

31a2 (IPC: F27C) Furnaces specially adapted for carrying-out metallurgical processes, for melting materials, or for heating liquid or molten materials

31a3 (IPC: F27D) Details or accessories of furnaces, kilns, ovens, or retorts, in so far as they are of kinds occurring in more than one kind of furnace

31b Moulding machines

(31b (IPC: B22) Casting; Powder metallurgy

31b1 (IPC: B22C) Foundry moulding

31b2 (IPC: B22D) Casting of metals; Casting of other substances by the same processes or devices

31b3 (IPC: B22F) Working metallic powder; Manufacture of articles from metallic powder; Obtaining metallic powder, not otherwise provided for

31c Casting and moulding, in general

31a Melting furnaces, drying ovens and drying equipment

Cupola furnaces

31a-1/01 Special types, air ducts etc. (charging devices 18a-6, 18a-6/01 – 18a-6/05, 18a-56/01 – 18a-56/05)

31a-1/10 with forehearth, shaft-type hearth furnaces

31a-1/20 with slag separators

31a-1/30 with several shafts

31a-1/40 with air preheating

31a-1/50 with oil, gas or coal dust firing

31a-1/60 connected with reverberatory, crucible or electric furnaces

31a-1/70 Elements of cupola furnaces, safety devices, dust and spark traps, etc.

Reverberatory or hearth furnaces (18b; 24c-9; 32a-1 – 32a-4; 32a-5/00; 40a-8; 48a-19/10; firing of reverberatory furnaces 24a-14; electric heating 21h-14 – 21h-28)

31a-2/01 fixed, with heat accumulators and preheaters

31a-2/10 fixed, with grate firing (stokers)

31a-2/20 fixed with coal dust firing

31a-2/30 rotatable or tiltable, with gas, oil, or coal-dust firing

31a-2/40 Electrically heated melting hearth furnaces

	Crucible furnaces (40a-9; 40a-19/12; 80b-8)
31a-3/01	fixed, special types, also with electric heating
31a-3/10	fixed, with grate firing
31a-3/20	fixed, with gas or oil firing, also with flameless firing
31a-3/30	tiltable, with grate firing
31a-3/40	tiltable, with oil or gas firing, also with flameless firing
31a-3/50	Crucible reverberatory furnaces, compound and battery furnaces
31a-3/60	Pot furnaces and other special furnaces
31a-3/70	Crucibles and tapping crucibles and their manufacture
31a-3/80	Gas traps, preheating devices, discharging devices, cover lifters, etc. on crucible and pot furnaces
31a-4	Drying ovens and installations, for casting moulds and cores (82a-2)
31a-5/01	Mobile drying and heating ovens and furnaces for moulds and cores
31a-5/10	Electric heating devices for moulds and cores (82a)
31a-6/01	Production of furnace linings
31a-6/10	Tuyeres for cupola furnaces
31a-6/20	Tap-hole closing devices
31a-6/40	Safety devices on reverberatory and crucible furnaces

31a1 (IPC: F27B) Furnaces, kilns, ovens, or retorts in general; Open sintering or like apparatus

Notes:

1. This subclass deals with furnaces, kilns, ovens, retorts, open sintering apparatus, and details or accessories therefor, in general. It includes the arrangement of electrical heating elements in or on furnaces, but not the elements themselves. It is not concerned with the processes carried on within the furnaces.

2. In this subclass, where appropriate, the term "furnaces" is to be understood as covering kilns, ovens, or retorts.

31a1-1/00	Shaft or like vertical or substantially vertical furnaces
31a1-1/02	. with two or more shafts or chambers, e.g. multi-storey
31a1-1/04	. . Combinations or arrangements of shafts
31a1-1/06	. of other than up-draught type
31a1-1/08	. heated otherwise than by solid fuel mixed with charge
31a1-1/10	. Details, accessories, or equipment peculiar to furnaces of these types
31a1-1/12	. . Shells or casings; Supports therefor
31a1-1/14	. . . Arrangements of linings (linings in general 31a3-1/00)
31a1-1/16	. . Arrangements of tuyeres
31a1-1/18	. . Arrangements of dust collectors
31a1-1/20	. . Arrangements of devices for charging or discharging
31a1-1/22	. . Arrangements of heat-exchange apparatus (heat-exchangers in general 17)
31a1-1/24	. . Cooling arrangements
31a1-1/26	. . Arrangements of controlling devices
31a1-1/28	. . Arrangements of monitoring devices, of indicators, of alarm devices
31a1-3/00	Hearth-type furnaces, e.g. of reverberatory type (31a1-9/00, 31a1-11/00, 31a1-13/00, 31a1-14/00, 31a1-15/00, 31a1-21/00 take precedence); Tank furnaces
31a1-3/02	. of single-chamber fixed-hearth type
31a1-3/04	. of multiple-hearth type; of multiple-chamber type; Combinations of hearth-type furnaces
31a1-3/06	. with movable working chambers or hearths, e.g. tiltable
31a1-3/08	. heated electrically, with or without any other source of heat
31a1-3/10	. Details, accessories, or equipment peculiar to hearth-type furnaces
31a1-3/12	. . Working chambers or casings; Supports therefor

31a1-3/14	. . . Arrangements of linings
31a1-3/16	. . . Walls; Roofs
31a1-3/18	. . Arrangements of devices for charging or discharging
31a1-3/20	. . Arrangements of heating devices
31a1-3/22	. . Arrangements of air or gas supply devices
31a1-3/24	. . Cooling arrangements
31a1-3/26	. . Arrangements of heat-exchange apparatus
31a1-5/00	Muffle furnaces; Retort furnaces; Other furnaces in which the charge is held completely isolated (31a1-9/00 takes precedence)
31a1-5/02	. of multiple-chamber type
31a1-5/04	. adapted for treating the charge in vacuum or special atmosphere
31a1-5/06	. Details, accessories, or equipment peculiar to furnaces of these types
31a1-5/08	. . Arrangements of linings
31a1-5/10	. . Muffles
31a1-5/12	. . Arrangements of devices for charging or discharging
31a1-5/14	. . Arrangements of heating devices
31a1-5/16	. . Arrangements of air or gas supply devices
31a1-7/00	Rotary-drum furnaces, i.e. horizontal or slightly inclined
31a1-7/02	. of multiple-chamber or multiple-drum type
31a1-7/04	. . with longitudinal divisions
31a1-7/06	. adapted for treating the charge in vacuum or special atmosphere
31a1-7/08	. externally heated
31a1-7/10	. internally heated, e.g. by means of passages in the wall
31a1-7/12	. tiltable
31a1-7/14	. with means for agitating or moving the charge
31a1-7/16	. . the means being fixed relatively to the drum (31a1-7/04 takes precedence)
31a1-7/18	. . the means being movable within the drum
31a1-7/20	. Details, accessories, or equipment peculiar to rotary-drum furnaces
31a1-7/22	. . Rotary drums; Supports therefor
31a1-7/24	. . . Seals between rotary and stationary parts
31a1-7/26	. . Drives
31a1-7/28	. . Arrangements of linings
31a1-7/30	. . Arrangements of partitions
31a1-7/32	. . Arrangements of devices for charging or discharging
31a1-7/34	. . Arrangements of heating devices
31a1-7/36	. . Arrangements of air or gas supply devices
31a1-7/38	. . Arrangements of cooling devices
31a1-9/00	Furnaces through which the charge is moved mechanically, e.g. of tunnel type (31a1-7/14 takes precedence); Similar furnaces in which the charge moves by gravity
31a1-9/02	. of multiple-track type; of multiple-chamber type; Combinations of furnaces
31a1-9/04	. adapted for treating the charge in vacuum or special atmosphere
31a1-9/06	. heated without contact between combustion gases and charge; electrically heated
31a1-9/08	. . heated through chamber walls
31a1-9/10	. . heated by hot air or gas
31a1-9/12	. with special arrangements for preheating or cooling the charge
31a1-9/14	. characterised by the path of the charge during treatment; characterised by the means by which the charge is moved during treatment (31a1-9/28 takes precedence; travelling or movable supports or containers for the charge 31a3-3/12)
31a1-9/16	. . the charge moving in a circular or arcuate path
31a1-9/18	. . . under the action of scrapers or pushers
31a1-9/20	. . the charge moving in a substantially straight path
31a1-9/22	. . . under the action of scrapers or pushers (31a1-9/26 takes precedence)
31a1-9/24	. . . being carried by a conveyer
31a1-9/26	. . . on or in trucks, sleds, or containers
31a1-9/28	. for treating continuous lengths of work
31a1-9/30	. Details, accessories, or equipment peculiar to furnaces of these types
31a1-9/32	. . Casings

31a1-9/34	. . . Arrangements of linings
31a1-9/36	. . Arrangements of heating devices
31a1-9/38	. . Arrangements of devices for charging or discharging
31a1-9/40	. . Arrangements of controlling or monitoring devices
31a1-11/00	Bell-type furnaces
31a1-11/02	. inverted or side-facing; moving
31a1-11/04	. Multi-station furnaces
31a1-11/06	. . adapted for treating the charge in vacuum or special atmosphere
31a1-11/08	. Single-station furnaces adapted for treating the charge in vacuum or special atmosphere
31a1-11/10	. Details, accessories, or equipment peculiar to bell-type furnaces
31a1-11/12	. . Arrangements of charging or discharging devices
31a1-11/14	. . Arrangements of heating devices
31a1-13/00	Furnaces with both stationary charge and progression of heating, e.g. of ring type, of type in which segmental kiln moves over stationary charge
31a1-13/02	. of multiple-chamber type with permanent partitions; Combinations of furnaces
31a1-13/04	. of single-chamber type with temporary partitions
31a1-13/06	. Details, accessories, or equipment peculiar to furnaces of this type
31a1-13/08	. . Casings
31a1-13/10	. . . Arrangements of linings
31a1-13/12	. . Arrangements of heating devices
31a1-14/00	Crucible or pot furnaces
31a1-14/02	. with tilting or rocking arrangements (31a1-14/04 takes precedence)
31a1-14/04	. adapted for treating the charge in vacuum or special atmosphere
31a1-14/06	. heated electrically, with or without any other source of heat (31a1-14/04 takes precedence)
31a1-14/08	. Details peculiar to crucible or pot furnaces
31a1-14/10	. . Crucibles
31a1-14/12	. . . Covers therefor
31a1-14/14	. . Arrangements of heating devices
31a1-15/00	Fluidised-bed furnaces; Other furnaces using or treating finely-divided materials in dispersion
31a1-15/02	. Details, accessories, or equipment peculiar to furnaces of these types
31a1-15/04	. . Casings; Supports therefor
31a1-15/06	. . . Arrangements of linings
31a1-15/08	. . Arrangements of devices for charging or discharging
31a1-15/10	. . Arrangements of air or gas supply devices
31a1-15/12	. . Arrangements of dust collectors
31a1-15/14	. . Arrangements of heating devices
31a1-15/16	. . Arrangements of cooling devices
31a1-15/18	. . Arrangements of controlling devices
31a1-15/20	. . Arrangements of monitoring devices, of indicators, of alarm devices
31a1-17/00	Furnaces of a kind not covered by any preceding group (structural combinations of furnaces 31a1-19/02)
31a1-17/02	. specially designed for laboratory use
31a1-19/00	Combinations of furnaces of kinds not covered by a single preceding main group
31a1-19/02	. combined in one structure
31a1-19/04	. arranged for associated working
31a1-21/00	Open or uncovered sintering apparatus; Other heat-treatment apparatus of like construction
31a1-21/02	. Sintering grates or tables
31a1-21/04	. Sintering pots or sintering pans
31a1-21/06	. Endless-strand sintering machines

31a2 (IPC: F27C) Furnaces specially adapted for carrying-out metallurgical processes, for melting materials, or for heating liquid or molten materials (fluidised bed furnaces 31a1-15/00)

Notes:

1: This subclass deals with furnaces, kilns, ovens, retorts, open sintering apparatus, and details or accessories therefor, in general. It includes the arrangement of electrical heating elements in or on furnaces, but not the elements themselves. It is not concerned with the processes carried on within the furnaces.

2: In this subclass, where appropriate, the term "furnaces" is to be understood as covering kilns, ovens, or retorts.

- 31a2-1/00 Shaft or like vertical or substantially vertical furnaces**
 31a2-1/02 . with two or more shafts or chambers, e.g. multi-storey
 31a2-1/04 . Details peculiar to furnaces of these types
 31a2-1/06 . . Forms of shells or bodies; Arrangements of internal fittings
 31a2-1/08 . . Arrangements of tuyeres or air-delivery passages
 31a2-1/10 . . in respect of heating or firing
 31a2-1/12 . . Cooling arrangements
- 31a2-3/00 Hearth-type furnaces, e.g. of reverberatory type, of Siemens type (31a2-5/00 to 31a2-13/00 take precedence); Tank furnaces**
 31a2-3/02 . of single-chamber fixed-hearth type
 31a2-3/04 . of multiple-hearth type; of multiple-chamber type; Combinations of hearth-type furnaces
 31a2-3/06 . Details peculiar to furnaces of these types
 31a2-3/08 . . Working chambers
 31a2-3/10 . . in respect of heating or firing
 31a2-3/12 . . Cooling arrangements
- 31a2-5/00 Muffle furnaces**
 31a2-5/02 . adapted for treating the charge in vacuum or special atmosphere
- 31a2-7/00 Rotary-drum furnaces**
- 31a2-9/00 Furnaces through which the charge is moved mechanically, e.g. of tunnel type (31a2-7/00 takes precedence); Similar furnaces in which the charge moves by gravity**
- 31a2-11/00 Bell-type furnaces**
 31a2-11/02 . adapted for treating the charge in vacuum or special atmosphere
- 31a2-13/00 Crucible or pot furnaces**
 31a2-13/02 . with tilting or rocking arrangements (31a2-13/04 takes precedence)
 31a2-13/04 . adapted for treating the charge in vacuum or special atmosphere
 31a2-13/06 . heated electrically, with or without any other source of heat (31a2-13/04 takes precedence)
 31a2-13/08 . Details peculiar to crucible or pot furnaces
 31a2-13/10 . . Crucibles
 31a2-13/12 . . . Covers therefor
 31a2-13/14 . . Arrangements of heating devices
- 31a2-15/00 Other furnaces; Combinations of furnaces not covered by a single preceding main group**
- Features peculiar to furnaces dealt with in this subclass, so far as not fully covered by a single preceding group**
- 31a2-17/00 Tapping equipment; Equipment for removing slag**
- 31a2-19/00 Details peculiar to furnaces dealt with in this subclass, so far as not fully covered by a single preceding group**

31a3 (IPC: F27D) Details or accessories of furnaces, kilns, ovens, or retorts, in so far as they are of kinds occurring in more than one kind of furnace (combustion apparatus 24)

Notes:

1. This subclass deals with furnaces, kilns, ovens, retorts, open sintering apparatus, and details or accessories therefor, in general. It includes the arrangement of electrical heating elements in or on furnaces, but not the elements themselves. It is not concerned with the processes carried on within the furnaces.

2. In this subclass, where appropriate, the term "furnaces" is to be understood as covering kilns, ovens, or retorts.

- 31a3-1/00 Casings; Linings; Walls; Roofs** (refractory material per se 80b; firebridges for combustion chambers 24k)
- 31a3-1/02 . Crowns; Roofs
 - 31a3-1/04 . characterised by the form of the bricks or blocks used
 - 31a3-1/06 . . Composite bricks or blocks
 - 31a3-1/08 . . . Bricks or blocks with internal reinforcement or metal backing
 - 31a3-1/10 . Monolithic linings; Supports therefor
 - 31a3-1/12 . incorporating cooling arrangements (constructions of tube assemblies in general 17)
 - 31a3-1/14 . Supports for linings (31a3-1/10 takes precedence)
 - 31a3-1/16 . Making or repairing linings
 - 31a3-1/18 . Door frames; Doors, lids, removable covers
- 31a3-3/00 Charging; Discharging; Manipulation of charge** (moving charge through a furnace 31a1-9/14)
- 31a3-3/02 . Skids or tracks for heavy objects
 - 31a3-3/04 . Ram or pusher apparatus
 - 31a3-3/06 . Charging or discharging machines on travelling carriages
 - 31a3-3/08 . Screw feeders; Screw dischargers
 - 31a3-3/10 . Charging directly from hoppers or shoots
 - 31a3-3/12 . Travelling or movable supports or containers for the charge
 - 31a3-3/14 . Charging or discharging liquid or molten material
 - 31a3-3/15 . Tapping equipment; Equipment for removing slag
 - 31a3-3/16 . Introducing a fluid jet or current into the charge
- 31a3-5/00 Supports, screens, or the like for the charge within the furnace** (travelling or movable supports 31a3-3/12)
- 31a3-7/00 Forming, maintaining, or circulating atmospheres in heating chambers**
- 31a3-7/02 . Supplying steam, vapour, gases, or liquids
 - 31a3-7/04 . Circulating atmospheres by mechanical means
 - 31a3-7/06 . Forming or maintaining special atmospheres or vacuum within heating chambers (31a3-7/02 takes precedence)
- 31a3-9/00 Cooling of furnaces or of charges therein** (31a3-1/00, 31a3-3/00 take precedence)
- 31a3-11/00 Arrangement of elements for electric heating in or on furnaces** (details 21h)
- 31a3-11/02 . Ohmic resistance heating
 - 31a3-11/04 . . with direct passage of current through the material being heated
 - 31a3-11/06 . Induction heating, i.e. in which the material being heated, or its container or elements embodied therein, form the secondary of a transformer
 - 31a3-11/08 . Heating by electric discharge, e.g. arc discharge
 - 31a3-11/10 . . Disposition of electrodes; Control of position of electrodes (automatic control of temperature 42q)
 - 31a3-11/12 . with electromagnetic fields acting directly on the material being heated
- 31a3-13/00 Apparatus for preheating charges; Arrangements for preheating charges**

31a3-15/00	Handling or treating discharged material; Supports or receiving chambers therefor
31a3-15/02	. Cooling
31a3-17/00	Arrangement for using waste heat (heat-exchangers per se 17); Arrangement for using, or disposing of, waste gases
31a3-19/00	Arrangement of controlling devices
31a3-21/00	Arrangement of monitoring devices; Arrangements of safety devices
31a3-21/02	. Observation or illuminating devices
31a3-21/04	. Arrangements of indicators or alarms
31a3-23/00	Details or accessories not covered by any preceding group
31a3-23/02	. Devices for removing incrustations

31b Moulding machines

Mechanically operated moulding machines

- 31b-1/01 with flask lifting devices
- 31b-1/10 with pattern lowering devices
- 31b-1/20 with turnover plate
- 31b-1/30 with stripping plate

Manually operated moulding machines

- 31b-2/01 with flask lifting devices
- 31b-2/10 with pattern lowering devices
- 31b-2/20 with turnover plate
- 31b-2/30 with stripping plate (80a-10 – 80a-14)
- 31b-3/01 Moulding machines with longitudinal tables or chains rotating around horizontal axis
- 31b-3/10 Moulding machines with moulding table rotating around vertical axis (80a-18)
- 31b-4 Roller moulding machines

Tube moulding machines (80a-34)

- 31b-5/01 with vertical flasks
- 31b-5/10 with horizontal flasks
- 31b-5/20 Rammers and ramming devices
- 31b-5/30 with jarring and impacting devices
- 31b-5/40 with cone pressure
- 31b-5/50 with worm pressure
- 31b-6 Machines for moulding belt pulleys
- 31b-7/01 Machines for moulding wheels
- 31b-7/10 Sweeping devices
- 31b-8/01 Moulding machines for pot and tableware casting
- 31b-8/10 Moulding machines for tubs and vessels
- 31b-9/01 Core moulding machines (80a-26 – 80a-28), general types
- 31b-9/10 Pressing between horizontal core plates
- 31b-9/20 Core production by sweeping, rotating and rolling
- 31b-9/30 Piston extrusion-presses
- 31b-9/40 Worm extrusion-presses
- 31b-9/50 Core moulding machines with jarring devices

Jarring moulding machines (80a-49)

- 31b-10/01 General design features
- 31b-10/10 with mechanical drive
- 31b-10/20 with pneumatic or hydraulic drive
- 31b-10/30 with electromagnetic drive

31b-10/40	with reaction, shock-less, jarring moulding machines
31b-10/50	with turnover plate
31b-11	Centrifugal sand moulding machines for filling flasks
31b-12	Sand blast machines for filling flasks (80a-46)
31b-13/01	Moulding machines of special design (moulding processes 31c, 501)
31b-13/10	Mobile moulding machines
31b-13/20	Moulding machines for casting without flasks
31b-13/30	Moulding presses with crank or eccentric drive, etc.
31b-13/40	Pneumatic or hydraulic moulding presses
31b-13/50	Moulding presses with electric drive
31b-13/60	Moulding presses with bilateral pressure
31b-13/70	Moulding presses with extensible or pivotable press head
31b-13/80	Twin-press moulding machines
31b-14/01	Impact and jarring devices for moulding machines
31b-14/10	Control mechanisms
31b-14/20	Turning, stopping and lifting devices
31b-14/30	Adjustable moulding tables

31b1 (IPC: B22C) Foundry moulding (moulding refractory materials in general 80a)

Note:

This subclass deals with the making of moulds for casting metals or of other refractory moulds. It embraces selection and preparation of materials therefor and also the necessary patterns, processes, machines, accessory devices or tools.

31b1-1/00	Compositions of refractory mould or core materials; Grain structures thereof (refractory materials in general 80b); Chemical or physical features in the formation or manufacture of moulds
31b1-1/02	. characterised by additives for special purposes, e.g. indicators, break-down additives
31b1-1/04	. . for protection of the casting, e.g. against decarbonisation
31b1-1/06	. . . for casting extremely oxidisable metals
31b1-1/08	. . for decreasing shrinkage of the mould, e.g. for investment casting
31b1-1/10	. . for influencing the hardening tendency of the mould material (influencing the hardening tendency of the binding agent only 31b1-1/16)
31b1-1/12	. . for manufacturing permanent moulds or cores
31b1-1/14	. . for separating the pattern from the mould
31b1-1/16	. characterised by the use of binding agents; Mixtures of binding agents
31b1-1/18	. . of inorganic agents
31b1-1/20	. . of organic agents
31b1-1/22	. . . of resins or rosins
31b1-1/24	. . . of oily or fatty substances; of distillation residues therefrom
31b1-1/26	. . . of carbohydrates; of distillation residues therefrom
31b1-3/00	Selection of compositions for coating the surfaces of moulds, cores, or patterns
31b1-5/00	Machines or devices specially designed for dressing or handling the mould material so far as specially adapted for that purpose (of general applicability, see the relevant classes, e.g. for material with water-setting properties 80a)
31b1-5/02	. dressing by centrifuging essentially or additionally
31b1-5/04	. by grinding, blending, mixing, kneading, or stirring
31b1-5/06	. by sieving or magnetic separating
31b1-5/08	. by sprinkling, cooling, or drying
31b1-5/10	. by dust separating

31b1-5/12	. for filling flasks (in combination with compacting 31b1-15/20 to 31b1-15/28)
31b1-5/14	. Equipment for storing or handling the dressed mould material, forming part of a plant for preparing such material
31b1-5/16	. . with conveyers or other equipment for feeding the material
31b1-5/18	. Plants for preparing mould materials
31b1-7/00	Patterns; Manufacture thereof so far as not provided for in other classes
31b1-7/02	. Lost patterns
31b1-7/04	. Pattern plates
31b1-7/06	. Core boxes
31b1-9/00	Moulds or cores (uniquely adapted to particular casting processes 31b2); Moulding processes (processes involving the use of particular moulding machines, see the relevant groups for these machines)
31b1-9/02	. Sand moulds or like moulds for shaped castings
31b1-9/04	. . Use of lost patterns
31b1-9/06	. Permanent moulds for shaped castings (moulds for ingots 31b2-7/06)
31b1-9/08	. Features with respect to supply of molten metal, e.g. ingates, circular gates, skim gates
31b1-9/10	. Cores; Manufacture or installation of cores
31b1-9/12	. Treating moulds or cores, e.g. drying, hardening
31b1-9/14	. . Equipment or plant specially designed for drying moulds or cores (31b1-13/08 takes precedence)
31b1-9/16	. . . Movable drying equipment
31b1-9/18	. Finishing
31b1-9/20	. Stack moulds, i.e. arrangement of multiple moulds or flasks
31b1-9/22	. Moulds for peculiarly-shaped castings
31b1-9/24	. . for hollow articles
31b1-9/26	. . . for ribbed tubes; for radiators
31b1-9/28	. . for wheels, rolls, or rollers
31b1-9/30	. . for chains
<u>Moulding machines for making moulds or cores</u>	
31b1-11/00	Moulding machines characterised by the relative arrangement of the parts of same
31b1-11/02	. Machines in which the moulds are moved during a cycle of successive operations
31b1-11/04	. . by a horizontal rotary table or carrier
31b1-11/06	. . by a vertical rotary carrier
31b1-11/08	. . by non-rotary conveying means, e.g. by travelling platforms
31b1-11/10	. with one or more flasks forming part of the machine, from which only the sand moulds made by compacting are removed
31b1-11/12	. Moulding machines able to travel
31b1-13/00	Moulding machines for making moulds or cores of particular shapes
31b1-13/02	. equipped with templates, e.g. for sweeping operation
31b1-13/04	. . with rotary templates, e.g. arranged on a pillar
31b1-13/06	. . with non-rotary template and rotary flask
31b1-13/08	. for shell moulds or shell cores
31b1-13/10	. for pipes or elongated hollow articles
31b1-13/12	. for cores
31b1-13/14	. . by sweeping, turning, or coating
31b1-13/16	. . by pressing through a die
31b1-15/00	Moulding machines characterised by the compacting mechanism; Accessories therefor
31b1-15/02	. Compacting by pressing devices only
31b1-15/04	. . involving muscle power, e.g. hand-operated levers
31b1-15/06	. . involving mechanical gearings, e.g. crank gears (31b1-15/04 takes precedence)
31b1-15/08	. . involving pneumatic or hydraulic mechanisms
31b1-15/10	. Compacting by jarring devices only (features of the jarring devices per se 42s)
31b1-15/12	. . involving mechanical gearings

31b1-15/14	. . involving pneumatic or hydraulic mechanisms
31b1-15/16	. . . the machine having special provision for reducing shock to its frame
31b1-15/18 by means of separate shock-absorbers
31b1-15/20	. Compacting by centrifugal forces only, e.g. in sand slingers
31b1-15/22	. Compacting during the charge of the mould material by pressure air or vacuum
31b1-15/24	. . involving blowing devices in which the material is supplied in the form of loose particles
31b1-15/26	. . involving propulsion devices in which the material is supplied in the shape of a compacted column or the like
31b1-15/28	. Compacting by different means acting simultaneously or successively, e.g. preliminary blowing and finally pressing
31b1-15/30	. . by both pressing and jarring devices
31b1-15/32	. . . involving mechanical gearing only
31b1-15/34	. . . involving pneumatic or hydraulic mechanisms only
31b1-17/00	Moulding machines characterised by the mechanism for separating the pattern from the mould and/or for turning over the flask or the pattern plate
31b1-17/02	. Moulding machines with pin lifting arrangement
31b1-17/04	. Drop-plate moulding machines
31b1-17/06	. Moulding machines using stripping plates; Stripping plates
31b1-17/08	. Moulding machines with mechanisms to turn over the pattern plate and/or the mould around a horizontal axis
31b1-17/10	. . Turning-over pattern plate and flask only (31b1-17/14 takes precedence)
31b1-17/12	. . Turning-over pattern plate, flask, and compacting device as a unit (31b1-17/14 takes precedence)
31b1-17/14	. . arranged to one side of the mould table, so-called roll-over table moulding machines
31b1-19/00	Components or accessories for moulding machines
31b1-19/02	. Mould tables
31b1-19/04	. Controlling devices specially designed for moulding machines
31b1-19/06	. Devices for rapping or loosening the pattern (vibratory features per se 42s)
31b1-21/00	Flasks; Accessories therefor (stripping plates 31b1-17/06)
31b1-21/02	. Sectional flasks, i.e. with divided, articulated, or interchangeable side sections
31b1-21/04	. Upset frames; Bottom boards or mould boards (pattern plates 31b1-7/04)
31b1-21/06	. . Bottom boards or mould boards
31b1-21/08	. Clamping equipment
31b1-21/10	. Guiding equipment
31b1-21/12	. Accessories
31b1-21/14	. . Reinforcing or securing equipment of the moulding material or of cores, e.g. gagers, chaplets, pins, bars
31b1-23/00	Tools; Devices not mentioned before for moulding
31b1-23/02	. Devices for coating moulds or cores
31b1-25/00	Foundry moulding plants (for preparing mould materials 31b1-5/18; in combination with casting plants 31b2-47/02)
31b2	(IPC: B22D) Casting of metals; Casting of other substances by the same processes or devices (metallurgical processing, selection of substances to be added to metal 18, 40)

Note:

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

31b2-1/00	Treatment of fused masses in the ladle or the supply runners before casting (metallurgical processing, e.g. refining of iron or other metal 18, 40)
31b2-1/02	. Arrangement of indicating or measuring devices, e.g. for temperature or viscosity of the fused mass

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

31b2-3/00 Pig or like casting (equipment for conveying molten metal 31b2-35/00)
31b2-3/02 . Moulding of beds

31b2-5/00 Machines or plants for pig or like casting
31b2-5/02 . with rotary casting tables
31b2-5/04 . with endless casting conveyers

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

31b2-7/00 Casting ingots (equipment for conveying molten metal 31b2-35/00)
31b2-7/02 . Casting compound ingots of two or more different metals in the molten state, i.e. integrally cast
31b2-7/04 . Casting hollow ingots
31b2-7/06 . Ingot moulds or their manufacture
31b2-7/08 . . Divided ingot moulds
31b2-7/10 . . Hot tops therefor
31b2-7/12 . Appurtenances, e.g. for sintering, for preventing splashing

31b2-9/00 Machines or plants for casting ingots

Particular casting processes; Machines or apparatus therefor

31b2-11/00 Continuous casting of metals, i.e. casting in indefinite lengths (metal drawing, metal extruding 7b)
31b2-11/02 . by drawing the fused mass only; Casting into tubular open-ended moulds
31b2-11/04 . . Casting into tubular open-ended calibrating moulds
31b2-11/06 . into moulds with travelling walls, e.g. with rolls, plates, belts, caterpillars, molten surfaces (rolling metal directly from melt 7a-1/44)
31b2-11/08 . Accessories for starting the casting procedure
31b2-11/10 . Accessories for supplying or treating molten metal
31b2-11/12 . Accessories for subsequent treating or working cast stock on the spot, e.g. cooling, cutting, removing
31b2-11/14 . Plants for continuous casting

31b2-13/00 Centrifugal casting; Casting by using centrifugal force
31b2-13/02 . of elongated solid or hollow bodies, e.g. pipes, in moulds rotating around their longitudinal axis
31b2-13/04 . of shallow solid or hollow bodies, e.g. wheels or rings, in moulds rotating around their axis of symmetry
31b2-13/06 . of solid or hollow bodies in moulds rotating around an axis arranged outside of the mould
31b2-13/08 . in which a stationary mould is fed from a rotating mass of liquid metal
31b2-13/10 . Accessories for centrifugal casting apparatus, e.g. moulds, linings therefor, means for feeding molten metal, cleansing moulds, removing castings (making or lining moulds 31b1)

31b2-15/00 Casting using a mould or core of which an important part is of high thermal conductivity, e.g. chill casting; Moulds or accessories specially adapted therefor

31b2-15/02 . of cylinders, pistons, bearing shells or like thin-walled objects
31b2-15/04 . Machines or apparatus for chill casting (31b2-15/02 takes precedence)

31b2-17/00 Pressure or injection die casting; Machines or accessories therefor, e.g. trimming dies, splash guards

31b2-17/02 . Hot chamber machines, i.e. with heated press chamber in which metal is melted
31b2-17/04 . . Plunger machines
31b2-17/06 . . air injection machines
31b2-17/08 . Cold chamber machines, i.e. with unheated press chamber into which molten metal is ladled
31b2-17/10 . . with horizontal press motion
31b2-17/12 . . with vertical press motion
31b2-17/14 . Machines with evacuated die cavity

31b2-17/16	. specially adapted for casting slide fasteners or elements therefor
31b2-17/18	. built up from units providing for different combinations
31b2-17/20	. Accessories; Details
31b2-17/22	. . Dies (manufacture see the appropriate class, e.g. 49I-15/24); Die plates; Die supports; Cooling equipment for dies; Accessories for loosening and ejecting castings from dies
31b2-17/24	. . . Accessories for locating and holding cores or inserts
31b2-17/26	. . Mechanisms or devices for locking or opening dies
31b2-17/28	. . Melting pots
31b2-17/30	. . Accessories for supplying molten metal, e.g. in rations
31b2-17/32	. . Controlling equipment
31b2-19/00	Casting in, on, or around objects which form part of the product (31b2-23/04 takes precedence; alumino-thermic welding 49h-23/00; covering surfaces by treatment with liquid metal without affecting the shape 48b-1/00)
31b2-19/02	. for making reinforced articles
31b2-19/04	. for joining parts, e.g. pipes
31b2-19/06	. for manufacturing or repairing tools
31b2-19/08	. for building up linings or coverings, e.g. of anti-frictional metal
31b2-19/10	. Repairing defective or damaged objects by metal casting procedures (by other procedures 49I-7/04)
31b2-19/12	. for making objects, e.g. hinges, with parts which are movable relatively to one another
31b2-21/00	Casting non-ferrous metals or metallic compounds so far as their metallurgical properties are of importance for the casting procedure; Selection of compositions therefor
31b2-21/02	. Casting exceedingly oxidisable non-ferrous metals, e.g. in inert atmosphere (use of inert atmosphere in casting metals in general 31b2-23/00; apparatus for vacuum casting 31b2-27/16)
31b2-21/04	. . Casting aluminium or magnesium
31b2-21/06	. Casting non-ferrous metals with a high melting-point, e.g. metallic carbides (31b2-21/02 takes precedence)
31b2-23/00	Casting processes not mentioned before (aluminothermic welding 49h-23/00)
31b2-23/02	. Top casting
31b2-23/04	. Casting by dipping (covering surfaces by treatment with liquid metal without affecting the shape 48b-1/00)
31b2-23/06	. Melting-down metal, e.g. metal particles, in the mould
31b2-23/08	. Obtaining granules or pellets from molten material (spraying devices per se 85g)
31b2-25/00	Special casting characterised by the nature of the product (31b2-15/02, 31b2-17/16, 31b2-19/00 take precedence)
31b2-25/02	. by its peculiarity of shape; of works of art
31b2-25/04	. . Casting metal electric battery plates or the like (casting electrodes for accumulators 21k9-35/20)
31b2-25/06	. by its physical properties (31b2-27/00 takes precedence)
31b2-25/08	. . by uniform hardness (31b2-15/00 takes precedence)
31b2-27/00	Treating the metal in the mould while it is molten or ductile (31b2-7/12, 31b2-11/10, 31b2-43/00 take precedence); Pressure or vacuum casting (31b2-17/00 takes precedence)
31b2-27/02	. Use of electric or magnetic effects
31b2-27/04	. Influencing the temperature of the metal, e.g. by heating or cooling the mould
31b2-27/06	. . Heating the top discard of ingots (hot tops for ingot moulds 31b2-7/10)
31b2-27/08	. Shaking, vibrating, or turning of moulds
31b2-27/10	. Pressure casting
31b2-27/12	. . making use of pressing devices
31b2-27/14	. . making use of pressure gas
31b2-27/16	. Vacuum casting

- 31b2-27/18 . Measures for using chemical processes for influencing the surface composition of castings, e.g. for increasing resistance to acid attack
- 31b2-27/20 . 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 67b)

31b2-29/00 Removing castings from moulds; Removing cores

- 31b2-29/02 . Vibratory apparatus specially designed for shaking out flasks
- 31b2-29/04 . Strippers specially designed therefor (strippers per se 35b)
- 31b2-29/06 . . actuated by pressure fluid

31b2-31/00 Cutting-off surplus material, e.g. gates

Other equipment for casting

31b2-33/00 Equipment for handling moulds

- 31b2-33/02 . Turning and transposing moulds
- 31b2-33/04 . Bringing together or separating moulds
- 31b2-33/06 . Burdening or relieving moulds

31b2-35/00 Equipment for conveying molten metal into beds or moulds (31b2-37/00 to 31b2-41/00 take precedence; specially adapted to particular processes or machines, see the relevant groups)

- 31b2-35/02 . into beds
- 31b2-35/04 . into moulds, e.g. base plates, runners
- 31b2-35/06 . Heating or cooling equipment

31b2-37/00 Equipment for controlling the pouring of molten metal from the ladle into moulds (31b2-39/00 takes precedence)

31b2-39/00 Equipment for supplying molten metal in rations

31b2-41/00 Casting ladles, cups or the like (31b2-37/00, 31b2-39/00, 31b2-43/00 take precedence)

- 31b2-41/02 . Linings
- 31b2-41/04 . tiltable
- 31b2-41/06 . Equipment for tilting
- 31b2-41/08 . for bottom pouring
- 31b2-41/10 . . Stoppers; Stopper removing equipment
- 31b2-41/12 . Travelling ladles or similar containers; Cars for ladles (casting cranes 35b)

31b2-43/00 Mechanical cleaning, e.g. skimming of molten metals

31b2-45/00 Equipment for casting, not otherwise provided for

31b2-47/00 Casting plants

- 31b2-47/02 . for both moulding and casting

31b3 (IPC: B22F) Working metallic powder; Manufacture of articles from metallic powder; Obtaining metallic powder, not otherwise provided for (processes or apparatus for obtaining metallic powder, covered by a single other sub-class, see the relevant sub-class, e.g. obtaining by spraying molten metal 31b2-23/08; making ceramics by compacting or sintering 80b; making alloys by compacting or sintering 40b-1/04, 40b-33/02)

Notes:

1. The term "metallic powder" is to be understood as covering powders containing a substantial proportion of non-metallic material.

2. The term "powder" is not intended to exclude somewhat larger particles which behave in a similar way.

31b3-1/00 Special treatment of metallic powder before working, e.g. to facilitate the operation; Metallic powders per se, e.g. mixtures of particles of different composition (80b, 39b take precedence)

31b3-3/00 Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefor

- 31b3-3/02 . Compacting only
- 31b3-3/04 . . by applying fluid pressure
- 31b3-3/06 . . by centrifugal forces
- 31b3-3/08 . . by explosive forces
- 31b3-3/10 . Sintering only, e.g. making porous workpieces
- 31b3-3/12 . Both compacting and sintering
- 31b3-3/14 . . simultaneously
- 31b3-3/16 . . in successive or repeated steps
- 31b3-3/18 . for producing sheet material by making use of pressure rollers
- 31b3-3/20 . for producing extruded rod stock
- 31b3-3/22 . for producing castings from a slip
- 31b3-3/24 . After-treatment of workpieces or articles
- 31b3-3/26 . . Impregnating

31b3-5/00 Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product

- 31b3-5/02 . of piston rings
- 31b3-5/04 . of turbine blades
- 31b3-5/06 . of threaded articles, e.g. nuts
- 31b3-5/08 . of toothed articles, e.g. gear wheels; of cam discs

31b3-7/00 Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting

- 31b3-7/02 . of composite layers
- 31b3-7/04 . . with one or more layers not made from powder, e.g. made from solid metal
- 31b3-7/06 . of composite workpieces or articles from parts, e.g. to form tipped tools
- 31b3-7/08 . . with one or more parts not made from powder

31b3-9/00 Making metallic powder by methods not otherwise provided for

31c Casting and moulding, in general

Moulding

- 31c-1/01 Moulding materials for casting moulds and cores
- 31c-1/02 Moulding materials for casting easily oxidised metals
- 31c-1/03 Core oils
- 31c-2 Pattern and mould powders
- 31c-3 Materials for lining moulds
- 31c-4 Devices for spraying and lining casting moulds (75c-22)

- 31c-5/01 Moulding processes, in general
- 31c-5/02 Multiple moulding
- 31c-5/03 Core moulding
- 31c-5/04 Moulding of radiators
- 31c-5/05 Moulding of tubs, pots and similar hollow articles (31b-8)
- 31c-5/06 Moulding of wheels and rollers (31b-6; 31b-7)
- Preparation of moulding materials**
- 31c-6/01 Centrifugal machines (31b-11; 31b-12; 50c-9; 80a-7)
- 31c-6/02 Edge rollers (50c-6; 80a-2; 80a-3)
- 31c-6/03 Jarring and cylinder screens, also magnetic separators, (1a-20 – 1a-21; 1b; 50d-1 – 50d-11)
- 31c-6/04 Stud disk machines (50c-9; 80a-7)
- 31c-6/05 Mobile machines (80a-1 – 80a-7)
- 31c-6/06 Devices for drying, dusting-off, cooling and moistening moulding materials (80a-5)
- 31c-6/07 Sand distributors (31b-11; 31b-12; 31b-14; 80a-1 – 81a-7)
- 31c-6/08 Complete installations for sand preparation
- Auxiliary moulding devices**
- 31c-7/01 Core chaplets, core bars
- 31c-7/02 Dowels
- 31c-7/03 Core supports
- 31c-8/01 Flasks, and core boxes, general (80a-48)
- 31c-8/02 Separable and articulated flasks (80a-48)
- 31c-8/03 Snap flasks and frames (80a-48)
- 31c-8/04 Flask clamps (80a-48)
- 31c-8/05 Flask guides and connections (80a-48)
- 31c-8/06 Sand supports and sand retaining flanges
- 31c-8/07 Patterns and their production (48a-7; 48a-8; 48a-7/00; 48b-2; 48b-1/00)
- 31c-8/08 Pattern plates and their production (48a-7; 48a-8; 48a-7/00; 48b-2; 48b-1/00)
- 31c-9 Various auxiliary devices for moulding, and lifting devices (31c-4)
- Casting in general**
- 31c-10/10 Ingot moulds, general
- 31c-10/02 Separable ingot moulds
- 31c-10/03 Production of ingot moulds (31c-10/01; 31c-19/01)
- 31c-10/04 Runner bricks and stools (31c-30/01; 80a-43)
- 31c-10/05 Tops of ingot moulds and upper runners
- 31c-10/06 Casting of hollow ingots (31c-10/03; 31c-18/01 – 31c-19/02)
- 31c-10/07 Casting of billets, also horizontal casting
- 31c-11 Production of compact ingots by compression in presses (18b-11)
- 31c-12/01 Production of compact castings, general, by means of gas and explosive pressure (small casting machines 30b-17)
- 31c-12/02 Production of compact castings in a vacuum; combined compression and suction method (30b-17)
- 31c-13 Production of compact castings by using electricity (21h-5)
- 31c-14 Production of compact castings by heating the sink head (31c-10/05; 31c-15/02)
- 31c-15/01 Production of compact ingots by jarring, centrifuging or turning over the chill
- 31c-15/02 Production of compact ingots by cooling or heating the mould (31c-14; 31c-30/02)
- 31c-15/03 Repairing casting defects
- 31c-15/04 Production of compact casting by various methods
- 31c-16/01 Production of chilled castings (40b-16; 40b-17; 40b-19/00) general, e.g. projectiles (72d), brake shoes (20f), switch frogs and rail sections (20i)
- 31c-16/02 Casting of rollers (7a)

- 31c-16/03 Casting of grate bars (7f; 24f)
- 31c-16/04 Casting of wheels and wheel hoops (20d; 49h)
- 31c-16/05 Surface treatment, also alkali and acid-proof castings (18c; 48a; 48b; 48d)
- 31c-17 Compound casting of ingots and plates (65a1-20)
- 31c-18/01 Centrifugal casting, production of pipes (80a-56)
- 31c-18/02 Centrifugal casting, production of various castings, e.g. wheels, bearing bushings, piston rings, projectiles (30b-12; 30b-16; 30b-17)
- 31c-19/01 Casting of pipes and pipe sections, also moulding related thereto (31c-10/03; 31c-10/06; 31c-18/01)
- 31c-19/02 Complete installations for pipe casting (31c-29/01)
- 31c-20/01 Art casting
- 31c-20/02 Slush casting
- 31c-20/03 Immersion casting
- 31c-21 Continuous casting, casting of wire bars and wire (7a-8; 7b-2; 7b-3)
- 31c-22 Casting of chains (49k-1 – 49k-7)
- 31c-23/01 Casting of alloys, e.g. copper alloys and nonferrous metals
- 31c-23/02 Casting of light metals
- 31c-23/03 Casting of high-melting metals and carbides, also moulds therefor
- 31c-24/01 Casting around or on an object, lining (31c-25/04)
- 31c-24/02 Casting-in of reinforcements and other inserts
- 31c-24/03 Pipe joints (47f-6 – 47f-14)
- 31c-24/04 Casting of bimetal objects, e.g. cutting tools (31c-24/01; 69-24; 69-25)
- 31c-25/01 Special casting and chills therefor, e.g. nails, horseshoes (casting of battery plates 21b)
- 31c-25/02 Manufacture of engine pistons and cylinders (46c1; 47f)
- 31c-25/03 Manufacture of piston rings (31c-18/02; 49l-9; 46c1-10; 47f-19/02)
- 31c-25/04 Manufacture of bearings (20d-15; 47b-12; 63d-20; 63d-21)
- Foundry equipment, installations and auxiliary devices (type casting 15a)**
- 31c-26/01 Die casting machines, general (15a-17 – 15a-26)
- 31c-26/02 Casting machines with piston pressure
- 31c-26/03 Casting machines with gas pressure and fixed scoop holder
- 31c-26/04 Casting machines with movable scoop holder
- 31c-27/01 Casting ladles, heating devices, linings (32a-6; 32a-5/00)
- 31c-27/02 Casting ladles, with plug closure (32a-6; 32a-5/00)
- 31c-27/03 Mobile casting ladles and ladle carriages (18a-9)
- 31c-28/01 Pig-iron casting, also moulding of casting beds
- 31c-28/02 Pig-iron casting on rotating casting tables
- 31c-28/03 Pig-iron casting in movable chains
- 31c-29/01 Installations for casting and moulding, in general, also for continuous work (31c-19/02)
- 31c-29/02 Installations for ingot casting
- 31c-30/01 Runners (31c-10/04)
- 31c-30/02 Cooling and heating devices (31c-15/02; 31c-27/01)
- 31c-30/03 Devices for trimming castings (31c-26/01; 49c-10 – 49c-12)
- 31c-30/04 Devices for removal of castings or mould sand from moulds, e.g. jarring devices (31b-10; 31b-14)
- 31c-30/05 Crucible tongs (32a-5; 32a-6)
- 31c-30/06 Crucible shakers
- 31c-31 Devices for ejecting ingots from ingot moulds, strippers (design of cranes 35b)
- 31c-32 Casting cleaning devices, core-extracting (polishing cylinders 67a-23; sandblasting devices 67b)
- 31c-33/01 Re-melting of metal chips (40a-15)

31c-33/02 Purification of the liquid metal in the melting pot or ladle, mechanically (refining
40a-15, 40a-9/00, 40b)