

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 23/218](#) 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**