

CPC**COOPERATIVE PATENT CLASSIFICATION****B21C****MANUFACTURE OF METAL SHEETS, WIRE, RODS, TUBES OR PROFILES, OTHERWISE THAN BY ROLLING; AUXILIARY OPERATIONS USED IN CONNECTION WITH METAL-WORKING WITHOUT ESSENTIALLY REMOVING MATERIAL**

Guidance heading: **Metal-drawing** ([continuous casting B22D 11/00](#); [pressure welding by means of a rolling mill B23K 20/04](#))

B21C 1/00 **Manufacture of metal sheets, metal wire, metal rods, metal tubes by drawing**

- B21C 1/003 . { [Drawing materials of special alloys so far as the composition of the alloy requires or permits special drawing methods or sequences](#) }
- B21C 1/006 . { [using vibratory energy](#) }
- B21C 1/02 . Drawing metal wire or like flexible metallic material by drawing machines or apparatus in which the drawing action is effected by drums
 - B21C 1/04 . . . with two or more dies operating in series
 - B21C 1/06 in which the material slips on the drums
 - B21C 1/08 in which the material does not slip on the drums
 - B21C 1/10 with accumulation of material between consecutively-arranged dies
 - B21C 1/12 . . . Regulating or controlling speed of drawing drums, e.g. to influence tension; Drives; Stop or relief mechanisms ([couplings for drums B21C 1/14](#); [design or construction of electrical equipment, see the relevant classes](#))
 - B21C 1/14 . . . Drums, e.g. capstans ([capstans or winches in general B66D](#)); Connection of grippers thereto; Grippers specially adapted for drawing machines or apparatus of the drum type; Couplings specially adapted for these drums
 - B21C 1/16 . . Metal drawing by machines or apparatus in which the drawing action is effected by other means than drums, e.g. by a longitudinally-moved carriage pulling or pushing the work or stock for making metal sheets, bars, or tubes
 - B21C 1/18 . . . from stock of limited length ([B21C 1/22 takes precedence](#))
 - B21C 1/20 . . . from stock of essentially unlimited length ([B21C 1/22 takes precedence](#))
 - B21C 1/22 . . . specially adapted for making tubular articles ([bending sheet metal into tubular form by drawing B21D 5/10](#))
 - B21C 1/24 by means of mandrels ([mandrels B21C 3/16](#))
 - B21C 1/26 Push-bench drawing
 - B21C 1/27 . . . Carriages; Drives
 - B21C 1/28 . . . Carriages; Connections of grippers thereto; Grippers ([for drawing machines of the drum type B21C 1/14](#))
 - B21C 1/30 . . . Drives, e.g. carriage-traversing mechanisms; Driving elements, e.g. drawing chains; Controlling the drive ([endlessly revolving chain systems for metal coiling: B21C 47/3458](#))
 - B21C 1/305 { [Linear motor pulling devices](#) }

- B21C 1/32 . . Feeding or discharging the material or mandrels
- B21C 1/34 . . Guiding or supporting the material or mandrels

B21C 3/00 Profiling tools for metal drawing; Combinations of dies and mandrels

- B21C 3/02 . Dies; Selection of material therefor; Cleaning thereof
- B21C 3/025 . . { comprising diamond parts }
- B21C 3/04 . . with non-adjustable section ([B21C 3/08](#) takes precedence)
- B21C 3/06 . . with adjustable section ([B21C 3/08](#) takes precedence)
- B21C 3/08 . . with section defined by rollers, balls, or the like
- B21C 3/10 . . with hydraulic forces acting immediately on work
- B21C 3/12 . . Die holders; Rotating dies
- B21C 3/14 . . . Die holders combined with devices for guiding the drawing material or combined with devices for cooling heating, or lubricating
- B21C 3/16 . Mandrels ([separating mandrels from work B21C 45/00](#)); Mounting or adjusting same
- B21C 3/18 . Making tools by operation not covered by a single other subclass; repairing

B21C 5/00 Pointing; Push-pointing

- B21C 5/003 . { of hollow material, e.g. tube }
- B21C 5/006 . { of solid material, e.g. wire or profiles }

B21C 9/00 Cooling, heating or lubricating drawing material ([B21C 3/14](#) takes precedence)

- B21C 9/005 . { Cold application of the lubricant (when combined with heating steps [B21C 9/00](#)) }
- B21C 9/02 . Selection of compositions therefor

B21C 19/00 Devices for straightening wire or like work combined with or specially adapted for use in connection with drawing or winding machines or apparatus

Guidance heading: Metal extruding ([continuous casting B22D 11/00](#))

B21C 23/00 Extruding metal; Impact extrusion

- B21C 23/001 . { to improve the material properties, e.g. lateral extrusion }
- B21C 23/002 . { Extruding materials of special alloys so far as the composition of the alloy requires or permits special extruding methods of sequences }
- B21C 23/004 . { using vibratory energy }
- B21C 23/005 . { Continuous extrusion starting from solid state material ([B21C 23/008](#) takes precedence) }

- B21C 23/007 . { Hydrostatic extrusion }
- B21C 23/008 .. { Continuous extrusion }
- B21C 23/01 . starting from material of particular form or shape, e.g. mechanically pre-treated ([B21C 23/22](#) takes precedence; heat treatment or combinations thereof with mechanical treatments, see appropriate classes)
- B21C 23/02 . Making uncoated products
- B21C 23/03 .. by both direct and backward extrusion
- B21C 23/035 ... { Making products of generally elongated shape }
- B21C 23/04 .. by direct extrusion
- B21C 23/06 ... Making sheets
- B21C 23/08 ... Making wire, bars, tubes
- B21C 23/085 { Making tubes ([B21C 23/10](#) take precedence) }
- B21C 23/10 Making finned tubes
- B21C 23/12 Extruding bent tubes or rods
- B21C 23/14 ... Making other products
- B21C 23/142 { Making profiles }
- B21C 23/145 { Interlocking profiles }
- B21C 23/147 { Making drill blanks (making twist-drills [B23P 15/32](#)) }
- B21C 23/16 Making turbo blades or propellers
- B21C 23/18 .. by impact extrusion
- B21C 23/183 ... { by forward extrusion }
- B21C 23/186 ... { by backward extrusion }
- B21C 23/20 .. by backward extrusion
- B21C 23/205 ... { Making products of generally elongated shape }
- B21C 23/21 . Presses specially adapted for extruding metal ([extrusion presses in general B30B 11/22](#))
- B21C 23/211 .. { Press driving devices }
- B21C 23/212 .. { Details ([B21C 23/217](#), **B21C 23/12F** take precedence) }
- B21C 23/214 ... { Devices for changing die or container }
- B21C 23/215 ... { Devices for positioning or centering press components, e.g. die or container }
- B21C 23/217 .. { Tube extrusion presses ([B21C 23/218](#) takes precedence) }
- B21C 23/218 .. { Indirect extrusion presses }
- B21C 23/22 . Making metal-coated products; Making products from two or more metals
- B21C 23/24 .. Covering indefinite lengths of metal or non-metal material with a metal coating
- B21C 23/26 ... Applying metal coats to cables, e.g. to insulated electric cables
- B21C 23/28 on intermittently-operating extrusion presses
- B21C 23/30 on continuously-operating extrusion presses
- B21C 23/32 . Lubrication of metal being extruded or of dies, or the like, e.g. physical state of lubricant, location where lubricant is applied ([chemical composition](#), see appropriate classes)

B21C 25/00 Profiling tools for metal extruding

- B21C 25/02 . Dies
- B21C 25/025 . . { Selection of materials therefor }
- B21C 25/04 . Mandrels
- B21C 25/06 . Press heads, dies, or mandrels for coating work
- B21C 25/08 . Dies or mandrels with section variable during extruding, e.g. for making tapered work; Controlling variation
- B21C 25/10 . Making tools by operations not covered by a single other subclass

B21C 26/00 Rams or plungers; Discs therefor**B21C 27/00 Containers for metal to be extruded ([B21C 29/02](#) takes precedence)**

- B21C 27/02 . for making coated work
- B21C 27/04 . Venting metal-container chamber

B21C 29/00 Cooling or heating work or parts of the extrusion press; { Gas treatment of work }

- B21C 29/003 . { Cooling or heating of work }
- B21C 29/006 . { Gas treatment of work, e.g. to prevent oxidation or to create surface effects }
- B21C 29/02 . { Cooling or heating } of containers for metal to be extruded
- B21C 29/04 . { Cooling or heating } of press heads, dies or mandrels

B21C 31/00 Control devices, e.g. for regulating the pressing speed or temperature of metal ([B21C 25/08](#) takes precedence); Measuring devices, e.g. for temperature of metal, combined with or specially adapted for use in connection with extrusion presses (measuring devices of more general interest within subclass [B21C](#), see group [B21C 51/00](#))**B21C 33/00 Feeding extrusion presses with metal to be extruded; { Loading the dummy block }**

- B21C 33/002 . { Encapsulated billet (manufacturing wires or fine wires [B21C 37/045](#), [B21C 37/047](#)) }
- B21C 33/004 . { Composite billet }
- B21C 33/006 . { Consecutive billets, e.g. billet profiles allowing air expulsion or bonding of billets }
- B21C 33/008 . { Scalping billets, e.g. for removing oxide layers prior or during extrusion }

B21C 33/02 . the metal being in liquid form

B21C 35/00 Removing work or waste from extruding presses; Drawing-off extruded work (in connection with the extruding of bent tubes or rods [B21C 23/12](#)); Cleaning dies, ducts, containers, or mandrels

B21C 35/02 . Removing or drawing-off work {(linear motor pulling devices [B21C 1/305](#))}

B21C 35/023 .. { Work treatment directly following extrusion, e.g. further deformation or surface treatment ([B21C 35/03](#) takes precedence; gas treatment [B21C 29/006](#))}

B21C 35/026 ... { Removing sections from the extruded work, e.g. removing a strip to create an open profile }

B21C 35/03 .. Straightening the work (metal straightening in general [B21D](#))

B21C 35/04 . Cutting-off or removing waste

B21C 35/06 . Cleaning dies, ducts, containers or mandrels

B21C 37/00 Manufacture of metal sheets, bars, wire, tubes or like semi-manufactured products, not otherwise provided for (by rolling [B21B](#); by working or processing semi-finished sheet metal, profiles, tubes, or wire [B21D](#) or [B21E](#); by casting [B22](#); by material-removing machine tools [B23](#); by welding, e.g. cladding or plating [B23K](#); by grinding or polishing [B24](#); by electroforming [C25D 1/00](#); by drawing or extruding, see the relevant groups); Manufacture of tubes of special shape

B21C 37/02 . of sheets

B21C 37/04 . of bars or wire {(wire-like electrical connectors in or for semiconductor devices [H01L 24/42](#))}

B21C 37/042 .. { Manufacture of coated wire or bars }

B21C 37/045 .. { Manufacture of wire or bars with particular section or properties }

B21C 37/047 .. { of fine wires }

B21C 37/06 . of tubes or metal hoses; Combined procedures for making tubes, e.g. for making multi-wall tubes (bending sheets for making tubes [B21D 5/00](#); seaming by folding [B21D 39/02](#))

B21C 37/065 .. { starting from a specific blank, e.g. tailored blank }

B21C 37/08 .. Making tubes with welded or soldered seams (involving only a soldering or welding operation [B23K](#)) { with helically arranged seams [B21C 37/122](#) }

B21C 37/0803 ... { the tubes having a special shape, e.g. polygonal tubes }

B21C 37/0807 ... { Tube treating or manipulating combined with, or specially adapted for use in connection with tube making machines, e.g. drawing-off devices, cutting-off }

B21C 37/0811 { removing or treating the weld bead }

B21C 37/0815 ... { without continuous longitudinal movement of the sheet during the bending operation (sheet bending in general [B21D](#))}

B21C 37/0818 ... { Manufacture of tubes by drawing of strip material through dies }

B21C 37/0822 ... { Guiding or aligning the edges of the bent sheet }

B21C 37/0826 ... { Preparing the edges of the metal sheet with the aim of having some effect on the weld }

B21C 37/083	...	Supply, or operations combined with supply, of strip material
B21C 37/087	...	using rods or strips of soldering material
B21C 37/09	...	of coated strip material; { Making multi-wall tubes }
B21C 37/10	..	Making tubes with riveted seams { or with non-welded and non-soldered seams }
B21C 37/101	...	{ Making of the seams }
B21C 37/102	...	{ of coated strip material (making multi-wall tubes)}
B21C 37/104	...	{ the tubes having a special shape, e.g. polygonal tubes }
B21C 37/105	...	{ Supply, or operations combined with supply, of strip material }
B21C 37/107	...	{ Tube treating or manipulating combined with or specially adapted for use in connection with tube-making machines e.g. drawing-off devices, cutting-off }
B21C 37/108	...	{ without continuous longitudinal movement of the sheet during the bending operation (sheet bending in general B21D)}
B21C 37/12	..	Making tubes or metal hoses with helically arranged seams
B21C 37/121	...	{ with non-welded and non-soldered seams }
B21C 37/122	...	{ with welded or soldered seams (welding and soldering helically arranged seams, per se B23K)}
B21C 37/123	...	{ of coated strip material; Making multi-wall tubes }
B21C 37/124	...	{ the tubes having a special shape, e.g. with corrugated wall, flexible tubes }
B21C 37/125	{ curved section, e.g. elbow }
B21C 37/126	...	{ Supply, or operations combined with supply, of strip material }
B21C 37/127	...	{ Tube treating or manipulating combined with or specially adapted for use in connection with tube making machines, e.g. drawing-off devices, cutting-off }
B21C 37/128	...	{ Control or regulating devices }
B21C 37/14	..	Making tubes from double flat material
B21C 37/15	..	Making tubes of special shape; Making tube fittings { B21C 37/0803 , B21C 37/104 , B21C 37/124 , take precedence }
B21C 37/151	...	{ Making tubes with multiple passages }
B21C 37/152	...	{ Making rifle and gunbarrels }
B21C 37/153	{ Making tubes with inner- and/or outer guides }
B21C 37/154	...	{ Making multi-wall tubes }
B21C 37/155	...	{ Making } tubes with non circular section (B21C 37/151 , B21C 37/154 take precedence)
B21C 37/156	...	{ Making tubes with wall irregularities (B21C 37/20 , B21C 37/22 take precedence)}
B21C 37/157	{ Perforations }
B21C 37/158	{ Protrusions, e.g. dimples }
B21C 37/16	...	Making tubes with varying diameter in longitudinal direction
B21C 37/18	conical tubes
B21C 37/185	{ starting from sheet material }
B21C 37/20	...	Making helical or similar guides in or on tubes without removing material, e.g. by drawing same over mandrels, by pushing same through dies; { Making tubes with angled walls, ribbed tubes and tubes with decorated walls }
B21C 37/202	{ with guides parallel to the tube axis }
B21C 37/205	{ with annular guides }
B21C 37/207	{ with helical guides }

- B21C 37/22 . . . Making finned or ribbed tubes by fixing strip or like material to tubes ([making heat exchangers B21D 53/02](#))
- B21C 37/225 { longitudinally-ribbed tubes }
- B21C 37/24 annularly-ribbed tubes
- B21C 37/26 helically-ribbed tubes
- B21C 37/28 . . . Making tube fittings for connecting pipes, e.g. U-pieces
- B21C 37/283 { Making U-pieces ([B21C 37/286 takes precedence](#)) }
- B21C 37/286 { starting from sheet material }
- B21C 37/29 Making branched pieces, e.g. T-pieces
- B21C 37/292 { Forming collars by drawing or pushing a rigid forming tool through an opening in the tube wall }
- B21C 37/294 { Forming collars by compressing a fluid or a yieldable or resilient mass in the tube }
- B21C 37/296 { Making branched pieces starting from strip material; Making branched tubes by securing a secondary tube in an opening in the undeformed wall of a principal tube }
- B21C 37/298 { Forming collars by flow-drilling ([flow drilling B21J 5/066](#)) }
- B21C 37/30 . . Finishing tubes, e.g. sizing, burnishing

B21C 43/00 **Devices for cleaning metal products combined with or specially adapted for use with machines or apparatus provided for in this subclass**

- B21C 43/02 . combined with or specially adapted for use in connection with drawing or winding machines or apparatus
- B21C 43/04 . . Devices for de-scaling wire or like flexible work

Guidance heading: **Auxiliary operation used in connection with metal working without essentially removing material**

B21C 45/00 **Separating mandrels from work or vice-versa**

B21C 47/00 **Winding-up, coiling or winding-off metal wire, metal band or other flexible metal material characterised by features relevant to metal processing only ([coiling wire into particular form B21F 3/00](#); hot coilers in connection with heat-treatment apparatus [C21D 9/68](#))**

- B21C 47/003 . { Regulation of tension or speed; Braking }
- B21C 47/006 . { winding-up or winding-off several parallel metal bands }
- B21C 47/02 . Winding-up or coiling
- B21C 47/04 . . on or in reels or drums, without using a moving guide ([reels or drums B21C 47/28](#))
- B21C 47/045 . . . { in rotating drums }
- B21C 47/06 . . . with loaded rollers, bolts, or equivalent means holding the material on the reel or drum
- B21C 47/063 { with pressure rollers only }

- B21C 47/066 { with belt wrappers only }
- B21C 47/08 . . without making use of a reel or drum, the first turn being formed by a stationary guide
- B21C 47/10 . . by means of a moving guide
- B21C 47/12 . . . the guide moving parallel to the axis of the coil ([B21C 47/14](#) takes precedence)
- B21C 47/14 . . . by means of a rotating guide, e.g. laying the material around a stationary reel or drum
- B21C 47/143 { the guide being a tube }
- B21C 47/146 { Controlling or influencing the laying pattern of the coils }
- B21C 47/16 . Unwinding or uncoiling
- B21C 47/18 . . from reels or drums
- B21C 47/20 . . . the unreeled material moving transversely to the tangent line of the drum, e.g. axially, radially
- B21C 47/22 . . Unwinding coils without reels or drums
- B21C 47/24 . Transferring coils to or from winding apparatus or to or from operative position therein; Preventing uncoiling during transfer
- B21C 47/242 . . { Devices for swinging the coil from horizontal to vertical, or vice versa }
- B21C 47/245 . . { Devices for the replacement of full reels by empty reels or vice versa, without considerable loss of time }
- B21C 47/247 . . { Joining wire or band ends }
- B21C 47/26 . Special arrangements with regard to simultaneous or subsequent treatment of the material
- B21C 47/262 . . { Treatment of a wire, while in the form of overlapping non-concentric rings }
- B21C 47/265 . . { "helicofil" systems }
- B21C 47/267 . . { Scrap treatment }
- B21C 47/28 . Drums or other coil-holders (gripping means [B21C 47/32](#))
- B21C 47/30 . . expansible or contractible
- B21C 47/32 . Tongs or gripping means specially adapted for reeling operations
- B21C 47/323 . . { Slits or pincers on the cylindrical wall of a reel or bobbin, adapted to grip the end of the material being wound }
- B21C 47/326 . . { Devices for pressing the end of the material being wound against the cylindrical wall of the reel or bobbin }
- B21C 47/34 . Feeding or guiding devices not specially adapted to a particular type of apparatus
- B21C 47/3408 . . { for monitoring the lateral position of the material }
- B21C 47/3416 . . . { with lateral edge contact }
- B21C 47/3425 . . . { without lateral edge contact }
- B21C 47/3433 . . { for guiding the leading end of the material, e.g. from or to a coiler }
- B21C 47/3441 . . . { Diverting the leading end, e.g. from main flow to a coiling device }
- B21C 47/345 . . { for monitoring the tension or advance of the material }
- B21C 47/3458 . . . { Endlessly revolving chain systems (metal drawing [B21C 1/30](#)) }

- B21C 47/3466 . . { by using specific means }
- B21C 47/3475 . . . { Fluid pressure or vacuum }
- B21C 47/3483 . . . { Magnetic field }
- B21C 47/3491 . . . { Brushes }

B21C 49/00 **Devices for temporarily accumulating material**

B21C 51/00 **Measuring, gauging, indicating, counting, or marking devices specially adapted for use in the production or manipulation of material in accordance with subclasses [B21B](#) to [B21F](#)**

- B21C 51/005 . { Marking devices }

B21C 99/00 **Subject matter not provided for in other groups of this subclass**