

**CPC****COOPERATIVE PATENT CLASSIFICATION****C03B****MANUFACTURE, SHAPING, OR SUPPLEMENTARY PROCESSES****WARNING**

The following IPC groups are not used in the CPC system. Subject matter covered by these groups is classified in the following CPC groups:

[C03B 8/00](#) covered by [C03B 19/00](#) , [C03B 37/00](#)  
[C03B 8/02](#) covered by [C03B 19/1065](#) , [C03B 19/12](#) , [C03B 37/01 B](#) ,  
[C03B 37/016](#)  
[C03B 8/04](#) covered by [C03B 19/106](#) , [C03B 19/14](#) , [C03B 37/014](#)

**Guidance heading:** Melting the raw material

**C03B 1/00** Preparing the batches ( chemical compositions [C03C](#) )

[C03B 1/02](#) . Compacting the glass batches, e.g. pelletising

**C03B 3/00** Charging the melting furnaces

[C03B 3/005](#) . { using screw feeders }

[C03B 3/02](#) . combined with preheating, premelting or pretreating the glass-making ingredients, pellets or cullet

[C03B 3/023](#) .. { Preheating }

[C03B 3/026](#) .. { by charging the ingredients into a flame, through a burner or equivalent heating means used to heat the melting furnace }

**C03B 5/00** Melting in furnaces; Furnaces so far as specially adapted for glass manufacture

[C03B 5/005](#) . { of glass-forming waste materials ( disposal or transformation of solid waste in general [B09B](#) ; treatment of radioactive waste [G21F 9/00](#) ) }

[C03B 5/02](#) . in electric furnaces, { e.g. by dielectric heating ( electric heating in general [H05B](#) ) }

[C03B 5/021](#) .. { by induction heating }

[C03B 5/023](#) .. { by microwave heating }

[C03B 5/025](#) .. { by arc discharge or plasma heating }

[C03B 5/027](#) .. by passing an electric current between electrodes immersed in the glass bath, i.e. by direct resistance heating

[C03B 5/0272](#) ... { Pot furnaces }

[C03B 5/0275](#) ... { Shaft furnaces ( [C03B 5/0277](#) takes precedence ) }

[C03B 5/0277](#) ... { Rotary furnaces }

[C03B 5/03](#) ... Tank furnaces

[C03B 5/031](#) .... { Cold top tank furnaces }

- C03B 5/033 . . . by using resistance heaters above or in the glass bath, i.e. by indirect resistance heating
- C03B 5/0332 . . . { Tank furnaces }
- C03B 5/0334 . . . { Pot furnaces; Core furnaces }
- C03B 5/0336 . . . { Shaft furnaces ( [C03B 5/0338](#) takes precedence ) }
- C03B 5/0338 . . . { Rotary furnaces }
- C03B 5/04 . . in tank furnaces {( [C03B 5/02](#) takes precedence ) }
- C03B 5/05 . . Discontinuously-working tank furnaces, e.g. day tanks
- C03B 5/06 . . in pot furnaces {( [C03B 5/02](#) takes precedence ) }
- C03B 5/08 . . Glass-melting pots
- C03B 5/10 . . in combined tank furnaces and pots {( [C03B 5/02](#) takes precedence ) }
- C03B 5/12 . . in shaft furnaces {( [C03B 5/02](#) takes precedence ) }
- C03B 5/14 . . in revolving cylindrical furnaces {( [C03B 5/02](#) takes precedence ) }
- C03B 5/16 . . Special features of the melting process; Auxiliary means specially adapted for glass-melting furnaces
- C03B 5/163 . . { Electrochemical treatments, e.g. to prevent bubbling or to create bubbles ( [C03B 5/169](#) , [C03B 5/185](#) take precedence ) }
- C03B 5/167 . . Means for preventing damage to equipment, e.g. by molten glass, hot gases, batches ( [C03B 5/20](#) , [C03B 5/42](#) take precedence )
- C03B 5/1672 . . . { Use of materials therefor }
- C03B 5/1675 . . . . { Platinum group metals }
- C03B 5/1677 . . . { by use of electrochemically protection means, e.g. passivation of electrodes }
- C03B 5/173 . . Apparatus for changing the composition of the molten glass in glass furnaces, e.g. for colouring the molten glass ( [chemical aspects C03C](#) )
- C03B 5/18 . . Stirring devices; Homogenisation {( [mixing in general B01F](#) ) }
- C03B 5/182 . . . by moving the molten glass along fixed elements, e.g. deflectors, weirs, baffle plates
- C03B 5/183 . . . using thermal means, e.g. for creating convection currents
- C03B 5/185 . . . . Electric means
- C03B 5/187 . . . with moving elements
- C03B 5/1875 . . . . { of the screw or pump-action type }
- C03B 5/193 . . . using gas, e.g. bubblers
- C03B 5/20 . . Bridges, shoes, throats, or other devices for withholding dirt, foam, or batch
- C03B 5/202 . . . { Devices for blowing onto the melt surface, e.g. high momentum burners }
- C03B 5/205 . . . { Mechanical means for skimming or scraping the melt surface }
- C03B 5/207 . . . { Foraminous or mesh screens, e.g. submerged sieves }
- C03B 5/225 . . Refining ( [C03B 5/18](#) takes precedence; { Refining agents [C03C 1/004](#) } )
- C03B 5/2252 . . . { under reduced pressure, e.g. with vacuum refiners }
- C03B 5/2255 . . . { by centrifuging }
- C03B 5/2257 . . . { by thin-layer fining }

- C03B 5/23      ..      Cooling the molten glass ( [C03B 5/18](#) , [C03B 5/225](#) take precedence )
- C03B 5/235    ..      Heating the glass ( [C03B 5/02](#) , [C03B 5/18](#) , [C03B 5/225](#) take precedence )

**NOTE**

Devices for withholding dirt, foam, or batch are also classified in [C03B 5/202](#)

- C03B 5/2353    ...      { by combustion with pure oxygen or oxygen-enriched air, e.g. using oxy-fuel burners or oxygen lances }
- C03B 5/2356    ...      { Submerged heating, e.g. by using heat pipes, hot gas or submerged combustion burners ( [bubblers](#) [C03B 5/193](#) ) }
- C03B 5/237     ...      Regenerators or recuperators specially adapted for glass-melting furnaces
- C03B 5/2375    ....      { Regenerator brick design ( [brick shapes in general](#) [F27D 1/042](#) ); Use of materials therefor; Brick stacking arrangements }
- C03B 5/24      ..      Automatically regulating the melting process
- C03B 5/245     ...      { Regulating the melt or batch level, depth or thickness }
- C03B 5/26      ..      Outlets, { e.g. drains, siphons }; Overflows, { e.g. for supplying the float tank, tweels }
- C03B 5/262     ...      { Drains, i.e. means to dump glass melt or remove unwanted materials }
- C03B 5/265     ...      { Overflows; Lips; Tweels }
- C03B 5/267     ....      { specially adapted for supplying the float tank }
- C03B 5/28      ..      Siphons
- C03B 5/42      ..      Details of construction of furnace walls, e.g. to prevent corrosion; Use of materials for furnace walls
- C03B 5/425     ...      Preventing corrosion or erosion ( [C03B 5/44](#) takes precedence )
- C03B 5/43      ...      Use of materials for furnace walls, e.g. fire-bricks
- C03B 5/435     ...      Heating arrangements for furnace walls
- C03B 5/44      ...      Cooling arrangements for furnace walls

**C03B 7/00      Distributors for the molten glass; Means for taking-off charges of molten glass; Producing the gob, { e.g. controlling the gob shape, weight or delivery tact }**

- C03B 7/005     .      { Controlling, regulating or measuring }
- C03B 7/01      .      Means for taking-off charges of molten glass {( [C03B 7/08](#) , [C03B 7/14](#) to [C03B 7/22](#) take precedence )}
- C03B 7/02      .      Forehearths, i.e. feeder channels
- C03B 7/04      ..      Revolving forehearths
- C03B 7/06      ..      Means for thermal conditioning or controlling the temperature of the glass
- C03B 7/065     ...      { by combustion with pure oxygen or oxygen-enriched air }
- C03B 7/07      ...      Electric means
- C03B 7/08      .      Feeder spouts, e.g. gob feeders
- C03B 7/082     ..      Pneumatic feeders
- C03B 7/084     ..      Tube mechanisms
- C03B 7/086     ..      Plunger mechanisms

- C03B 7/088 . . Outlets, e.g. orifice rings
- C03B 7/09 . . Spout blocks
- C03B 7/092 . . Stirring devices; Homogenisation ( [C03B 5/18 takes precedence](#) )
- C03B 7/094 . . Means for heating, cooling or insulation
- C03B 7/096 . . . . for heating
- C03B 7/098 . . . . electric
  
- C03B 7/10 . Cutting-off { or severing } the glass flow with the aid of knives or scissors { or non-contacting cutting means, e.g. a gas jet }; Construction of the blades used
- C03B 7/11 . . Construction of the blades
- C03B 7/12 . . Cutting-off { or severing } a free-hanging glass stream, { e.g. by the combination of gravity and surface tension forces }
  
- C03B 7/14 . Transferring molten glass or gobs to glass blowing or pressing machines ( [C03B 7/18 to C03B 7/22 take precedence](#) )
- C03B 7/16 . . using deflector chutes
  
- C03B 7/18 . Suction feeders
- C03B 7/20 . Scoop feeders
- C03B 7/22 . Gathering-devices in the form of rods or pipes

**Guidance heading:** Shaping of glass ( manufacture of fibres [C03B 37/00](#) )

## **C03B 9/00 Blowing glass; Production of hollow glass articles**

- C03B 9/02 . with the mouth; Auxiliary means therefor
- C03B 9/03 . . Blow pipes
- C03B 9/04 . . Making hollow glass articles with feet or projections
- C03B 9/06 . . Making hollow glass articles with double walls, e.g. vacuum flasks
  
- C03B 9/08 . Finish-blowing with compressed air of blanks blown with the mouth
  
- C03B 9/10 . Blowing glass cylinders for sheet manufacture
  
- C03B 9/12 . starting from a ribbon of glass; Ribbon machines
  
- C03B 9/13 . in gob feeder machines ( [C03B 9/28](#) , [C03B 9/29 take precedence](#) )
- C03B 9/14 . . in "blow" machines or in "blow-and-blow" machines ( [C03B 9/193](#) , [C03B 9/20 take precedence](#) )
- C03B 9/145 . . . . { Details of machines without turn-over moulds }
- C03B 9/16 . . . . in machines with turn-over moulds
- C03B 9/165 . . . . { Details of such machines, e.g. guide funnels, turn-over mechanisms ( [C03B 9/18 takes precedence](#) ) }
- C03B 9/18 . . . . Rotary-table machines
- C03B 9/185 . . . . . { having at least two rotary tables }

- C03B 9/19 . . . . . having only one rotary table
- C03B 9/193 . . . in "press-and-blow" machines
- C03B 9/1932 . . . { Details of such machines, e.g. plungers or plunger mechanisms for the press-and-blow machine, cooling of plungers ( [C03B 9/195](#) takes precedence ) }
- C03B 9/1934 . . . . . { Mechanical displacement means of the plunger }
- C03B 9/1936 . . . . . { Hydraulic or pneumatic displacement means of the plunger }
- C03B 9/1938 . . . . . { Electrical means for the displacement of the plunger }
- C03B 9/195 . . . Rotary-table machines
- C03B 9/1955 . . . . . { having at least two rotary tables }
- C03B 9/197 . . . Construction of the blank mould
  
- C03B 9/20 . . . in "vacuum blowing" or in "vacuum-and-blow" machines
- C03B 9/22 . . . Rotary-table machines
- C03B 9/225 . . . { having at least two rotary tables }
- C03B 9/24 . . . Construction of the blank mould
  
- C03B 9/28 . . . in machines of the endless-chain type ( [C03B 9/12](#) takes precedence )
  
- C03B 9/29 . . . Paste mould machines ( [C03B 9/28](#) takes precedence )
- C03B 9/292 . . . { Details of such machines ( [C03B 9/295](#) takes precedence ) }
- C03B 9/295 . . . Rotary-table machines
- C03B 9/2955 . . . { having at least two rotary tables }
  
- C03B 9/30 . . . Details of blowing glass ( for blowing with the mouth [C03B 9/02](#) ); Use of materials for the moulds
- C03B 9/31 . . . Blowing laminated glass articles or glass with enclosures, e.g. wires, bubbles
- C03B 9/32 . . . Giving special shapes to parts of hollow glass articles
- C03B 9/325 . . . Forming screw-threads or lips at the mouth of hollow glass articles; Neck moulds
- C03B 9/33 . . . Making hollow glass articles with feet or projections; Moulds therefor
- C03B 9/335 . . . Forming bottoms to blown hollow glass articles; Bottom moulds
- C03B 9/34 . . . Glass-blowing moulds not otherwise provided for
- C03B 9/342 . . . { Neck moulds ( [C03B 9/325](#) takes precedence ) }
- C03B 9/344 . . . { Bottom moulds ( [C03B 9/335](#) takes precedence ) }
- C03B 9/347 . . . Construction of the blank or blow mould
- C03B 9/353 . . . Mould holders; { Mould opening and closing mechanisms }
- C03B 9/3532 . . . . . { Mechanisms for holders of half moulds moving by rotation about a common vertical axis }
- C03B 9/3535 . . . . . { with the half moulds parallel upon opening and closing }
- C03B 9/3537 . . . . . { Mechanisms for holders of half moulds moving by linear translation }
- C03B 9/36 . . . Blow heads; Supplying, ejecting or controlling the air
- C03B 9/3609 . . . { Selection or characteristics of the blowing medium, e.g. gas composition, moisture content, cryogenic state }
- C03B 9/3618 . . . { Means for holding or transferring the blow head }

- C03B 9/3627 . . . { Means for general supply or distribution of the air to the blow heads }
- C03B 9/3636 . . . . { Manifolds or regulating devices, e.g. valves }
- C03B 9/3645 . . . { Details thereof relating to plungers }
- C03B 9/3654 . . . { Details thereof relating to neck forming }
- C03B 9/3663 . . . { Details thereof relating to internal blowing of the hollow glass }
- C03B 9/3672 . . . . { using a tube }
- C03B 9/3681 . . . . . { Movable tubes }
- C03B 9/369 . . . { Details thereof relating to bottom forming }
- C03B 9/38 . . Means for cooling, heating, or insulating glass-blowing machines { or for cooling the glass moulded by the machine }
- C03B 9/3808 . . . { Selection or characteristics of the cooling, heating or insulating medium, e.g. gas composition, moisture content, cryogenic state }
- C03B 9/3816 . . . { Means for general supply, distribution or control of the medium to the mould, e.g. sensors, circuits, distribution networks }
- C03B 9/3825 . . . { Details thereof relating to plungers }
- C03B 9/3833 . . . { Details thereof relating to neck moulds }
- C03B 9/3841 . . . { Details thereof relating to direct cooling, heating or insulating of the moulded glass }
- C03B 9/385 . . . . { using a tube for cooling or heating the inside, e.g. blowheads }
- C03B 9/3858 . . . . . { Movable tubes }
- C03B 9/3866 . . . { Details thereof relating to bottom moulds, e.g. baffles }
- C03B 9/3875 . . . { Details thereof relating to the side-wall, body or main part of the moulds }
- C03B 9/3883 . . . . { Air delivery thereto, e.g. plenum, piping }
- C03B 9/3891 . . . { Manifolds or regulating devices, e.g. valves, injectors }
- C03B 9/40 . . Gearing or controlling mechanisms specially adapted for glass-blowing machines
- C03B 9/403 . . . { Hydraulic or pneumatic systems }
- C03B 9/406 . . . . { Manifolds or regulating devices, e.g. valves }
- C03B 9/41 . . . Electric or electronic systems ( in general [G05B 19/00](#) )
- C03B 9/42 . . Means for fusing, burning-off, or edge-melting combined with glass-blowing machines ( uniting glass pieces by fusing [C03B 23/20](#) )
- C03B 9/44 . . Means for discharging combined with glass-blowing machines, e.g. take-outs
- C03B 9/447 . . . Means for the removal of glass articles from the blow-mould, e.g. take-outs
- C03B 9/453 . . . Means for pushing newly formed glass articles onto a conveyer, e.g. sweep-out mechanisms; Dead-plate mechanisms
- C03B 9/4535 . . . . { Dead-plate mechanisms }
- C03B 9/46 . . Means for cutting the hot glass in glass-blowing machines ( burning-off [C03B 9/42](#) )
- C03B 9/48 . . Use of materials for the moulds
  
- C03B 11/00** **Pressing** { molten }glass { or performed glass reheated to equivalent low viscosity without blowing ( shaping molten glass by a press-blow process [C03B 9/00](#) , e.g. [C03B 9/193](#) ; re-forming shaped glass [C03B 23/00](#) ; re-heating the performed glass [C03B 29/00](#) ; transporting the performed or pressed glass during its manufacture [C03B 35/00](#) ) }
  
- C03B 11/005 . { Pressing under special atmospheres, e.g. inert, reactive, vacuum, clean }

- C03B 11/02 . in machines with rotary tables
- C03B 11/04 . in machines with moulds fed by suction
- C03B 11/05 . in machines with reciprocating moulds
- C03B 11/06 . Construction of plunger or mould
- C03B 11/07 . . Suction moulds
- C03B 11/08 . . for making solid articles, e.g. lenses
- C03B 11/082 . . . { having profiled, patterned or micro-structured surfaces }
- C03B 11/084 . . . { material composition or material properties of press dies therefor }
- C03B 11/086 . . . . { of coated dies ( use of materials as release or lubricating compositions [C03B 40/02](#) ) }
- C03B 11/088 . . . { Flat discs }
- C03B 11/10 . . for making hollow { or semi-hollow } articles
- C03B 11/12 . Cooling, heating, or insulating the plunger, the mould, or the glass-pressing machine; { cooling or heating of the glass in the mould } ( [C03B 9/38](#) takes precedence )
- C03B 11/122 . . { Heating }
- C03B 11/125 . . { Cooling }
- C03B 11/127 . . . { of hollow or semi-hollow articles or their moulds }
- C03B 11/14 . { Pressing laminated glass articles or glass } with metal inserts { or enclosures, e.g. wires, bubbles, coloured parts }
- C03B 11/16 . Gearing or controlling mechanisms specially adapted for glass presses
- C03B 13/00** **Rolling { molten } glass, { i.e. where the molten glass is shaped by rolling ( re-forming shaped glass by rolling [C03B 23/004](#) , [C03B 23/033](#) , [C03B 23/055](#) ) }**
- C03B 13/01 . Rolling profiled glass articles, { e.g. with I, L, T cross-sectional profiles }
- C03B 13/02 . Rolling non-patterned sheets discontinuously
- C03B 13/04 . Rolling non-patterned sheets continuously
- C03B 13/06 . Rolling corrugated sheets, { e.g. with undulating waving form }
- C03B 13/08 . Rolling patterned sheets, { e.g. sheets having a surface pattern }
- C03B 13/10 . Rolling multi-layer sheets, { e.g. sheets having a coloured glass layer }
- C03B 13/12 . Rolling glass with enclosures, e.g. wire, { bubbles, fibres, particles } or asbestos
- C03B 13/14 . Rolling other articles, { i.e. not covered by [C03B 13/01](#) to [C03B 13/12](#) , e.g. channeled articles, briquette-shaped articles }
- C03B 13/16 . Construction of the glass rollers



- C03B 13/18 . Auxiliary means for rolling glass, e.g. sheet supports, gripping devices, hand-ladles, means for moving glass pots
- C03B 13/183 . . { Receiving tables or roller beds for the rolled plateglass }
- C03B 13/186 . . { Pot gripping devices }

#### **C03B 15/00 Drawing glass upwardly from the melt**

- C03B 15/02 . Drawing glass sheets
- C03B 15/04 . . from the free surface of the melt
- C03B 15/06 . . from a debiteuse
- C03B 15/08 . . by means of bars below the surface of the melt
- C03B 15/10 . . multi-layer glass sheets or glass sheets coated with coloured layers
- C03B 15/12 . . Construction of the annealing tower
- C03B 15/14 . Drawing tubes, cylinders, or rods from the melt
- C03B 15/16 . . Drawing tubes, cylinders or rods, coated with coloured layers
- C03B 15/18 . Means for laying-down and conveying combined with the drawing of glass sheets, tubes or rods

#### **C03B 17/00 Forming { molten }glass by flowing-out, pushing-out, { extruding }or drawing downwardly or laterally from forming slits or by overflowing over lips**

- C03B 17/02 . Forming { molten }glass coated with coloured layers; { Forming molten glass of different compositions or layers; Forming molten glass comprising reinforcements or inserts }
- C03B 17/025 . . { Tubes or rods }
- C03B 17/04 . Forming tubes or rods by drawing from stationary or rotating tools or from forming nozzles
- C03B 17/06 . Forming glass sheets
- C03B 17/061 . . { by lateral drawing or extrusion }
- C03B 17/062 . . . { combined with flowing onto a solid or gaseous support from which the sheet is drawn }
- C03B 17/064 . . { by the overflow downdraw fusion process; Isopipes therefor }
- C03B 17/065 . . { Forming profiled, patterned or corrugated sheets }
- C03B 17/067 . . { combined with thermal conditioning of the sheets }
- C03B 17/068 . . { Means for providing the drawing force, e.g. traction or draw rollers }

#### **C03B 18/00 Shaping glass in contact with the surface of a liquid**

- C03B 18/02 . Forming sheets
- C03B 18/04 . . Changing or regulating the dimensions of the molten glass ribbon
- C03B 18/06 . . . using mechanical means, e.g. restrictor bars, edge rollers
- C03B 18/08 . . . using gas



- C03B 18/10 . . . using electric means
- C03B 18/12 . . Making multi-layer, coloured or armoured glass ( [chemical aspects C03C](#) )
- C03B 18/14 . . Changing the surface of the glass ribbon, e.g. roughening ( [by chemical methods C03C](#) )
- C03B 18/16 . . Construction of the float tank; Use of material for the float tank; Coating or protection of the tank wall
- C03B 18/18 . . Controlling or regulating the temperature of the float bath; Composition or purification of the float bath
- C03B 18/20 . . Composition of the atmosphere above the float bath; Treating or purifying the atmosphere above the float bath
- C03B 18/22 . . . Controlling or regulating the temperature of the atmosphere above the float tank
  
- C03B 19/00** **Other methods of shaping glass** ( [manufacture or treatment of flakes, fibres or filaments from softened glass, minerals or slags C03B 37/00](#) )
  
- C03B 19/01 . by progressive fusion { [or sintering](#) } of powdered glass onto a shaping substrate, i.e. accretion, { [e.g. plasma oxidation deposition \( making fibre preforms C03B 37/01291 \)](#) }
- C03B 19/02 . by casting { [molten glass, e.g. injection moulding](#) }
- C03B 19/025 . . { [by injection moulding, e.g. extrusion](#) }
- C03B 19/04 . by centrifuging { ( [C03B 19/095 takes precedence](#) ) }
- C03B 19/06 . by sintering, { [e.g. by cold isostatic pressing of powders and subsequent sintering, by hot pressing of powders, by sintering slurries or dispersions not undergoing a liquid phase reaction](#) }
- C03B 19/063 . . { [by hot-pressing powders](#) }
- C03B 19/066 . . { [for the production of quartz or fused silica articles \( other processes specially adapted for the production of quartz or fused silica articles C03B 20/00 \)](#) }
- C03B 19/08 . by foaming
- C03B 19/09 . by fusing powdered glass in a shaping mould
- C03B 19/095 . . { [by centrifuging, e.g. arc discharge in rotating mould \( crucibles for crystal pulling in general C30B 15/10 , C30B 35/002 \)](#) }
  
- C03B 19/10 . Forming beads
- C03B 19/1005 . . { [Forming solid beads \( chemical aspects C03C 12/00 \)](#) }
- C03B 19/101 . . . { [by casting molten glass into a mould or onto a wire](#) }
- C03B 19/1015 . . . { [by using centrifugal force or by pouring molten glass onto a rotating cutting body, e.g. shredding](#) }
- C03B 19/102 . . . { [by blowing a gas onto a stream of molten glass or onto particulate materials, e.g. pulverising](#) }
- C03B 19/1025 . . . . { [Bead furnaces or burners](#) }
- C03B 19/103 . . . . { [Fluidised-bed furnaces](#) }
- C03B 19/1035 . . . { [by pressing](#) }
- C03B 19/104 . . . { [by rolling, e.g. using revolving cylinders, rotating discs, rolls](#) }

- C03B 19/1045 . . . { by bringing hot glass in contact with a liquid, e.g. shattering }
- C03B 19/105 . . . . { the liquid being a molten metal or salt }
- C03B 19/1055 . . . { by extruding, e.g. dripping molten glass in a gaseous atmosphere }
- C03B 19/106 . . . { by chemical vapour deposition; by liquid phase reaction }
- C03B 19/1065 . . . . { by liquid phase reactions, e.g. by means of a gel phase }
- C03B 19/107 . . { Forming hollow beads ( [chemical aspects C03C 11/002](#) ) }
- C03B 19/1075 . . . { by blowing, pressing, centrifuging, rolling or dripping }
- C03B 19/108 . . { Forming porous, sintered or foamed beads ( [chemical aspects C03C 11/00](#) ) }
- C03B 19/1085 . . . { by blowing, pressing, centrifuging, rolling or dripping }
- C03B 19/109 . . { Glass-melting furnaces specially adapted for making beads }
- C03B 19/1095 . . { Thermal after-treatment of beads, e.g. tempering, crystallisation, annealing }
  
- C03B 19/12 . by liquid-phase reaction processes
  
- C03B 19/14 . by gas- { or vapour- } phase reaction processes
- C03B 19/1407 . . { Deposition reactors therefor }
- C03B 19/1415 . . { Reactant delivery systems }
- C03B 19/1423 . . . { Reactant deposition burners }
- C03B 19/143 . . . . { Plasma vapour deposition }
- C03B 19/1438 . . { for delivering and depositing additional reactants as liquids or solutions, e.g. solution doping of the article or deposit }
- C03B 19/1446 . . { Means for after-treatment or catching of worked reactant gases }
- C03B 19/1453 . . { Thermal after-treatment of the shaped article, e.g. dehydrating, consolidating, sintering }
- C03B 19/1461 . . . { for doping the shaped article with fluorine }
- C03B 19/1469 . . { Means for changing or stabilising the shape or form of the shaped article or deposit }
- C03B 19/1476 . . { Means for heating during or immediately prior to deposition ( [C03B 19/1415 takes precedence](#) ) }
- C03B 19/1484 . . { Means for supporting, rotating or translating the article being formed }
- C03B 19/1492 . . . { Deposition substrates, e.g. targets }

**C03B 20/00** **Processes specially adapted for the production of quartz or fused silica articles,**  
 { not otherwise provided for ( [C03B 19/01](#) , [C03B 19/066](#) , [C03B 19/106](#) , [C03B 19/12](#) ,  
[C03B 19/14](#) , [C03B 37/00](#) take precedence ) }

**C03B 21/00** **Severing glass sheets, tubes or rods while still plastic**

- C03B 21/02 . by cutting ( [C03B 9/46](#) takes precedence )
- C03B 21/04 . by punching out
- C03B 21/06 . by flashing-off, burning-off or fusing ( [C03B 9/42](#) takes precedence )

**C03B 23/00** **Re-forming shaped glass ( re-forming fibres or filaments [C03B 37/14](#) )**

- C03B 23/0006 . { by drawing ( [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) take precedence ) }
- C03B 23/0013 . { by pressing ( [C03B 21/04](#) , [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) , [C03B 23/26](#) take precedence ) }
- C03B 23/002 .. { Re-forming the rim portions }
- C03B 23/0026 . { by gravity, e.g. sagging ( [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) take precedence ) }
- C03B 23/0033 . { by centrifuging ( [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) take precedence ) }
- C03B 23/004 . { by rolling ( [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) take precedence ) }
- C03B 23/0046 .. { Re-forming the rim portions }
- C03B 23/0053 ... { Hand tools therefor }
- C03B 23/006 . { by fusing, e.g. for flame sealing ( [C03B 9/42](#) , [C03B 21/06](#) , [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) , [C03B 33/08](#) take precedence ) }
- C03B 23/0066 . { by bending ( [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) take precedence ) }
- C03B 23/0073 . { by blowing ( [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) take precedence ) }
- C03B 23/008 .. { Vacuum-blowing }
- C03B 23/0086 . { Heating devices specially adapted for re-forming shaped glass articles in general, e.g. burners ( [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) take precedence ) }
- C03B 23/0093 . { Tools and machines specially adapted for re-forming shaped glass articles in general, e.g. chucks ( [C03B 23/0086](#) , [C03B 23/02](#) , [C03B 23/04](#) , [C03B 23/18](#) take precedence ) }
- C03B 23/02 . Re-forming glass sheets
- C03B 23/023 .. by bending
- C03B 23/0235 ... { involving applying local or additional heating, cooling or insulating means }
- C03B 23/025 ... by gravity
- C03B 23/0252 .... { by gravity only, e.g. sagging ( [C03B 23/035](#) takes precedence ) }
- C03B 23/0254 ..... { in a continuous way, e.g. gravity roll bending }
- C03B 23/0256 .... { Gravity bending accelerated by applying mechanical forces, e.g. inertia, weights or local forces }
- C03B 23/0258 .... { Gravity bending involving applying local or additional heating, cooling or insulating means }
- C03B 23/027 .... with moulds having at least two upward pivotable mould sections
- C03B 23/03 ... by press-bending between shaping moulds
- C03B 23/0302 .... { between opposing full-face shaping moulds }
- C03B 23/0305 .... { Press-bending accelerated by applying mechanical forces, e.g. inertia, weights or local forces }
- C03B 23/0307 .... { Press-bending involving applying local or additional heating, cooling or insulating means }
- C03B 23/031 .... the glass sheets being in a vertical position ( [C03B 23/033](#) takes precedence )

- C03B 23/0315 . . . . . { and supported on the lower edge }
- C03B 23/033 . . . . . in a continuous way, e.g. roll forming, { or press-roll bending }
- C03B 23/035 . . . . . using a gas cushion or by changing gas pressure, e.g. by applying vacuum { or blowing for supporting the glass while bending }
- C03B 23/0352 . . . . . { by suction or blowing out for providing the deformation force to bend the glass sheet }
- C03B 23/0355 . . . . . { by blowing without suction directly on the glass sheet }
- C03B 23/0357 . . . . . { by suction without blowing, e.g. with vacuum or by venturi effect }
- C03B 23/037 . . . . . by drawing
  
- C03B 23/04 . . . . . Re-forming tubes or rods
- C03B 23/043 . . . . . Heating devices specially adapted for re-forming tubes or rods in general, e.g. burners
- C03B 23/045 . . . . . Tools or apparatus specially adapted for re-forming tubes or rods in general, e.g. glass lathes, chucks ( [C03B 23/043](#) takes precedence )
- C03B 23/047 . . . . . by drawing ( { [C03B 23/091](#) } , [C03B 37/025](#) takes precedence )
- C03B 23/0473 . . . . . { for forming constrictions }
- C03B 23/0476 . . . . . { onto a forming die, e.g. a mandrel or a wire }
- C03B 23/049 . . . . . by pressing ( [C03B 21/04](#) , { [C03B 23/092](#) } , [C03B 23/26](#) take precedence )
- C03B 23/0493 . . . . . { in a longitudinal direction, e.g. for upsetting or extrusion }
- C03B 23/0496 . . . . . { for expanding in a radial way, e.g. by forcing a mandrel through a tube or rod }
- C03B 23/051 . . . . . by gravity, e.g. sagging ( { [C03B 23/093](#) takes precedence } )
- C03B 23/053 . . . . . by centrifuging ( { [C03B 23/094](#) } , [C03B 37/04](#) takes precedence )
- C03B 23/055 . . . . . by rolling ( { [C03B 23/095](#) takes precedence } )
- C03B 23/057 . . . . . by fusing, e.g. for flame sealing ( [C03B 9/42](#) , [C03B 21/06](#) { [C03B 23/099](#) } , [C03B 33/08](#) take precedence )
  
- C03B 23/06 . . . . . by bending ( { [C03B 23/096](#) takes precedence } )
- C03B 23/065 . . . . . { in only one plane, e.g. for making circular neon tubes }
- C03B 23/07 . . . . . by blowing, e.g. for making electric bulbs ( { [C03B 23/097](#) takes precedence } )
- C03B 23/073 . . . . . { Vacuum-blowing }
- C03B 23/076 . . . . . { Shrinking the glass tube on to a mandrel }
- C03B 23/08 . . . . . to exact dimensions, e.g. calibrating
- C03B 23/09 . . . . . Reshaping the ends, e.g. as grooves, threads or mouths
- C03B 23/091 . . . . . { by drawing }
- C03B 23/092 . . . . . { by pressing }
- C03B 23/093 . . . . . { by gravity, e.g. sagging }
- C03B 23/094 . . . . . { by centrifuging }
- C03B 23/095 . . . . . { by rolling }
- C03B 23/096 . . . . . { by bending }
- C03B 23/097 . . . . . { by blowing }
- C03B 23/098 . . . . . { Vacuum-blowing }
- C03B 23/099 . . . . . { by fusing, e.g. flame sealing }
- C03B 23/11 . . . . . Reshaping by drawing without blowing, in combination with separating, e.g. for making ampoules

- C03B 23/112 . . . { Apparatus for conveying the tubes or rods in a curved path around a vertical axis through one or more forming stations }
- C03B 23/114 . . . . { Devices for feeding tubes or rods to these machines }
- C03B 23/116 . . . { Apparatus for conveying the tubes or rods in a curved path around a horizontal axis through one or more forming stations }
- C03B 23/118 . . . { Apparatus for conveying the tubes or rods in a horizontal or an inclined plane through one or more forming stations }
- C03B 23/13 . . Reshaping combined with uniting or heat sealing, e.g. for making vacuum bottles
- C03B 23/18 . Re-forming and sealing ampoules
- C03B 23/20 . Uniting glass pieces by fusing without substantial reshaping
- C03B 23/203 . . Uniting glass sheets ( [C03B 23/24 takes precedence](#) )
- C03B 23/207 . . Uniting glass rods, glass tubes, or hollow glassware ( [C03B 23/24 takes precedence](#) )
- C03B 23/213 . . . Joining projections or feet
- C03B 23/217 . . . for the production of cathode ray tubes or similarly shaped tubes
- C03B 23/22 . . Uniting glass lenses, e.g. forming bifocal lenses
- C03B 23/24 . . Making hollow glass sheets or bricks
- C03B 23/245 . . . { Hollow glass sheets }
- C03B 23/26 . Punching reheated glass

**Guidance heading:** After-treatment of glass products ( of fibres [C03B 37/10](#) )

#### **C03B 25/00      Annealing glass products**

- C03B 25/02 . in a discontinuous way
- C03B 25/025 . . { Glass sheets }
- C03B 25/04 . in a continuous way
- C03B 25/06 . . with horizontal displacement of the glass products
- C03B 25/08 . . . of glass sheets
- C03B 25/087 . . . . being in a vertical position
- C03B 25/093 . . . . being in a horizontal position on a fluid support, e.g. a gas or molten metal
- C03B 25/10 . . with vertical displacement of the glass products
- C03B 25/12 . . . of glass sheets

#### **C03B 27/00      Tempering { or quenching } glass products**

- C03B 27/004 . by bringing the hot glass product in contact with a solid cooling surface, e.g. sand grains
- C03B 27/008 . by using heat of sublimation of solid particles
- C03B 27/012 . by heat treatment, e.g. for crystallisation; Heat treatment of glass products before tempering by cooling ( [C03B 27/008](#) , [C03B 27/016 take precedence](#) )

- C03B 27/016 . by absorbing heat radiated from the glass product
- C03B 27/02 . using liquid
- C03B 27/022 .. { the liquid being organic, e.g. an oil }
- C03B 27/024 ... { the liquid being sprayed on the object }
- C03B 27/026 .. { the liquid being a liquid gas, e.g. a cryogenic liquid, liquid nitrogen }
- C03B 27/028 .. { the liquid being water-based }
- C03B 27/03 .. the liquid being a molten metal or a molten salt
- C03B 27/035 ... { the liquid being sprayed on the object }
- C03B 27/04 . using gas
- C03B 27/0404 .. { Nozzles, blow heads, blowing units or their arrangements, specially adapted for flat or bent glass sheets }
- C03B 27/0408 ... { being dismountable }
- C03B 27/0413 .. { Stresses, e.g. patterns, values or formulae for flat or bent glass sheets }
- C03B 27/0417 .. { Controlling or regulating for flat or bent glass sheets }
- C03B 27/0422 .. { for flat or bent glass sheets starting in an horizontal position and ending in a non-horizontal position }
- C03B 27/0426 ... { for bent glass sheets }
- C03B 27/0431 .... { the quench unit being adapted to the bend of the sheet ( [C03B 27/0435](#) takes precedence ) }
- C03B 27/0435 .... { the quench unit being variably adaptable to the bend of the sheet }
- C03B 27/044 .. for flat or bent glass sheets being in a horizontal position
- C03B 27/0442 ... { for bent glass sheets }
- C03B 27/0445 .... { the quench unit being adapted to the bend of the sheet ( [C03B 27/0447](#) takes precedence ) }
- C03B 27/0447 .... { the quench unit being variably adaptable to the bend of the sheet }
- C03B 27/048 ... on a gas cushion
- C03B 27/052 .. for flat or bent glass sheets being in a vertical position
- C03B 27/0522 ... { Nozzles, blow heads, blowing units or their arrangements }
- C03B 27/0524 .... { being dismountable }
- C03B 27/0526 ... { Stresses, e.g. patterns, values or formulae }
- C03B 27/0528 ... { Controlling or regulating }
- C03B 27/056 ... supported on the lower edge
- C03B 27/06 .. for glass products other than flat or bent glass plates, e.g. hollow glassware, lenses
- C03B 27/062 ... { Nozzles or blow-heads, e.g. tubes }
- C03B 27/065 ... { Stresses, e.g. patterns, values or formulae }
- C03B 27/067 ... { Controlling or regulating }
- C03B 29/00 Reheating glass products for softening or fusing their surfaces; Fire-polishing; Fusing of margins**
- C03B 29/02 . in a discontinuous way
- C03B 29/025 .. { Glass sheets }

- C03B 29/04 . in a continuous way
- C03B 29/06 . . with horizontal displacement of the products
- C03B 29/08 . . . Glass sheets
- C03B 29/10 . . . . being in a vertical position
- C03B 29/12 . . . . being in a horizontal position on a fluid support, e.g. a gas or molten metal
- C03B 29/14 . . with vertical displacement of the products
- C03B 29/16 . . . Glass sheets
  
- C03B 31/00** **Manufacture of rippled or crackled glass**
  
- C03B 32/00** **Thermal after-treatment of glass products not provided for in groups { [C03B 19/00](#) }, [C03B 25/00](#) to [C03B 31/00](#) { or [C03B 37/00](#) }, e.g. crystallisation, eliminating gas inclusions or other impurities; { Hot-pressing vitrified, non-porous, shaped glass products }**
  
- C03B 32/005 . { Hot-pressing vitrified, non-porous, shaped glass products }
- C03B 32/02 . Thermal crystallisation, e.g. for crystallising glass bodies into glass-ceramic articles { ( [C03B 27/012](#) takes precedence ) }
  
- C03B 33/00** **Severing cooled glass ( severing glass fibres [C03B 37/16](#) )**
  
- C03B 33/02 . Cutting or splitting sheet glass { or ribbons }; Apparatus or machines therefor ( [C03B 33/09](#) takes precedence; glass-cutting tools [C03B 33/10](#) )
- C03B 33/0207 . . { the sheet being in a substantially vertical plane }
- C03B 33/0215 . . { the ribbon being in a substantially vertical plane }
- C03B 33/0222 . . { Scoring using a focussed radiation beam, e.g. laser }
- C03B 33/023 . . the sheet { or ribbon } being in a horizontal position
- C03B 33/0235 . . . { Ribbons }
- C03B 33/027 . . . Scoring tool holders; Driving mechanisms therefor
- C03B 33/03 . . . Glass cutting tables; Apparatus for transporting or handling sheet glass during the cutting or breaking operations
- C03B 33/033 . . . Apparatus for opening score lines in glass sheets
- C03B 33/037 . . . Controlling or regulating
- C03B 33/04 . . Cutting or splitting in curves, especially for making spectacle lenses
  
- C03B 33/06 . Cutting or splitting glass tubes, rods, or hollow products ( [C03B 33/09](#) takes precedence )
  
- C03B 33/07 . Cutting armoured, { multi-layered, coated } or laminated, glass products
- C03B 33/072 . . { Armoured glass, i.e. comprising reinforcement }
- C03B 33/074 . . { Glass products comprising an outer layer or surface coating of non-glass material }
- C03B 33/076 . . { Laminated glass comprising interlayers }
- C03B 33/078 . . . { Polymeric interlayers }



- C03B 33/08 . by fusing, { i.e. by melting through the glass }
- C03B 33/082 .. { using a focussed radiation beam, e.g. laser ( [C03B 33/0855](#) takes precedence ) }
- C03B 33/085 .. Tubes, rods or hollow products
- C03B 33/0855 ... { using a focussed radiation beam, e.g. laser }
  
- C03B 33/09 . by thermal shock
- C03B 33/091 .. { using at least one focussed radiation beam, e.g. laser beam ( [C03B 33/0955](#) takes precedence ) }
- C03B 33/093 ... { using two or more focussed radiation beams }
- C03B 33/095 .. Tubes, rods or hollow products
- C03B 33/0955 ... { using a focussed radiation beam, e.g. laser }
  
- C03B 33/10 . Glass-cutting tools, e.g. scoring tools
- C03B 33/102 .. { involving a focussed radiation beam, e.g. lasers }
- C03B 33/105 .. { Details of cutting or scoring means, e.g. tips }
- C03B 33/107 ... { Wheel design, e.g. materials, construction, shape }
- C03B 33/12 .. Hand tools ( [wheel design C03B 33/107](#) )
- C03B 33/14 ... specially adapted for cutting tubes, rods, or hollow products ( ( [for cutting ampoules B67B 7/92](#) ) )
  
- C03B 35/00** **Transporting of glass products during their manufacture, { e.g. hot glass lenses, prisms } ( [conveying systems for fragile sheets, e.g. glass B65G 49/06](#) )**
  
- C03B 35/005 . { Transporting hot solid glass products other than sheets or rods, e.g. lenses, prisms, by suction or floatation }
  
- C03B 35/04 . Transporting of hot hollow { or semi-hollow } glass products ( [C03B 35/26](#) takes precedence )
- C03B 35/06 .. Feeding of hot hollow glass products into annealing or heating kilns
- C03B 35/062 ... { using conveyers, e.g. chain- or roller conveyers, dead-plates }
- C03B 35/064 .... { specially adapted as a lehr loader }
- C03B 35/066 ..... { combined with article distributing means, e.g. pivoting deflectors, arresting fingers, stationary guides }
- C03B 35/068 ... { by gravitational force, e.g. via chutes }
- C03B 35/08 ... using rotary means directly acting on the products
- C03B 35/085 .... { Transfer mechanisms of the "endless-chain" type }
- C03B 35/10 ... using reciprocating means directly acting on the products, e.g. pushers, stackers
- C03B 35/12 ... by picking-up and depositing
- C03B 35/125 .... { Transfer mechanisms of the "rotary" type, e.g. "take-outs", "setting-over" mechanisms }
  
- C03B 35/14 . Transporting hot glass sheets { or ribbons, e.g. by heat-resistant conveyor belts or bands }
- C03B 35/142 .. { by travelling transporting tables }
- C03B 35/145 .. { by top-side transfer or supporting devices, e.g. lifting or conveying using suction }

C03B 35/147	...	{ of the non-contact type }
C03B 35/16	..	by roller conveyors
C03B 35/161	...	{ specially adapted for bent sheets or ribbons ( <a href="#">C03B 35/166</a> takes precedence ) }
C03B 35/162	...	{ combined with means for thermal adjustment of the rollers, e.g. cooling ( <a href="#">C03B 35/183</a> takes precedence ) }
C03B 35/163	...	{ Drive means, clutches, gearing or drive speed control means }
C03B 35/164	....	{ electric or electronicsystems therefor, e.g. for automatic control }
C03B 35/165	...	{ Supports or couplings for roller ends, e.g. trunions, gudgeons }
C03B 35/166	...	{ specially adapted for both flat and bent sheets or ribbons }
C03B 35/167	...	{ specially adapted for removing defect sheets, ribbons or parts thereof }
C03B 35/168	...	{ Means for cleaning the rollers }
C03B 35/18	...	Construction of the conveyer rollers { Materials, coatings or coverings thereof }
C03B 35/181	....	{ Materials, coatings, loose coverings or sleeves thereof }
C03B 35/182	....	{ specially adapted for bent sheets or ribbons ( <a href="#">C03B 35/187</a> takes precedence ) }
C03B 35/183	....	{ specially adapted for thermal adjustment of the rollers, e.g. insulating, heating, cooling thereof }
C03B 35/184	.....	{ Cooling }
C03B 35/185	....	{ having a discontinuous surface for contacting the sheets or ribbons other than cloth or fabric, e.g. having protrusions or depressions, spirally wound cable, projecting discs or tires }

**NOTE**

Disc rollers having a discontinuous surface are also classified in [C03B 35/189](#)

C03B 35/186	....	{ End caps, end fixtures or roller end shape designs }
C03B 35/187	....	{ Rollers specially adapted for both flat and bent sheets or ribbons, i.e. rollers of adjustable curvature }
C03B 35/188	....	{ Rollers specially adapted for supplying a gas, e.g. porous or foraminous rollers with internal air supply }
C03B 35/189	....	{ Disc rollers }

**NOTE**

Disc rollers having a discontinuous surface are also classified in [C03B 35/185](#)

C03B 35/20	..	by gripping tongs or supporting frames
C03B 35/202	...	{ by supporting frames ( <a href="#">C03B 35/145</a> takes precedence ) }
C03B 35/205	....	{ the glass sheets being in a vertical position }
C03B 35/207	....	{ Construction or design of supporting frames }
C03B 35/22	..	on a fluid support bed, e.g. on molten metal
C03B 35/24	...	on a gas support bed
C03B 35/243	....	{ having a non-planar surface, e.g. curved, for bent sheets }
C03B 35/246	....	{ Transporting continuous glass ribbons }

C03B 35/26	. Transporting of glass tubes or rods
<b>C03B 37/00</b>	<b>Manufacture or treatment of flakes, fibres, or filaments from softened glass, minerals, or slags</b>
C03B 37/005	. Manufacture of flakes
C03B 37/01	. Manufacture of glass fibres or filaments
C03B 37/011	.. { starting from a liquid phase reaction process, e.g. through a gel phase }
C03B 37/012	.. Manufacture of preforms for drawing fibres or filaments
C03B 37/01202	... { Means for storing or carrying optical fibre preforms, e.g. containers }
C03B 37/01205	... { starting from tubes, rods, fibres or filaments ( <a href="#">C03B 37/014</a> takes precedence ) }
C03B 37/01208	.... { for making preforms of microstructured, photonic crystal or holey optical fibres }
C03B 37/01211	.... { by inserting one or more rods or tubes into a tube }
C03B 37/01214	..... { for making preforms of multifibres, fibre bundles other than multiple core preforms }
C03B 37/01217	..... { for making preforms of polarisation-maintaining optical fibres ( <a href="#">polarisation-maintaining optical fibres per se G02B 6/105</a> ) }
C03B 37/0122	..... { for making preforms of photonic crystal, microstructured or holey optical fibres }
C03B 37/01222	..... { for making preforms of multiple core optical fibres ( <a href="#">preforms of multifibres C03B 37/01214</a> ) }
C03B 37/01225	.... { Means for changing or stabilising the shape, e.g. diameter, of tubes or rods in general, e.g. collapsing }
C03B 37/01228	..... { Removal of preform material ( <a href="#">C03B 37/01251</a> takes precedence ) }
C03B 37/01231	..... { to form a longitudinal hole, e.g. by drilling }
C03B 37/01234	..... { to form longitudinal grooves, e.g. by chamfering }
C03B 37/01237	..... { to modify the diameter by heat-polishing, e.g. fire-polishing }
C03B 37/0124	.... { Means for reducing the diameter of rods or tubes by drawing, e.g. for preform draw-down }
C03B 37/01242	..... { Controlling or regulating the down-draw process }
C03B 37/01245	..... { by drawing and collapsing }
C03B 37/01248	..... { by collapsing without drawing }
C03B 37/01251	.... { Reshaping the ends }
C03B 37/01254	..... { by expanding radially, e.g. by forcing a mandrel through or axial pressing a tube or rod }
C03B 37/01257	..... { Heating devices therefor }
C03B 37/0126	..... { Means for supporting, rotating, translating the rod, tube or preform }
C03B 37/01262	.... { Depositing additional preform material as liquids or solutions, e.g. solution doping of preform tubes or rods }
C03B 37/01265	... { starting entirely or partially from molten glass, e.g. by dipping a preform in a melt }
C03B 37/01268	.... { by casting }
C03B 37/01271	.... { by centrifuging }

C03B 37/01274	....	{ by extrusion or drawing }
C03B 37/01277	....	{ by projecting or spraying the melt, e.g. as droplets, on a preform }
C03B 37/0128	...	{ starting from pulverulent glass }
C03B 37/01282	....	{ by pressing or sintering, e.g. hot-pressing }
C03B 37/01285	....	{ by centrifuging }
C03B 37/01288	....	{ by extrusion, e.g. of glass powder and binder ( moulding plastics around a core using a cross-head annular extrusion nozzle <a href="#">B29C 47/28</a> ; extrusion presses in general <a href="#">B30B 11/22</a> ) }
C03B 37/01291	....	{ by progressive melting, e.g. melting glass powder during delivery to and adhering the so-formed melt to a target or preform, e.g. the Plasma Oxidation Deposition (POD) process }
C03B 37/01294	.....	{ by delivering pulverulent glass to the deposition target or preform where the powder is progressively melted, e.g. accretion }
C03B 37/01297	.....	{ by melting glass powder in a mould }
C03B 37/014	...	made entirely or partially by chemical means, { e.g. vapour phase deposition of bulk porous glass either by outside vapour deposition (OVD), or by outside vapour phase oxidation (OVPO) or by vapour axial deposition (VAD) ( <a href="#">C03C 17/02</a> takes precedence ) }
C03B 37/01406	....	{ Deposition reactors therefor }
C03B 37/01413	....	{ Reactant delivery systems ( <a href="#">C03B 37/01807</a> takes precedence; devices therefor in general <a href="#">B01D 1/00</a> , <a href="#">B01J 4/00</a> ) }
C03B 37/0142	.....	{ Reactant deposition burners }
C03B 37/01426	.....	{ Plasma deposition burners or torches }
C03B 37/01433	.....	{ for delivering and depositing additional reactants as liquids or solutions, e.g. for solution doping of the porous glass preform }
C03B 37/0144	....	{ Means for after-treatment or catching of worked reactant gases ( <a href="#">C03B 37/01846</a> takes precedence ) }
C03B 37/01446	....	{ Thermal after-treatment of preforms, e.g. dehydrating, consolidating, sintering ( <a href="#">C03B 37/01853</a> takes precedence ) }
C03B 37/01453	.....	{ for doping the preform with fluorine }
C03B 37/0146	.....	{ Furnaces therefor, e.g. muffle tubes, furnace linings }
C03B 37/01466	....	{ Means for changing or stabilising the diameter or form of tubes or rods ( <a href="#">C03B 37/01861</a> takes precedence ) }
C03B 37/01473	.....	{ Collapsing }
C03B 37/0148	....	{ Means for heating preforms during or immediately prior to deposition ( <a href="#">C03B 37/0142</a> , <a href="#">C03B 37/01876</a> take precedence ) }
C03B 37/01486	....	{ Means for supporting, rotating or translating the preforms being formed, e.g. lathes ( <a href="#">C03B 37/01884</a> takes precedence ) }
C03B 37/01493	.....	{ Deposition substrates, e.g. targets, mandrels, start rods or tubes }
C03B 37/016	....	by a liquid phase reaction process, e.g. through a gel phase
C03B 37/018	....	by glass deposition on a glass substrate, e.g. by { inside-, modified-, plasma-, or plasma modified- chemical vapour deposition ( ICVD, MCVD, PCVD, PMCVD ) , i.e. by thin layer coating on the inside or outside of a glass tube or on a glass rod } ( <a href="#">C03B 37/016</a> takes precedence; { bulk deposition of porous glass by OVD or VAD <a href="#">C03B 37/014</a> } ; surface treatment of glass by coating <a href="#">C03C 17/02</a> )
C03B 37/01807	.....	{ Reactant delivery systems, e.g. reactant deposition burners }
C03B 37/01815	.....	{ Reactant deposition burners or deposition heating means }

C03B 37/01823	.....	{ Plasma deposition burners or heating means }
C03B 37/0183	.....	{ for plasma within a tube substrate }
C03B 37/01838	.....	{ for delivering and depositing additional reactants as liquids or solutions, e.g. for solution doping of the deposited glass }
C03B 37/01846	.....	{ Means for after-treatment or catching of worked reactant gases }
C03B 37/01853	.....	{ Thermal after-treatment of preforms, e.g. dehydrating, consolidating, sintering }
C03B 37/01861	.....	{ Means for changing or stabilising the diameter or form of tubes or rods }
C03B 37/01869	.....	{ Collapsing }
C03B 37/01876	.....	{ Means for heating tubes or rods during or immediately prior to deposition, e.g. electric resistance heaters ( <a href="#">C03B 37/01815</a> takes precedence ) }
C03B 37/01884	.....	{ Means for supporting, rotating and translating tubes or rods being formed, e.g. lathes }
C03B 37/01892	.....	{ Deposition substrates, e.g. tubes, mandrels }
C03B 37/02	..	by drawing or extruding, { e.g. direct drawing of molten glass from nozzles; Cooling fins therefor ( <a href="#">C03B 37/04</a> takes precedence; sizing of the fibres <a href="#">C03C 25/00</a> ) }
C03B 37/0203	...	{ Cooling non-optical fibres drawn or extruded from bushings, nozzles or orifices }
C03B 37/0206	....	{ by contacting of the fibres with liquid or mist }
C03B 37/0209	....	{ by means of a solid heat sink, e.g. cooling fins }
C03B 37/0213	....	{ by forced gas cooling, i.e. blowing or suction }
C03B 37/0216	...	{ Solving the problem of disruption of drawn fibre, e.g. breakage, start-up, shut-down procedures }
C03B 37/022	...	from molten glass in which the resultant product consists of different sorts of glass or is characterised by shape, e.g. hollow fibres, { undulated fibres, fibres presenting a rough surface ( <a href="#">C03B 37/025</a> takes precedence ) }
C03B 37/023	....	Fibres composed of different sorts of glass, { e.g. glass optical fibres, made by the double crucible technique }
C03B 37/0235	.....	{ Thermal treatment of the fibre during the drawing process, e.g. cooling ( <a href="#">C03B 37/02718</a> takes precedence; coating <a href="#">C03C 25/10</a> ) }
C03B 37/025	...	from reheated softened tubes, rods, fibres or filaments, { e.g. drawing fibres from preforms ( draw-down of tubes, rods or preforms to reduced diameter preforms <a href="#">C03B 37/0124</a> ) }
C03B 37/0253	....	{ Controlling or regulating ( for glass fibre manufacture in general <a href="#">C03B 37/07</a> ) }
C03B 37/0256	....	{ Drawing hollow fibres ( <a href="#">C03B 37/02781</a> takes precedence ) }
C03B 37/026	....	Drawing fibres reinforced with a metal wire { or with other non-glass material }
C03B 37/027	....	Fibres composed of different sorts of glass, { e.g. glass optical fibres } ( <a href="#">C03B 37/0253</a> , <a href="#">C03B 37/028</a> take precedence )
C03B 37/02709	.....	{ Polarisation maintaining fibres, e.g. PM, PANDA, bi-refrigent optical fibres }
C03B 37/02718	.....	{ Thermal treatment of the fibre during the drawing process, e.g. cooling ( coating <a href="#">C03C 25/10</a> ) }
C03B 37/02727	.....	{ Annealing or re-heating }
C03B 37/02736	.....	{ Means for supporting, rotating or feeding the tubes, rods, fibres or filaments to be drawn, e.g. fibre draw towers, preform alignment,

- butt-joining preforms or dummy parts during feeding ( [uniting rods or tubes C03B 23/207](#) )}
- C03B 37/02745 . . . . . { Fibres having rotational spin around the central longitudinal axis, e.g. alternating +/- spin to reduce polarisation mode dispersion }
- C03B 37/02754 . . . . . { Solid fibres drawn from hollow preforms }
- C03B 37/02763 . . . . . { Fibres having axial variations, e.g. axially varying diameter, material or optical properties ( [rotational spin C03B 37/02745](#) ) }
- C03B 37/02772 . . . . . { shaping the preform lower end or bulb, e.g. pre-gobbing, controlling draw bulb shape, or preform draw start-up procedures }
- C03B 37/02781 . . . . . { Hollow fibres, e.g. holey fibres }
- C03B 37/0279 . . . . . { Photonic crystal fibres or microstructured optical fibres other than holey optical fibres }
- C03B 37/028 . . . . . Drawing fibre bundles, e.g. for making fibre bundles of multifibres, { [image fibres](#); ( [Drawing multicore or photonic crystal fibres C03B 37/027](#) ) }
- C03B 37/029 . . . . . Furnaces therefor
- C03B 37/03 . . . . . Drawing means, e.g. drawing drums; { [Traction or tensioning devices](#) }
- C03B 37/032 . . . . . { [for glass optical fibres](#) }
- C03B 37/035 . . . . . having means for deflecting or stripping-off fibres { [or for removing defective parts](#) }
- C03B 37/04 . . . . . by using centrifugal force, { [e.g. spinning through radial orifices](#); [Construction of the spinner cups therefor \( bonder application C03C 25/00 \)](#) }
- C03B 37/041 . . . . . { [Transferring molten glass to the spinner](#) }
- C03B 37/042 . . . . . { [starting from tubes, rods, fibres or filaments](#) }
- C03B 37/044 . . . . . { [for producing fibres of at least two distinct glass compositions, e.g. bi-component fibres \( \[conjugated artificial filaments or the like, e.g. with glass fibres, D01F 8/00\]\(#\) \)](#) }
- C03B 37/045 . . . . . { [Construction of the spinner cups](#) }
- C03B 37/047 . . . . . { [Selection of materials for the spinner cups](#) }
- C03B 37/048 . . . . . { [Means for attenuating the spun fibres, e.g. blowers for spinner cups](#) }
- C03B 37/05 . . . . . by projecting { [molten glass](#) } on a rotating body having no radial orifices
- C03B 37/055 . . . . . { [by projecting onto and spinning off the outer surface of the rotating body](#) }
- C03B 37/06 . . . . . by blasting or blowing molten glass, e.g. for making staple fibres
- C03B 37/065 . . . . . starting from tubes, rods, fibres or filaments
- C03B 37/07 . . . . . Controlling or regulating ( { [C03B 37/0253 takes precedence](#) } ; [controlling or regulating in general G05](#) )
- C03B 37/075 . . . . . Manufacture of { [non-optical](#) } fibres or filaments consisting of different sorts of glass or characterised by shape, e.g. undulated fibres ( [C03B 37/022](#) , [C03B 37/027](#) , [C03B 37/028 take precedence](#); [light guides G02B 6/00](#) )
- C03B 37/0753 . . . . . { [consisting of different sorts of glass, e.g. bi-component fibres](#) }
- C03B 37/0756 . . . . . { [Hollow fibres](#) }
- C03B 37/08 . . . . . Bushings, { [e.g. construction, bushing reinforcement means](#) }; Spinnerettes; Nozzles; Nozzle plates
- C03B 37/0805 . . . . . { [Manufacturing, repairing, or other treatment of bushings, nozzles or bushing nozzle plates](#) }
- C03B 37/081 . . . . . Indirect-melting bushings



- C03B 37/083 . . Nozzles; Bushing nozzle plates ( [C03B 37/095](#) takes precedence )
- C03B 37/085 . . Feeding devices therefor
- C03B 37/09 . . electrically heated
- C03B 37/091 . . . { Indirect-resistance heating }
- C03B 37/092 . . . Direct-resistance heating
- C03B 37/095 . . Use of materials therefor
  
- C03B 37/10 . Non-chemical treatment ( [C03C 25/00](#) takes precedence; yarns or threads [D02](#) ; woven fabrics [D03](#) ; non-woven fabrics [D04](#) )
- C03B 37/12 . . of fibres or filaments during winding up
- C03B 37/14 . . Re-forming fibres or filaments, { i.e. changing their shape } ( [C03B 37/025](#) takes precedence )
- C03B 37/15 . . . with heat application, e.g. for making optical fibres ( fusion-splicing of light guides [G02B 6/255](#) ; treatment of light guides to shape optical elements [G02B 6/28](#) )
- C03B 37/16 . . Cutting or severing ( light guides [G02B 6/25](#) )
  
- C03B 40/00** **Preventing adhesion between glass and glass or between glass and the means used to shape it, { hold it or support it }**
  
- C03B 40/005 . { Fabrics, felts or loose covers }
- C03B 40/02 . by lubrication; Use of materials as release or lubricating compositions
- C03B 40/027 . . Apparatus for applying lubricants to glass shaping moulds or tools
- C03B 40/033 . . Means for preventing adhesion between glass and glass
- C03B 40/04 . using gas
  
- C03B 2201/00** **Type of glass produced**
  
- C03B 2201/01 . Antique glass imitations
- C03B 2201/02 . Pure silica glass, e.g. pure fused quartz
- C03B 2201/03 . . Impurity concentration specified
- C03B 2201/04 . . . Hydroxyl ion (OH)
  
- C03B 2201/06 . Doped silica-based glasses
- C03B 2201/07 . . Impurity concentration specified
- C03B 2201/075 . . . Hydroxyl ion (OH)
- C03B 2201/08 . . doped with boron or fluorine or other refractive index decreasing dopant
- C03B 2201/10 . . . doped with boron ( [C03B 2201/14](#) takes precedence )
- C03B 2201/12 . . . doped with fluorine ( [C03B 2201/14](#) takes precedence )
- C03B 2201/14 . . . doped with boron and fluorine
- C03B 2201/20 . . doped with non-metals other than boron or fluorine
- C03B 2201/21 . . . doped with molecular hydrogen
- C03B 2201/22 . . . doped with deuterium



- C03B 2201/23 . . . doped with hydroxyl groups
- C03B 2201/24 . . . doped with nitrogen, e.g. silicon oxy-nitride glasses

#### **NOTE**

Codes [C03B 2201/28](#) , [C03B 2201/31](#) and [C03B 2201/32](#) for the common dopants P, Ge and Al respectively, are only used for features specific to such dopants and not for general cases, such as for increasing the refractive index of silica glass.

- C03B 2201/28 . . . doped with phosphorus
- C03B 2201/30 . . doped with metals, e.g. Ga, Sn, Sb, Pb or Bi
- C03B 2201/31 . . . doped with germanium
- C03B 2201/32 . . . doped with aluminium ( [C03B 2201/36](#) takes precedence )
- C03B 2201/34 . . . doped with rare earth metals, i.e. with Sc, Y or lanthanides, e.g. for laser-amplifiers
- C03B 2201/36 . . . . doped with rare earth metals and aluminium, e.g. Er-Al co-doped
- C03B 2201/40 . . . doped with transition metals other than rare earth metals, e.g. Zr, Nb, Ta or Zn
- C03B 2201/42 . . . . doped with titanium
- C03B 2201/50 . . . doped with alkali metals
- C03B 2201/54 . . . doped with beryllium, magnesium or alkaline earth metals
- C03B 2201/58 . . . doped with metals in non-oxide form, e.g. CdSe
- C03B 2201/60 . Silica-free oxide glasses
- C03B 2201/62 . . containing boron
- C03B 2201/70 . . containing phosphorus
- C03B 2201/78 . . containing germanium
- C03B 2201/80 . Non-oxide glasses or glass-type compositions
- C03B 2201/82 . . Fluoride glasses, e.g. ZBLAN glass
- C03B 2201/83 . . . Ionic or single crystal type, e.g. NaF, LiF, CaF<sub>2</sub>
- C03B 2201/84 . . Halide glasses other than fluoride glasses, i.e. Cl, Br or I glasses, e.g. AgCl-AgBr "glass"
- C03B 2201/86 . . Chalcogenide glasses, i.e. S, Se or Te glasses
- C03B 2201/88 . . Chalcohalide glasses, i.e. containing one or more of S, Se, Te and one or more of F, Cl, Br, I

#### **C03B 2203/00 Fibre product details, e.g. structure, shape**

- C03B 2203/02 . External structure or shape details
- C03B 2203/04 . . Polygonal outer cross-section, e.g. triangular, square
- C03B 2203/06 . . Axial perturbations, e.g. twist, by torsion, undulating, crimped
- C03B 2203/10 . Internal structure or shape details
- C03B 2203/12 . . Non-circular or non-elliptical cross-section, e.g. planar core
- C03B 2203/14 . . Non-solid, i.e. hollow products, e.g. hollow clad or with core-clad interface
- C03B 2203/16 . . . Hollow core

- C03B 2203/18 . . Axial perturbations, e.g. in refractive index or composition
- C03B 2203/19 . . . Alternating positive/negative spins or twists
- C03B 2203/20 . . . helical
- C03B 2203/22 . . Radial profile of refractive index, composition or softening point
- C03B 2203/222 . . . Mismatching viscosities or softening points of glass layers
- C03B 2203/223 . . . Matching viscosities or softening points of glass layers
- C03B 2203/224 . . . Mismatching coefficients of thermal expansion [CTE] of glass layers
- C03B 2203/225 . . . Matching coefficients of thermal expansion [CTE] of glass layers
- C03B 2203/23 . . . Double or multiple optical cladding profiles
- C03B 2203/24 . . . Single mode ( [SM or monomode](#) )
- C03B 2203/26 . . . Parabolic or graded index (GRIN) core profile
- C03B 2203/28 . . . Large core fibres, e.g. with a core diameter greater than 60 micrometers
- C03B 2203/29 . . . Segmented core fibres
  
- C03B 2203/30 . Polarisation maintaining (PM), i.e. birefringent products, e.g. with elliptical core, by use of stress rods, "PANDA" type fibres
- C03B 2203/302 . . Non-circular core cross-sections
- C03B 2203/31 . . by use of stress-imparting rods, e.g. by insertion
  
- C03B 2203/32 . Eccentric core or cladding
  
- C03B 2203/34 . Plural core other than bundles, e.g. double core
  
- C03B 2203/36 . Dispersion modified fibres, e.g. wavelength or polarisation shifted, flattened or compensating fibres ( [DSF](#), [DFF](#), [DCF](#) )
  
- C03B 2203/40 . Multifibres or fibre bundles, e.g. for making image fibres
  
- C03B 2203/42 . Photonic crystal fibres, e.g. fibres using the photonic bandgap PBG effect, microstructured or holey optical fibres
  
- C03B 2205/00 Fibre drawing or extruding details**
  
- C03B 2205/02 . Upward drawing
  
- C03B 2205/04 . Non-vertical drawing
  
- C03B 2205/06 . Rotating the fibre fibre about its longitudinal axis
- C03B 2205/07 . . Rotating the preform about its longitudinal axis
  
- C03B 2205/08 . Sub-atmospheric pressure applied, e.g. vacuum
- C03B 2205/09 . . to the outside of the preform or fibre
  
- C03B 2205/10 . pressurised
  
- C03B 2205/12 . Drawing solid optical fibre directly from a hollow preform
- C03B 2205/13 . . from a hollow glass tube containing glass-forming material in particulate form, e.g. to form the core by melting the powder during drawing

- C03B 2205/14 . . comprising collapse of an outer tube onto an inner central solid preform rod
- C03B 2205/16 . . the drawn fibre consisting of circularly symmetric core and clad
- C03B 2205/20 . Irradiation of the base fibre during drawing to modify waveguide properties
- C03B 2205/30 . Means for continuous drawing from a preform
- C03B 2205/32 . Simultaneous drawing of multiple preforms to separate multiple fibres
- C03B 2205/40 . Monitoring or regulating the draw tension or draw rate
- C03B 2205/42 . Drawing at high speed, i.e. > 10 m/s
- C03B 2205/44 . Monitoring or regulating the preform feed rate
- C03B 2205/45 . Monitoring or regulating the preform neck-down region with respect to position or shape
- C03B 2205/46 . Monitoring or regulating the preform position with respect to the draw axis
- C03B 2205/47 . Shaping the preform draw bulb before or during drawing
- C03B 2205/50 . Cooling the drawn fibre using liquid coolant prior to coating, e.g. indirect cooling via cooling jacket
  - C03B 2205/51 . . using liquified or cryogenic gas
  - C03B 2205/52 . . by direct contact with liquid coolant, e.g. as spray, mist
  - C03B 2205/53 . . . by passage through liquid coolant bath
  - C03B 2205/54 . . . After-treatment to remove coolant attached to cooled fibre
- C03B 2205/55 . Cooling or annealing the drawn fibre prior to coating using a series of coolers or heaters
- C03B 2205/56 . Annealing or re-heating the drawn fibre prior to coating
- C03B 2205/57 . Recovering, recycling or purifying the coolant, e.g. helium
- C03B 2205/60 . Optical fibre draw furnaces
  - C03B 2205/61 . . Recovering, recycling or purifying the inert gas, e.g. helium
  - C03B 2205/62 . . Heating means for drawing
    - C03B 2205/63 . . . Ohmic resistance heaters, e.g. carbon or graphite resistance heaters
    - C03B 2205/64 . . . Induction furnaces, i.e. HF/RF coil, e.g. of the graphite or zirconia susceptor type
    - C03B 2205/66 . . . Microwave or similar electromagnetic wave heating, e.g. resonant cavity type
    - C03B 2205/67 . . . Laser heating
    - C03B 2205/68 . . . Hot gas, e.g. plasma, flame, burner
    - C03B 2205/69 . . . Auxiliary thermal treatment immediately prior to drawing, e.g. pre-heaters, laser-assisted resistance heaters
  - C03B 2205/70 . . Draw furnace insulation
  - C03B 2205/72 . . Controlling or measuring the draw furnace temperature

- C03B 2205/74 . . Means for moving at least a part of the draw furnace, e.g. by rotation or vertical or horizontal movement
- C03B 2205/80 . . Means for sealing the preform entry or upper end of the furnace
- C03B 2205/81 . . . using gas
- C03B 2205/82 . . Means for sealing the fibre exit or lower end of the furnace
- C03B 2205/83 . . . using gas
- C03B 2205/90 . . Manipulating the gas flow through the furnace other than by use of upper or lower seals, e.g. by modification of the core tube shape or by using baffles
- C03B 2205/91 . . . by controlling the furnace gas flow rate into or out of the furnace
- C03B 2205/92 . . . using means for gradually reducing the cross-section towards the outlet or around the preform draw end, e.g. tapered
- C03B 2205/96 . . . using tangential feed approximately perpendicular to the draw axis
- C03B 2205/98 . . . using annular gas inlet distributors

### **C03B 2207/00 Glass deposition burners**

- C03B 2207/02 . Elongated flat flame or slit-nozzle type
- C03B 2207/04 . Multi-nested ports
- C03B 2207/06 . . Concentric circular ports
- C03B 2207/08 . . Recessed or protruding ports
- C03B 2207/10 . . Split ports
- C03B 2207/12 . . Nozzle or orifice plates
- C03B 2207/14 . . Tapered or flared nozzles or ports angled to central burner axis
- C03B 2207/16 . . Non-circular ports, e.g. square or oval
- C03B 2207/18 . . Eccentric ports
- C03B 2207/20 . Specific substances in specified ports, e.g. all gas flows specified
- C03B 2207/22 . . Inert gas details
- C03B 2207/24 . . Multiple flame type, e.g. double-concentric flame
- C03B 2207/26 . . Multiple ports for glass precursor
- C03B 2207/28 . . . for different glass precursors, reactants or modifiers
- C03B 2207/30 . For glass precursor of non-standard type, e.g. solid  $\text{SiH}_3\text{F}$
- C03B 2207/32 . . Non-halide
- C03B 2207/34 . . Liquid, e.g. mist or aerosol
- C03B 2207/36 . Fuel or oxidant details, e.g. flow rate, flow rate ratio, fuel additives
- C03B 2207/38 . . Fuel combinations or non-standard fuels, e.g.  $\text{H}_2 + \text{CH}_4$ , ethane
- C03B 2207/40 . Mechanical flame shields
- C03B 2207/42 . Assembly details; Material or dimensions of burner; Manifolds or supports
- C03B 2207/46 . Comprising performance enhancing means, e.g. electrostatic charge or built-in heater
- C03B 2207/50 . Multiple burner arrangements

- C03B 2207/52 . . Linear array of like burners
- C03B 2207/54 . . combined with means for heating the deposit, e.g. non-deposition burner
- C03B 2207/60 . Relationship between burner and deposit, e.g. position
- C03B 2207/62 . . Distance
- C03B 2207/64 . . Angle
- C03B 2207/66 . . Relative motion
- C03B 2207/70 . Control measures
- C03B 2207/80 . Feeding the burner or the burner-heated deposition site
- C03B 2207/81 . . Constructional details of the feed line, e.g. heating, insulation, material, manifolds, filters
- C03B 2207/85 . . with vapour generated from liquid glass precursors, e.g. directly by heating the liquid
  - C03B 2207/86 . . . by bubbling a gas through the liquid
  - C03B 2207/87 . . . Controlling the temperature
  - C03B 2207/88 . . . Controlling the pressure
  - C03B 2207/89 . . . Controlling the liquid level in or supply to the tank
- C03B 2207/90 . . with vapour generated from solid glass precursors i.e. by sublimation
- C03B 2211/00 Heating processes for glass melting in glass melting furnaces**
  - C03B 2211/20 . Submerged gas heating
  - C03B 2211/22 . . by direct combustion in the melt
    - C03B 2211/23 . . . using oxygen, i.e. pure oxygen or oxygen-enriched air
  - C03B 2211/24 . . by direct contact of non-combusting hot gas in the melt
  - C03B 2211/25 . . by indirect heating, e.g. with heat pipes
  - C03B 2211/30 . introducing oxygen into the glass melting furnace separately from the fuel
  - C03B 2211/40 . using oxy-fuel burners
    - C03B 2211/60 . . oxy-fuel burner construction
      - C03B 2211/62 . . . flat-flame
  - C03B 2211/70 . Skull melting, i.e. melting or refining in cooled wall crucibles or within solidified glass crust, e.g. in continuous walled vessels
  - C03B 2211/71 . . within segmented wall vessels where the molten glass solidifies between and seals the gaps between wall segments
- C03B 2215/00 Press-moulding glass**
  - C03B 2215/02 . Press-mould materials
    - C03B 2215/03 . . defined by material properties or parameters, e.g. relative CTE of mould parts
    - C03B 2215/05 . . Press-mould die materials
      - C03B 2215/06 . . . Metals or alloys

<a href="#">C03B 2215/07</a>	...	Ceramic or cermets
<a href="#">C03B 2215/08</a>	..	Coated press-mould dies
<a href="#">C03B 2215/10</a>	...	Die base materials
<a href="#">C03B 2215/11</a>	....	Metals
<a href="#">C03B 2215/12</a>	....	Ceramics or cermets, e.g. cemented WC, Al <sub>2</sub> O <sub>3</sub> or TiC
<a href="#">C03B 2215/14</a>	...	Die top coat materials, e.g. materials for the glass-contacting layers
<a href="#">C03B 2215/16</a>	....	Metals or alloys, e.g. Ni-P, Ni-B, amorphous metals
<a href="#">C03B 2215/17</a>	.....	comprising one or more of the noble metals, i.e. Ag, Au, platinum group metals
<a href="#">C03B 2215/20</a>	....	Oxide ceramics
<a href="#">C03B 2215/22</a>	....	Non-oxide ceramics ( <a href="#">carbon C03B 2215/24</a> )
<a href="#">C03B 2215/24</a>	....	Carbon, e.g. diamond, graphite, amorphous carbon
<a href="#">C03B 2215/26</a>	....	Mixtures of materials covered by more than one of the groups <a href="#">C03B 2215/16</a> to <a href="#">C03B 2215/24</a> , e.g. C-SiC, Cr-Cr <sub>2</sub> O <sub>3</sub> , SiALON
<a href="#">C03B 2215/30</a>	...	Intermediate layers, e.g. graded zone of base/top material
<a href="#">C03B 2215/31</a>	....	Two or more distinct intermediate layers or zones
<a href="#">C03B 2215/32</a>	....	of metallic or silicon material
<a href="#">C03B 2215/34</a>	....	of ceramic or cermet material, e.g. diamond-like carbon
<a href="#">C03B 2215/38</a>	....	Mixed or graded material layers or zones
<a href="#">C03B 2215/40</a>	.	Product characteristics
<a href="#">C03B 2215/404</a>	..	Products with identification marks
<a href="#">C03B 2215/406</a>	..	Products comprising at least two different glasses
<a href="#">C03B 2215/41</a>	..	Profiled surfaces
<a href="#">C03B 2215/412</a>	...	fine structured, e.g. fresnel lenses, prismatic reflectors, other sharp-edged surface profiles
<a href="#">C03B 2215/413</a>	...	optical fibre alignment, fixing or connecting members having V-grooves
<a href="#">C03B 2215/414</a>	...	Arrays of products, e.g. lenses
<a href="#">C03B 2215/44</a>	..	Flat, parallel-faced disc or plate products
<a href="#">C03B 2215/45</a>	..	Ring or doughnut disc products or their preforms
<a href="#">C03B 2215/46</a>	..	Lenses, e.g. bi-convex
<a href="#">C03B 2215/47</a>	...	Bi-concave
<a href="#">C03B 2215/48</a>	...	Convex-concave
<a href="#">C03B 2215/49</a>	...	Complex forms not covered by groups <a href="#">C03B 2215/47</a> or <a href="#">C03B 2215/48</a>
<a href="#">C03B 2215/50</a>	.	Structural details of the press-mould assembly
<a href="#">C03B 2215/60</a>	.	Aligning press die axes
<a href="#">C03B 2215/61</a>	.	Positioning the glass to be pressed with respect to the press dies or press axis
<a href="#">C03B 2215/62</a>	.	Vibration-assisted pressing
<a href="#">C03B 2215/63</a>	.	Pressing between porous dies supplied with gas, i.e. contactless pressing
<a href="#">C03B 2215/64</a>	.	Spinning, centrifuging or using g-force to distribute the glass

- C03B 2215/65 . Means for releasing gas trapped between glass and press die
- C03B 2215/66 . Means for providing special atmospheres, e.g. reduced pressure, inert gas, reducing gas, clean room
- C03B 2215/67 . Pressing between dies rotating about the press axis
- C03B 2215/68 . Means for parting the die from the pressed glass other than by cooling or use of a take-out
- C03B 2215/69 . Controlling the pressure applied to the glass via the dies
- C03B 2215/70 . Horizontal or inclined press axis
- C03B 2215/71 . Injecting molten glass into the mould cavity
- C03B 2215/72 . Barrel presses or equivalent, e.g. of the ring mould type
- C03B 2215/73 . . with means to allow glass overflow in a direction perpendicular to the press axis
- C03B 2215/74 . . . with means to trim off excess material
- C03B 2215/76 . Pressing whereby some glass overflows unrestrained beyond the press mould in a direction perpendicular to the press axis
- C03B 2215/77 . . with means to trim off excess material
- C03B 2215/78 . Pressing together along two or more perpendicular axes
- C03B 2215/79 . Uniting product and product holder during pressing e.g. lens and lens holder
- C03B 2215/80 . Simultaneous pressing of multiple products; Multiple parallel moulds
- C03B 2215/86 . Linear series of multiple press moulds
- C03B 2215/87 . . with change of transportation direction in the horizontal plane, e.g. rectangular or "U" shape serial transport
- C03B 2225/00      **Transporting hot glass sheets during their manufacture****
- C03B 2225/02 . Means for positioning, aligning or orientating the sheets during their travel, e.g. stops