

CPC COOPERATIVE PATENT CLASSIFICATION

B PERFORMING OPERATIONS; TRANSPORTING

(NOTES omitted)

SHAPING

B21 MECHANICAL METAL-WORKING WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING METAL (casting, powder metallurgy [B22](#); shearing [B23D](#); working of metal by the action of a high concentration of electric current [B23H](#); soldering, welding, flame-cutting [B23K](#); other working of metal [B23P](#); punching sheet material in general [B26F](#); processes for changing of physical properties of metals [C21D](#), [C22F](#); electroforming [C25D 1/00](#))

(NOTES omitted)

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

WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

Metal-drawing (continuous casting [B22D 11/00](#); pressure welding by means of a rolling mill [B23K 20/04](#))

- 1/00 Manufacture of metal sheets, metal wire, metal rods, metal tubes by drawing**
- 1/003 . {Drawing materials of special alloys so far as the composition of the alloy requires or permits special drawing methods or sequences}
- 1/006 . {using vibratory energy}
- 1/02 . Drawing metal wire or like flexible metallic material by drawing machines or apparatus in which the drawing action is effected by drums
- 1/04 . . with two or more dies operating in series
- 1/06 . . . in which the material slips on the drums
- 1/08 . . . in which the material does not slip on the drums
- 1/10 with accumulation of material between consecutively-arranged dies
- 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)
- 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
- 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
- 1/18 . . from stock of limited length ([B21C 1/22](#) takes precedence)

- 1/20 . . from stock of essentially unlimited length ([B21C 1/22](#) takes precedence)
- 1/22 . . specially adapted for making tubular articles (bending sheet metal into tubular form by drawing [B21D 5/10](#))
- 1/24 . . . by means of mandrels (mandrels [B21C 3/16](#))
- 1/26 Push-bench drawing
- 1/27 . . Carriages; Drives
- 1/28 . . . Carriages; Connections of grippers thereto; Grippers (for drawing machines of the drum type [B21C 1/14](#))
- 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](#))}
- 1/305 {Linear motor pulling devices}
- 1/32 . . Feeding or discharging the material or mandrels
- 1/34 . . Guiding or supporting the material or mandrels
- 3/00 Profiling tools for metal drawing; Combinations of dies and mandrels**
- 3/02 . Dies; Selection of material therefor; Cleaning thereof
- 3/025 . . {comprising diamond parts}
- 3/04 . . with non-adjustable section ([B21C 3/08](#) takes precedence)
- 3/06 . . with adjustable section ([B21C 3/08](#) takes precedence)
- 3/08 . . with section defined by rollers, balls, or the like
- 3/10 . . with hydraulic forces acting immediately on work
- 3/12 . . Die holders; Rotating dies

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| 3/14 | . . . Die holders combined with devices for guiding the drawing material or combined with devices for cooling heating, or lubricating | 23/211 | . . . {Press driving devices} |
| 3/16 | . Mandrels (separating mandrels from work B21C 45/00); Mounting or adjusting same | 23/212 | . . . {Details (B21C 23/217 , B21C 23/218 take precedence)} |
| 3/18 | . Making tools by operations not covered by a single other subclass; Repairing | 23/214 | . . . {Devices for changing die or container} |
| 5/00 | Pointing; Push-pointing | 23/215 | . . . {Devices for positioning or centering press components, e.g. die or container} |
| 5/003 | . {of hollow material, e.g. tube} | 23/217 | . . . {Tube extrusion presses (B21C 23/218 takes precedence)} |
| 5/006 | . {of solid material, e.g. wire or profiles} | 23/218 | . . . {Indirect extrusion presses} |
| 9/00 | Cooling, heating or lubricating drawing material (B21C 3/14 takes precedence) | 23/22 | . Making metal-coated products; Making products from two or more metals |
| 9/005 | . {Cold application of the lubricant (when combined with heating steps B21C 9/00)} | 23/24 | . . . Covering indefinite lengths of metal or non-metal material with a metal coating |
| 9/02 | . Selection of compositions therefor | 23/26 | Applying metal coats to cables, e.g. to insulated electric cables |
| 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 | 23/28 | on intermittently-operating extrusion presses |
| | | 23/30 | on continuously-operating extrusion presses |
| | | 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) |
| Metal extruding (continuous casting B22D 11/00) | | 25/00 | Profiling tools for metal extruding |
| 23/00 | Extruding metal; Impact extrusion | 25/02 | . Dies |
| 23/001 | . {to improve the material properties, e.g. lateral extrusion} | 25/025 | . . . {Selection of materials therefor} |
| 23/002 | . {Extruding materials of special alloys so far as the composition of the alloy requires or permits special extruding methods of sequences} | 25/04 | . Mandrels |
| 23/004 | . {using vibratory energy} | 25/06 | . Press heads, dies, or mandrels for coating work |
| 23/005 | . {Continuous extrusion starting from solid state material (B21C 23/008 takes precedence)} | 25/08 | . Dies or mandrels with section variable during extruding, e.g. for making tapered work; Controlling variation |
| 23/007 | . {Hydrostatic extrusion} | 25/10 | . Making tools by operations not covered by a single other subclass |
| 23/008 | . . . {Continuous extrusion} | 26/00 | Rams or plungers; Discs therefor |
| 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) | 27/00 | Containers for metal to be extruded (B21C 29/02 takes precedence) |
| 23/02 | . Making uncoated products | 27/02 | . for making coated work |
| 23/03 | . . . by both direct and backward extrusion | 27/04 | . Venting metal-container chamber |
| 23/035 | {Making products of generally elongated shape} | 29/00 | Cooling or heating work or parts of the extrusion press; {Gas treatment of work} |
| 23/04 | . . . by direct extrusion | 29/003 | . {Cooling or heating of work} |
| 23/06 | Making sheets | 29/006 | . {Gas treatment of work, e.g. to prevent oxidation or to create surface effects} |
| 23/08 | Making wire, bars, tubes | 29/02 | . {Cooling or heating} of containers for metal to be extruded |
| 23/085 | {Making tubes (B21C 23/10 take precedence)} | 29/04 | . {Cooling or heating} of press heads, dies or mandrels |
| 23/10 | Making finned tubes | 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) |
| 23/12 | Extruding bent tubes or rods | 33/00 | Feeding extrusion presses with metal to be extruded {; Loading the dummy block} |
| 23/14 | Making other products | 33/002 | . {Encapsulated billet (manufacturing wires or fine wires B21C 37/045 , B21C 37/047)} |
| 23/142 | {Making profiles} | 33/004 | . {Composite billet} |
| 23/145 | {Interlocking profiles} | 33/006 | . {Consecutive billets, e.g. billet profiles allowing air expulsion or bonding of billets} |
| 23/147 | {Making drill blanks (making twist-drills B23P 15/32)} | | |
| 23/16 | Making turbo blades or propellers | | |
| 23/18 | . . . by impact extrusion | | |
| 23/183 | {by forward extrusion} | | |
| 23/186 | {by backward extrusion} | | |
| 23/20 | . . . by backward extrusion | | |
| 23/205 | {Making products of generally elongated shape} | | |
| 23/21 | . Presses specially adapted for extruding metal (extrusion presses in general B30B 11/22) | | |

- 33/008 . {Scalping billets, e.g. for removing oxide layers prior or during extrusion}
- 33/02 . the metal being in liquid form
- 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**
- 35/02 . Removing or drawing-off work {(linear motor pulling devices [B21C 1/305](#))}
- 35/023 . . {Work treatment directly following extrusion, e.g. further deformation or surface treatment ([B21C 35/03](#) takes precedence; gas treatment [B21C 29/006](#))}
- 35/026 . . . {Removing sections from the extruded work, e.g. removing a strip to create an open profile}
- 35/03 . . Straightening the work (metal straightening in general [B21D](#))
- 35/04 . Cutting-off or removing waste
- 35/06 . Cleaning dies, ducts, containers or mandrels
- 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**
- 37/02 . of sheets
- 37/04 . of bars or wire {(wire-like electrical connectors in or for semiconductor devices [H01L 24/42](#))}
- 37/042 . . {Manufacture of coated wire or bars}
- 37/045 . . {Manufacture of wire or bars with particular section or properties}
- 37/047 . . {of fine wires}
- 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](#))
- 37/065 . . {starting from a specific blank, e.g. tailored blank}
- 37/08 . . Making tubes with welded or soldered seams (involving only a soldering or welding operation [B23K](#) {; with helically arranged seams [B21C 37/122](#))}
- 37/0803 . . . {the tubes having a special shape, e.g. polygonal tubes}
- 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}
- 37/0811 {removing or treating the weld bead}
- 37/0815 . . . {without continuous longitudinal movement of the sheet during the bending operation (sheet bending in general [B21D](#))}
- 37/0818 . . . {Manufacture of tubes by drawing of strip material through dies}
- 37/0822 . . . {Guiding or aligning the edges of the bent sheet}
- 37/0826 . . . {Preparing the edges of the metal sheet with the aim of having some effect on the weld}
- 37/083 . . . Supply, or operations combined with supply, of strip material
- 37/087 . . . using rods or strips of soldering material
- 37/09 . . . of coated strip material {; Making multi-wall tubes}
- 37/10 . . Making tubes with riveted seams {or with non-welded and non-soldered seams}
- 37/101 . . . {Making of the seams}
- 37/102 . . . {of coated strip material (making multi-wall tubes)}
- 37/104 . . . {the tubes having a special shape, e.g. polygonal tubes}
- 37/105 . . . {Supply, or operations combined with supply, of strip material}
- 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}
- 37/108 . . . {without continuous longitudinal movement of the sheet during the bending operation (sheet bending in general [B21D](#))}
- 37/12 . . Making tubes or metal hoses with helically arranged seams
- 37/121 . . . {with non-welded and non-soldered seams}
- 37/122 . . . {with welded or soldered seams (welding and soldering helically arranged seams, *per se* [B23K](#))}
- 37/123 . . . {of coated strip material; Making multi-wall tubes}
- 37/124 . . . {the tubes having a special shape, e.g. with corrugated wall, flexible tubes}
- 37/125 {curved section, e.g. elbow}
- 37/126 . . . {Supply, or operations combined with supply, of strip material}
- 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}
- 37/128 . . . {Control or regulating devices}
- 37/14 . . Making tubes from double flat material
- 37/15 . . Making tubes of special shape; Making tube fittings {([B21C 37/0803](#), [B21C 37/104](#), [B21C 37/124](#), take precedence)}
- 37/151 {Making tubes with multiple passages}
- 37/152 {Making rifle and gunbarrels}
- 37/153 {Making tubes with inner- and/or outer guides}
- 37/154 {Making multi-wall tubes}
- 37/155 {Making tubes with non circular section ([B21C 37/151](#), [B21C 37/154](#) take precedence)}
- 37/156 {Making tubes with wall irregularities ([B21C 37/20](#), [B21C 37/22](#) take precedence)}
- 37/157 {Perforations}
- 37/158 {Protrusions, e.g. dimples}
- 37/16 . . . Making tubes with varying diameter in longitudinal direction
- 37/18 conical tubes
- 37/185 {starting from sheet material}
- 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}
- 37/202 {with guides parallel to the tube axis}

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| 37/205 | {with annular guides} | 47/146 | {Controlling or influencing the laying pattern of the coils} |
| 37/207 | {with helical guides} | 47/16 | . Unwinding or uncoiling |
| 37/22 | . . . Making finned or ribbed tubes by fixing strip or like material to tubes (making heat exchangers B21D 53/02) | 47/18 | . . from reels or drums |
| 37/225 | {longitudinally-ribbed tubes} | 47/20 | . . . the unreeling material moving transversely to the tangent line of the drum, e.g. axially, radially |
| 37/24 | annularly-ribbed tubes | 47/22 | . . Unwinding coils without reels or drums |
| 37/26 | helically-ribbed tubes | 47/24 | . Transferring coils to or from winding apparatus or to or from operative position therein; Preventing uncoiling during transfer |
| 37/28 | . . . Making tube fittings for connecting pipes, e.g. U-pieces | 47/242 | . . {Devices for swinging the coil from horizontal to vertical, or <i>vice versa</i> } |
| 37/283 | {Making U-pieces (B21C 37/286 takes precedence)} | 47/245 | . . {Devices for the replacement of full reels by empty reels or <i>vice versa</i> , without considerable loss of time} |
| 37/286 | {starting from sheet material} | 47/247 | . . {Joining wire or band ends} |
| 37/29 | Making branched pieces, e.g. T-pieces | 47/26 | . Special arrangements with regard to simultaneous or subsequent treatment of the material |
| 37/292 | {Forming collars by drawing or pushing a rigid forming tool through an opening in the tube wall} | 47/262 | . . {Treatment of a wire, while in the form of overlapping non-concentric rings} |
| 37/294 | {Forming collars by compressing a fluid or a yieldable or resilient mass in the tube} | 47/265 | . . {"helicofil" systems} |
| 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} | 47/267 | . . {Scrap treatment} |
| 37/298 | {Forming collars by flow-drilling (flow drilling B21J 5/066)} | 47/28 | . Drums or other coil-holders (gripping means B21C 47/32) |
| 37/30 | . . Finishing tubes, e.g. sizing, burnishing | 47/30 | . . expansible or contractible |
| 43/00 | Devices for cleaning metal products combined with or specially adapted for use with machines or apparatus provided for in this subclass | 47/32 | . Tongs or gripping means specially adapted for reeling operations |
| 43/02 | . combined with or specially adapted for use in connection with drawing or winding machines or apparatus | 47/323 | . . {Slits or pincers on the cylindrical wall of a reel or bobbin, adapted to grip the end of the material being wound} |
| 43/04 | . . Devices for de-scaling wire or like flexible work | 47/326 | . . {Devices for pressing the end of the material being wound against the cylindrical wall of the reel or bobbin} |
| <u>Auxiliary operation used in connection with metal working without essentially removing material</u> | | 47/34 | . Feeding or guiding devices not specially adapted to a particular type of apparatus |
| 45/00 | Separating mandrels from work or <i>vice versa</i> | 47/3408 | . . {for monitoring the lateral position of the material} |
| 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 forms B21F 3/00; hot coilers in connection with heat-treatment apparatus C21D 9/68) | 47/3416 | . . . {with lateral edge contact} |
| 47/003 | . {Regulation of tension or speed; Braking} | 47/3425 | . . . {without lateral edge contact} |
| 47/006 | . {winding-up or winding-off several parallel metal bands} | 47/3433 | . . {for guiding the leading end of the material, e.g. from or to a coiler} |
| 47/02 | . Winding-up or coiling | 47/3441 | . . . {Diverting the leading end, e.g. from main flow to a coiling device} |
| 47/04 | . . on or in reels or drums, without using a moving guide (reels or drums B21C 47/28) | 47/345 | . . {for monitoring the tension or advance of the material} |
| 47/045 | . . . {in rotating drums} | 47/3458 | . . . {Endlessly revolving chain systems (metal drawing B21C 1/30)} |
| 47/06 | . . . with loaded rollers, bolts, or equivalent means holding the material on the reel or drum | 47/3466 | . . {by using specific means} |
| 47/063 | {with pressure rollers only} | 47/3475 | . . . {Fluid pressure or vacuum} |
| 47/066 | {with belt wrappers only} | 47/3483 | . . . {Magnetic field} |
| 47/08 | . . without making use of a reel or drum, the first turn being formed by a stationary guide | 47/3491 | . . . {Brushes} |
| 47/10 | . . by means of a moving guide | 49/00 | Devices for temporarily accumulating material |
| 47/12 | . . . the guide moving parallel to the axis of the coil (B21C 47/14 takes precedence) | 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 - B21F |
| 47/14 | . . . by means of a rotating guide, e.g. laying the material around a stationary reel or drum | 51/005 | . {Marking devices} |
| 47/143 | {the guide being a tube} | 99/00 | Subject matter not provided for in other groups of this subclass |