

**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 ( <a href="#">chemical composition</a> , <a href="#">see appropriate classes</a> )
<b>B21C 25/00</b>		<b>Profiling tools for metal extruding</b>
B21C 25/02	.	Dies
B21C 25/025	. .	{ <a href="#">Selection of materials therefor</a> }
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
<b>B21C 26/00</b>		<b>Rams or plungers; Discs therefor</b>
<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; { <a href="#">Gas treatment of work</a> }</b>
B21C 29/003	.	{ <a href="#">Cooling or heating of work</a> }
B21C 29/006	.	{ <a href="#">Gas treatment of work, e.g. to prevent oxidation or to create surface effects</a> }
B21C 29/02	.	{ <a href="#">Cooling or heating</a> } of containers for metal to be extruded
B21C 29/04	.	{ <a href="#">Cooling or heating</a> } 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> ( <a href="#">measuring devices of more general interest within subclass B21C</a> , <a href="#">see group B21C 51/00</a> )

<b>B21C 33/00</b>	<b>Feeding extrusion presses with metal to be extruded; { Loading the dummy block}</b>
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 (in connection with the extruding of bent tubes or rods <a href="#">B21C 23/12</a>); 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 (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); 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 ( <a href="#">involving only a soldering or welding operation B23K</a> ) <a href="#">{with helically arranged seams B21C 37/122}</a>
B21C 37/0803	...	<a href="#">{the tubes having a special shape, e.g. polygonal tubes}</a>
B21C 37/0807	...	<a href="#">{Tube treating or manipulating combined with, or specially adapted for use in connection with tube making machines, e.g. drawing-off devices, cutting-off}</a>
B21C 37/0811	....	<a href="#">{removing or treating the weld bead}</a>
B21C 37/0815	...	<a href="#">{without continuous longitudinal movement of the sheet during the bending operation (<a href="#">sheet bending in general B21D</a>)}</a>
B21C 37/0818	...	<a href="#">{Manufacture of tubes by drawing of strip material through dies}</a>
B21C 37/0822	...	<a href="#">{Guiding or aligning the edges of the bent sheet}</a>
B21C 37/0826	...	<a href="#">{Preparing the edges of the metal sheet with the aim of having some effect on the weld}</a>
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; <a href="#">{Making multi-wall tubes}</a>
B21C 37/10	..	Making tubes with riveted seams <a href="#">{or with non-welded and non-soldered seams}</a>
B21C 37/101	...	<a href="#">{Making of the seams}</a>
B21C 37/102	...	<a href="#">{of coated strip material (<a href="#">making multi-wall tubes</a>)}</a>
B21C 37/104	...	<a href="#">{the tubes having a special shape, e.g. polygonal tubes}</a>
B21C 37/105	...	<a href="#">{Supply, or operations combined with supply, of strip material}</a>
B21C 37/107	...	<a href="#">{Tube treating or manipulating combined with or specially adapted for use in connection with tube-making machines e.g. drawing-off devices, cutting-off}</a>
B21C 37/108	...	<a href="#">{without continuous longitudinal movement of the sheet during the bending operation (<a href="#">sheet bending in general B21D</a>)}</a>
B21C 37/12	..	Making tubes or metal hoses with helically arranged seams
B21C 37/121	...	<a href="#">{with non-welded and non-soldered seams}</a>
B21C 37/122	...	<a href="#">{with welded or soldered seams (<a href="#">welding and soldering helically arranged seams, per se B23K</a>)}</a>
B21C 37/123	...	<a href="#">{of coated strip material; Making multi-wall tubes}</a>
B21C 37/124	...	<a href="#">{the tubes having a special shape, e.g. with corrugated wall, flexible tubes}</a>
B21C 37/125	....	<a href="#">{curved section, e.g. elbow}</a>
B21C 37/126	...	<a href="#">{Supply, or operations combined with supply, of strip material}</a>
B21C 37/127	...	<a href="#">{Tube treating or manipulating combined with or specially adapted for use in connection with tube making machines, e.g. drawing-off devices, cutting-off}</a>
B21C 37/128	...	<a href="#">{Control or regulating devices}</a>
B21C 37/14	..	Making tubes from double flat material
B21C 37/15	..	Making tubes of special shape; Making tube fittings <a href="#">{<a href="#">B21C 37/0803</a>, <a href="#">B21C 37/104</a>, <a href="#">B21C 37/124</a>, take precedence}</a>
B21C 37/151	...	<a href="#">{Making tubes with multiple passages}</a>
B21C 37/152	...	<a href="#">{Making rifle and gunbarrels}</a>
B21C 37/153	....	<a href="#">{Making tubes with inner- and/or outer guides}</a>
B21C 37/154	...	<a href="#">{Making multi-wall tubes}</a>

B21C 37/155	...	{ Making} tubes with non circular section ( <a href="#">B21C 37/151</a> , <a href="#">B21C 37/154</a> take precedence)
B21C 37/156	...	{ Making tubes with wall irregularities ( <a href="#">B21C 37/20</a> , <a href="#">B21C 37/22</a> 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 ( <a href="#">making heat exchangers B21D 53/02</a> )
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 ( <a href="#">B21C 37/286</a> 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 ( <a href="#">flow drilling B21J 5/066</a> )}
B21C 37/30	..	Finishing tubes, e.g. sizing, burnishing
<b>B21C 43/00</b>		<b>Devices for cleaning metal products combined with or specially adapted for use with machines or apparatus provided for in this subclass</b>
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

<b>B21C 45/00</b>	<b>Separating mandrels from work or vice-versa</b>
<b>B21C 47/00</b>	<b>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 <a href="#">B21F 3/00</a>; hot coilers in connection with heat-treatment apparatus <a href="#">C21D 9/68</a>)</b>
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 ( <a href="#">reels or drums B21C 47/28</a> )
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 ( <a href="#">B21C 47/14 takes precedence</a> )
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**