

**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

<b>B21C 3/00</b>	<b>Profiling tools for metal drawing; Combinations of dies and mandrels</b>
B21C 3/02	. Dies; Selection of material therefor; Cleaning thereof
B21C 3/025	.. {comprising diamond parts}
B21C 3/04	.. with non-adjustable section ( <a href="#">B21C 3/08</a> takes precedence)
B21C 3/06	.. with adjustable section ( <a href="#">B21C 3/08</a> 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 ( <a href="#">separating mandrels from work B21C 45/00</a> ); Mounting or adjusting same
B21C 3/18	. Making tools by operation not covered by a single other subclass; repairing

<b>B21C 5/00</b>	<b>Pointing; Push-pointing</b>
B21C 5/003	. { of hollow material, e.g. tube}
B21C 5/006	. { of solid material, e.g. wire or profiles}

<b>B21C 9/00</b>	<b>Cooling, heating or lubricating drawing material</b> ( <a href="#">B21C 3/14</a> takes precedence)
B21C 9/005	. {Cold application of the lubricant ( <a href="#">when combined with heating steps B21C 9/00</a> )}
B21C 9/02	. Selection of compositions therefor

<b>B21C 19/00</b>	<b>Devices for straightening wire or like work combined with or specially adapted for use in connection with drawing or winding machines or apparatus</b>
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**Guidance heading:** **Metal extruding** ([continuous casting B22D 11/00](#))

<b>B21C 23/00</b>	<b>Extruding metal; Impact extrusion</b>
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 ( <a href="#">B21C 23/008</a> 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 ( <a href="#">B21C 23/22</a> 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**

<b>B21C 27/00</b>	<b>Containers for metal to be extruded</b> ( <a href="#">B21C 29/02</a> takes precedence)
B21C 27/02	. for making coated work
B21C 27/04	. Venting metal-container chamber
<b>B21C 29/00</b>	<b>Cooling or heating work or parts of the extrusion press;</b> { 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
<b>B21C 31/00</b>	<b>Control devices, e.g. for regulating the pressing speed or temperature of metal</b> ( <a href="#">B21C 25/08</a> takes precedence); <b>Measuring devices, e.g. for temperature of metal, combined with or specially adapted for use in connection with extrusion presses</b> (measuring devices of more general interest within subclass <a href="#">B21C</a> , see group <a href="#">B21C 51/00</a> )
<b>B21C 33/00</b>	<b>Feeding extrusion presses with metal to be extruded;</b> { Loading the dummy block }
B21C 33/002	. { Encapsulated billet (manufacturing wires or fine wires <a href="#">B21C 37/045</a> , <a href="#">B21C 37/047</a> ) }
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
<b>B21C 35/00</b>	<b>Removing work or waste from extruding presses; Drawing-off extruded work</b> (in connection with the extruding of bent tubes or rods <a href="#">B21C 23/12</a> ); <b>Cleaning dies, ducts, containers, or mandrels</b>
B21C 35/02	. Removing or drawing-off work {(linear motor pulling devices <a href="#">B21C 1/305</a> )}
B21C 35/023	.. { Work treatment directly following extrusion, e.g. further deformation or surface treatment ( <a href="#">B21C 35/03</a> takes precedence; gas treatment <a href="#">B21C 29/006</a> ) }
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 <a href="#">B21D</a> )
B21C 35/04	. Cutting-off or removing waste
B21C 35/06	. Cleaning dies, ducts, containers or mandrels
<b>B21C 37/00</b>	<b>Manufacture of metal sheets, bars, wire, tubes or like semi-manufactured products, not otherwise provided for</b> (by rolling <a href="#">B21B</a> ; by working or processing semi-finished sheet metal, profiles, tubes, or wire <a href="#">B21D</a> or <a href="#">B21E</a> ; by casting <a href="#">B22</a> ; by material-removing machine tools <a href="#">B23</a> ; by welding, e.g. cladding or plating <a href="#">B23K</a> ; by grinding or polishing <a href="#">B24</a> ; by electroforming <a href="#">C25D 1/00</a> ; by drawing or extruding, see the relevant groups); <b>Manufacture of tubes of special shape</b>
B21C 37/02	. of sheets
B21C 37/04	. of bars or wire {(wire-like electrical connectors in or for semiconductor devices <a href="#">H01L 24/42</a> )}
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 <a href="#">B21D 5/00</a> ; seaming by folding <a href="#">B21D 39/02</a> )
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 <a href="#">B23K</a> ){with helically arranged seams <a href="#">B21C 37/122</a> }
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 <a href="#">B21D</a> )}
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 <a href="#">B21D</a> )}
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 <a href="#">B23K</a> )}
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 ( <a href="#">gripping means B21C 47/32</a> )
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 ( <a href="#">metal drawing B21C 1/30</a> )}
B21C 47/3466	.. { by using specific means}
B21C 47/3475	... { Fluid pressure or vacuum}
B21C 47/3483	... { Magnetic field}
B21C 47/3491	... { Brushes}
<b>B21C 49/00</b>	<b>Devices for temporarily accumulating material</b>
<b>B21C 51/00</b>	<b>Measuring, gauging, indicating, counting, or marking devices specially adapted for use in the production or manipulation of material in accordance with subclasses <a href="#">B21B</a> to <a href="#">B21F</a></b>
B21C 51/005	. {Marking devices}
<b>B21C 99/00</b>	<b>Subject matter not provided for in other groups of this subclass</b>