

CPC COOPERATIVE PATENT CLASSIFICATION

B PERFORMING OPERATIONS; TRANSPORTING

(NOTES omitted)

SHAPING

B21 MECHANICAL METAL-WORKING WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING METAL

(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

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| | | 1/28 | . . . Carriages; Connections of grippers thereto; Grippers |
| 1/00 | Manufacture of metal sheets, metal wire, metal rods, metal tubes by drawing | 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)} |
| 1/003 | . {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} | 1/305 | {Linear motor pulling devices} |
| 1/02 | . Drawing metal wire or like flexible metallic material by drawing machines or apparatus in which the drawing action is effected by drums | 1/32 | . . Feeding or discharging the material or mandrels |
| 1/04 | . . with two or more dies operating in series | 1/34 | . . Guiding or supporting the material or mandrels |
| 1/06 | . . . in which the material slips on the drums | 3/00 | Profiling tools for metal drawing; Combinations of dies and mandrels |
| 1/08 | . . . in which the material does not slip on the drums | 3/02 | . Dies; Selection of material therefor; Cleaning thereof |
| 1/10 | with accumulation of material between consecutively-arranged dies | 3/025 | . . {comprising diamond parts} |
| 1/12 | . . Regulating or controlling speed of drawing drums, e.g. to influence tension; Drives; Stop or relief mechanisms | 3/04 | . . with non-adjustable section (B21C 3/08 takes precedence) |
| 1/14 | . . Drums, e.g. capstans; Connection of grippers thereto; Grippers specially adapted for drawing machines or apparatus of the drum type; Couplings specially adapted for these drums | 3/06 | . . with adjustable section (B21C 3/08 takes precedence) |
| 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 | 3/08 | . . with section defined by rollers, balls, or the like |
| 1/18 | . . from stock of limited length (B21C 1/22 takes precedence) | 3/10 | . . with hydraulic forces acting immediately on work |
| 1/20 | . . from stock of essentially unlimited length (B21C 1/22 takes precedence) | 3/12 | . . Die holders; Rotating dies |
| 1/22 | . . specially adapted for making tubular articles (bending sheet metal into tubular form by drawing B21D 5/10) | 3/14 | . . . Die holders combined with devices for guiding the drawing material or combined with devices for cooling heating, or lubricating |
| 1/24 | . . . by means of mandrels | 3/16 | . Mandrels; Mounting or adjusting same |
| 1/26 | Push-bench drawing | 3/18 | . Making tools by operations not covered by a single other subclass; Repairing |
| 1/27 | . . Carriages; Drives | 5/00 | Pointing; Push-pointing |
| | | 5/003 | . {of hollow material, e.g. tube} |
| | | 5/006 | . {of solid material, e.g. wire or profiles} |
| | | 9/00 | Cooling, heating or lubricating drawing material (B21C 3/14 takes precedence) |
| | | 9/005 | . {Cold application of the lubricant (when combined with heating steps B21C 9/00)} |
| | | 9/02 | . Selection of compositions therefor |

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| 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 | 23/32 | <ul style="list-style-type: none"> • Lubrication of metal being extruded or of dies, or the like, e.g. physical state of lubricant, location where lubricant is applied |
| <u>Metal extruding</u> | | | |
| 23/00 | Extruding metal; Impact extrusion | 25/00 | Profiling tools for metal extruding |
| 23/001 | <ul style="list-style-type: none"> • {to improve the material properties, e.g. lateral extrusion} | 25/02 | <ul style="list-style-type: none"> • Dies |
| 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} | 25/025 | <ul style="list-style-type: none"> • . {Selection of materials therefor} |
| 23/004 | <ul style="list-style-type: none"> • {using vibratory energy} | 25/04 | <ul style="list-style-type: none"> • Mandrels |
| 23/005 | <ul style="list-style-type: none"> • {Continuous extrusion starting from solid state material (B21C 23/008 takes precedence)} | 25/06 | <ul style="list-style-type: none"> • Press heads, dies, or mandrels for coating work |
| 23/007 | <ul style="list-style-type: none"> • {Hydrostatic extrusion} | 25/08 | <ul style="list-style-type: none"> • Dies or mandrels with section variable during extruding, e.g. for making tapered work; Controlling variation |
| 23/008 | <ul style="list-style-type: none"> • . {Continuous extrusion} | 25/10 | <ul style="list-style-type: none"> • Making tools by operations not covered by a single other subclass |
| 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) | 26/00 | Rams or plungers; Discs therefor |
| 23/02 | <ul style="list-style-type: none"> • Making uncoated products | 27/00 | Containers for metal to be extruded (B21C 29/02 takes precedence) |
| 23/03 | <ul style="list-style-type: none"> • . by both direct and backward extrusion | 27/02 | <ul style="list-style-type: none"> • for making coated work |
| 23/035 | <ul style="list-style-type: none"> • . . {Making products of generally elongated shape} | 27/04 | <ul style="list-style-type: none"> • Venting metal-container chamber |
| 23/04 | <ul style="list-style-type: none"> • . by direct extrusion | 29/00 | Cooling or heating work or parts of the extrusion press; {Gas treatment of work} |
| 23/06 | <ul style="list-style-type: none"> • . . Making sheets | 29/003 | <ul style="list-style-type: none"> • {Cooling or heating of work} |
| 23/08 | <ul style="list-style-type: none"> • . . Making wire, bars, tubes | 29/006 | <ul style="list-style-type: none"> • {Gas treatment of work, e.g. to prevent oxidation or to create surface effects} |
| 23/085 | <ul style="list-style-type: none"> • . . . {Making tubes (B21C 23/10 take precedence)} | 29/02 | <ul style="list-style-type: none"> • {Cooling or heating} of containers for metal to be extruded |
| 23/10 | <ul style="list-style-type: none"> • . . . Making finned tubes | 29/04 | <ul style="list-style-type: none"> • {Cooling or heating} of press heads, dies or mandrels |
| 23/12 | <ul style="list-style-type: none"> • . . . Extruding bent tubes or rods | 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 |
| 23/14 | <ul style="list-style-type: none"> • . . Making other products | 33/00 | Feeding extrusion presses with metal to be extruded {; Loading the dummy block} |
| 23/142 | <ul style="list-style-type: none"> • . . . {Making profiles} | 33/002 | <ul style="list-style-type: none"> • {Encapsulated billet (manufacturing wires or fine wires B21C 37/045, B21C 37/047)} |
| 23/145 | <ul style="list-style-type: none"> • {Interlocking profiles} | 33/004 | <ul style="list-style-type: none"> • {Composite billet} |
| 23/147 | <ul style="list-style-type: none"> • {Making drill blanks (making twist-drills B23P 15/32)} | 33/006 | <ul style="list-style-type: none"> • {Consecutive billets, e.g. billet profiles allowing air expulsion or bonding of billets} |
| 23/16 | <ul style="list-style-type: none"> • . . . Making turbo blades or propellers | 33/008 | <ul style="list-style-type: none"> • {Scalping billets, e.g. for removing oxide layers prior or during extrusion} |
| 23/18 | <ul style="list-style-type: none"> • . by impact extrusion | 33/02 | <ul style="list-style-type: none"> • the metal being in liquid form |
| 23/183 | <ul style="list-style-type: none"> • . . {by forward extrusion} | 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 |
| 23/186 | <ul style="list-style-type: none"> • . . {by backward extrusion} | 35/02 | <ul style="list-style-type: none"> • Removing or drawing-off work {(linear motor pulling devices B21C 1/305)} |
| 23/20 | <ul style="list-style-type: none"> • . by backward extrusion | 35/023 | <ul style="list-style-type: none"> • . {Work treatment directly following extrusion, e.g. further deformation or surface treatment (B21C 35/03 takes precedence; gas treatment B21C 29/006)} |
| 23/205 | <ul style="list-style-type: none"> • . . {Making products of generally elongated shape} | 35/026 | <ul style="list-style-type: none"> • . . . {Removing sections from the extruded work, e.g. removing a strip to create an open profile} |
| 23/21 | <ul style="list-style-type: none"> • Presses specially adapted for extruding metal | 35/03 | <ul style="list-style-type: none"> • . Straightening the work |
| 23/211 | <ul style="list-style-type: none"> • . {Press driving devices} | 35/04 | <ul style="list-style-type: none"> • Cutting-off or removing waste |
| 23/212 | <ul style="list-style-type: none"> • . {Details (B21C 23/217, B21C 23/218 take precedence)} | 35/06 | <ul style="list-style-type: none"> • Cleaning dies, ducts, containers or mandrels |
| 23/214 | <ul style="list-style-type: none"> • . . {Devices for changing die or container} | | |
| 23/215 | <ul style="list-style-type: none"> • . . {Devices for positioning or centering press components, e.g. die or container} | | |
| 23/217 | <ul style="list-style-type: none"> • . {Tube extrusion presses (B21C 23/218 takes precedence)} | | |
| 23/218 | <ul style="list-style-type: none"> • . {Indirect extrusion presses} | | |
| 23/22 | <ul style="list-style-type: none"> • Making metal-coated products; Making products from two or more metals | | |
| 23/24 | <ul style="list-style-type: none"> • . Covering indefinite lengths of metal or non-metal material with a metal coating | | |
| 23/26 | <ul style="list-style-type: none"> • . . Applying metal coats to cables, e.g. to insulated electric cables | | |
| 23/28 | <ul style="list-style-type: none"> • . . . on intermittently-operating extrusion presses | | |
| 23/30 | <ul style="list-style-type: none"> • . . . on continuously-operating extrusion presses | | |

37/00 Manufacture of metal sheets, bars, wire, tubes or like semi-manufactured products, not otherwise provided for; 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
- 37/065 . . {starting from a specific blank, e.g. tailored blank}
- 37/08 . . Making tubes with welded or soldered seams {(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}
- 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}
- 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}
- 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}
- 37/205 {with annular guides}
- 37/207 {with helical guides}
- 37/22 . . . Making finned or ribbed tubes by fixing strip or like material to tubes
- 37/225 {longitudinally-ribbed tubes}
- 37/24 annularly-ribbed tubes
- 37/26 helically-ribbed tubes
- 37/28 . . . Making tube fittings for connecting pipes, e.g. U-pieces
- 37/283 {Making U-pieces (B21C 37/286 takes precedence)}
- 37/286 {starting from sheet material}
- 37/29 Making branched pieces, e.g. T-pieces
- 37/292 {Forming collars by drawing or pushing a rigid forming tool through an opening in the tube wall}
- 37/294 {Forming collars by compressing a fluid or a yieldable or resilient mass in the tube}
- 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}
- 37/298 {Forming collars by flow-drilling (flow drilling B21J 5/066)}
- 37/30 . . Finishing tubes, e.g. sizing, burnishing

43/00 Devices for cleaning metal products combined with or specially adapted for use with machines or apparatus provided for in this subclass

- 43/02 . combined with or specially adapted for use in connection with drawing or winding machines or apparatus
- 43/04 . . Devices for de-scaling wire or like flexible work

Auxiliary operation used in connection with metal working without essentially removing material**45/00 Separating mandrels from work or vice versa****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](#))**

- 47/003 . {Regulation of tension or speed; Braking}
- 47/006 . {winding-up or winding-off several parallel metal bands}
- 47/02 . Winding-up or coiling
- 47/04 . . on or in reels or drums, without using a moving guide
- 47/045 . . . {in rotating drums}
- 47/06 . . . with loaded rollers, bolts, or equivalent means holding the material on the reel or drum
- 47/063 {with pressure rollers only}
- 47/066 {with belt wrappers only}
- 47/08 . . without making use of a reel or drum, the first turn being formed by a stationary guide
- 47/10 . . by means of a moving guide
- 47/12 . . . the guide moving parallel to the axis of the coil ([B21C 47/14](#) takes precedence)
- 47/14 . . . by means of a rotating guide, e.g. laying the material around a stationary reel or drum
- 47/143 {the guide being a tube}
- 47/146 {Controlling or influencing the laying pattern of the coils}
- 47/16 . Unwinding or uncoiling
- 47/18 . . from reels or drums
- 47/20 . . . the unreeled material moving transversely to the tangent line of the drum, e.g. axially, radially
- 47/22 . . Unwinding coils without reels or drums
- 47/24 . Transferring coils to or from winding apparatus or to or from operative position therein; Preventing uncoiling during transfer
- 47/242 . . {Devices for swinging the coil from horizontal to vertical, or vice versa}
- 47/245 . . {Devices for the replacement of full reels by empty reels or vice versa, without considerable loss of time}
- 47/247 . . {Joining wire or band ends}
- 47/26 . Special arrangements with regard to simultaneous or subsequent treatment of the material
- 47/262 . . {Treatment of a wire, while in the form of overlapping non-concentric rings}
- 47/265 . . {"helicofil" systems}
- 47/267 . . {Scrap treatment}
- 47/28 . Drums or other coil-holders
- 47/30 . . expandable or contractible
- 47/32 . Tongs or gripping means specially adapted for reeling operations
- 47/323 . . {Slits or pincers on the cylindrical wall of a reel or bobbin, adapted to grip the end of the material being wound}
- 47/326 . . {Devices for pressing the end of the material being wound against the cylindrical wall of the reel or bobbin}
- 47/34 . Feeding or guiding devices not specially adapted to a particular type of apparatus

- 47/3408 . . {for monitoring the lateral position of the material}
- 47/3416 . . . {with lateral edge contact}
- 47/3425 . . . {without lateral edge contact}
- 47/3433 . . {for guiding the leading end of the material, e.g. from or to a coiler}
- 47/3441 . . . {Diverting the leading end, e.g. from main flow to a coiling device}
- 47/345 . . {for monitoring the tension or advance of the material}
- 47/3458 . . . {Endlessly revolving chain systems ([metal drawing B21C 1/30](#))}
- 47/3466 . . {by using specific means}
- 47/3475 . . . {Fluid pressure or vacuum}
- 47/3483 . . . {Magnetic field}
- 47/3491 . . . {Brushes}

49/00 Devices for temporarily accumulating material**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](#)**

- 51/005 . {Marking devices}

99/00 Subject matter not provided for in other groups of this subclass