

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	<ul style="list-style-type: none"> • Dies; Selection of material therefor; Cleaning thereof
B21C 3/025	<ul style="list-style-type: none"> • . {comprising diamond parts}
B21C 3/04	<ul style="list-style-type: none"> • . with non-adjustable section (B21C 3/08 takes precedence)
B21C 3/06	<ul style="list-style-type: none"> • . with adjustable section (B21C 3/08 takes precedence)
B21C 3/08	<ul style="list-style-type: none"> • . with section defined by rollers, balls, or the like
B21C 3/10	<ul style="list-style-type: none"> • . with hydraulic forces acting immediately on work
B21C 3/12	<ul style="list-style-type: none"> • . Die holders; Rotating dies
B21C 3/14	<ul style="list-style-type: none"> • . . Die holders combined with devices for guiding the drawing material or combined with devices for cooling heating, or lubricating
B21C 3/16	<ul style="list-style-type: none"> • Mandrels (separating mandrels from work B21C 45/00); Mounting or adjusting same
B21C 3/18	<ul style="list-style-type: none"> • Making tools by operation not covered by a single other subclass; repairing
B21C 5/00	Pointing; Push-pointing
B21C 5/003	<ul style="list-style-type: none"> • {of hollow material, e.g. tube}
B21C 5/006	<ul style="list-style-type: none"> • {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	<ul style="list-style-type: none"> • {Cold application of the lubricant (when combined with heating steps B21C 9/00)}
B21C 9/02	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • {to improve the material properties, e.g. lateral extrusion}
B21C 23/002	<ul style="list-style-type: none"> • {Extruding materials of special alloys so far as the composition of the alloy requires or permits special extruding methods of sequences}
B21C 23/004	<ul style="list-style-type: none"> • {using vibratory energy}
B21C 23/005	<ul style="list-style-type: none"> • {Continuous extrusion starting from solid state material (B21C 23/008 takes precedence)}
B21C 23/007	<ul style="list-style-type: none"> • {Hydrostatic extrusion}
B21C 23/008	<ul style="list-style-type: none"> • . {Continuous extrusion}
B21C 23/01	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Making uncoated products
B21C 23/03	<ul style="list-style-type: none"> • . 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	<ul style="list-style-type: none"> of sheets
B21C 37/04	<ul style="list-style-type: none"> of bars or wire {(wire-like electrical connectors in or for semiconductor devices H01L 24/42)}
B21C 37/042	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Manufacture of coated wire or bars}
B21C 37/045	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Manufacture of wire or bars with particular section or properties}
B21C 37/047	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {of fine wires}
B21C 37/06	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {starting from a specific blank, e.g. tailored blank}
B21C 37/08	<ul style="list-style-type: none"> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {the tubes having a special shape, e.g. polygonal tubes}
B21C 37/0807	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {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	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {removing or treating the weld bead}
B21C 37/0815	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {without continuous longitudinal movement of the sheet during the bending operation (sheet bending in general B21D)}
B21C 37/0818	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Manufacture of tubes by drawing of strip material through dies}
B21C 37/0822	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Guiding or aligning the edges of the bent sheet}
B21C 37/0826	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Preparing the edges of the metal sheet with the aim of having some effect on the weld}
B21C 37/083	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> Supply, or operations combined with supply, of strip material
B21C 37/087	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> using rods or strips of soldering material
B21C 37/09	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> of coated strip material; {Making multi-wall tubes}
B21C 37/10	<ul style="list-style-type: none"> <ul style="list-style-type: none"> Making tubes with riveted seams {or with non-welded and non-soldered seams}
B21C 37/101	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Making of the seams}
B21C 37/102	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {of coated strip material (making multi-wall tubes)}
B21C 37/104	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {the tubes having a special shape, e.g. polygonal tubes}
B21C 37/105	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Supply, or operations combined with supply, of strip material}
B21C 37/107	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {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	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {without continuous longitudinal movement of the sheet during the bending operation (sheet bending in general B21D)}
B21C 37/12	<ul style="list-style-type: none"> <ul style="list-style-type: none"> 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**