

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**

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

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 B21F ; 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

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