

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)

B21D WORKING OR PROCESSING OF SHEET METAL OR METAL TUBES, RODS OR PROFILES WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING METAL (working or processing of wire [B21F](#))

NOTES

1. This subclass covers cutting or perforating of sheet metal or other stock material
2. This subclass does not cover the working of metal foils in a manner analogous to the working of paper, which is covered by classes [B26](#), [B31](#)

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.

Straightening; Restoring form; Bending; Corrugating; Flanging

1/00 Straightening, restoring form or removing local distortions of sheet metal or specific articles made therefrom ([B21D 3/00](#) takes precedence); **Stretching sheet metal combined with rolling** (working sheet metal of limited length by stretching [B21D 25/00](#); by localised hammering [B21D 31/06](#))

1/02 . by rollers ([B21D 1/06](#) takes precedence)

1/05 . Stretching combined with rolling

1/06 . Removing local distortions

1/065 . . {by hammering}

1/08 . . of hollow bodies made from sheet metal (of substantially open bodies [B21D 1/10](#) ; flattening hollow objects for transport and reforming [B21D 51/14](#))

1/10 . . of specific articles made from sheet metal, e.g. mudguards

1/12 . Straightening vehicle body parts or bodies ([B21D 1/14](#) takes precedence)

1/14 . Straightening frame structures

1/145 . . {Clamps therefor}

3/00 Straightening or restoring form of metal rods, metal tubes, metal profiles, or specific articles made therefrom, whether or not in combination with sheet metal parts (straightening of well casings [in situ](#) [E21B](#); {straightening rails or rail joints [E01B 31/08](#)})

3/005 . {by eccentric turning members}

3/02 . by rollers

- 3/04 . . arranged on axes skew to the path of the work
- 3/045 . . . {Workpiece feed channels therefor}
- 3/05 . . arranged on axes rectangular to the path of the work
- 3/06 . . arranged inclined to a revolving flier rolling frame
- 3/08 . . which move in an orbit without rotating round the work
- 3/10 . between rams and anvils or abutments
- 3/12 . by stretching with or without twisting (by twisting only [B21D 11/14](#))
- 3/14 . Recontouring
- 3/16 . of specific articles made from metal rods, tubes, or profiles, e.g. crankshafts, by specially adapted methods or means

5/00 Bending sheet metal along straight lines, e.g. to form simple curves ([B21D 11/06](#) - [B21D 11/18](#) take precedence; corrugating sheet metal [B21D 13/00](#); as edge treatment [B21D 19/00](#))

- 5/002 . {Positioning devices}
- 5/004 . {with program control}
- 5/006 . {combined with measuring of bends}
- 5/008 . {combined with heating or cooling of the bends}
- 5/01 . between rams and anvils or abutments
- 5/015 . . {for making tubes}
- 5/02 . on press brakes without making use of clamping means
- 5/0209 . . {Tools therefor}
- 5/0218 . . . {Length adjustment of the punch}

- 5/0227 . . . {Length adjustment of the die}
- 5/0236 . . . {Tool clamping}
- 5/0245 {Fluid operated}
- 5/0254 . . . {Tool exchanging}
- 5/0263 . . . {Die with two oscillating halves}
- 5/0272 . . {Deflection compensating means}
- 5/0281 . . {Workpiece supporting devices}
- 5/029 . . {with shearing devices}
- 5/04 . on brakes making use of clamping means on one side of the work
- 5/042 . . {With a rotational movement of the bending blade}
- 5/045 . . {With a wiping movement of the bending blade}
- 5/047 . . {Length adjustment of the clamping means}
- 5/06 . by drawing procedure making use of dies or forming-rollers, e.g. making profiles
- 5/08 . . making use of forming-rollers ([B21D 5/12 takes precedence](#))
- 5/083 . . . {for obtaining profiles with changing cross-sectional configuration}
- 5/086 . . . {for obtaining closed hollow profiles}
- 5/10 . . for making tubes
- 5/12 . . . making use of forming-rollers
- 5/14 . by passing between rollers ([B21D 5/06 takes precedence](#))
- 5/143 . . {making use of a mandrel}
- 5/146 . . {one roll being covered with deformable material}
- 5/16 . Folding; Pleating
- 7/00 Bending rods, profiles, or tubes**
([B21D 11/02 - B21D 11/18 take precedence](#); using mandrels or the like [B21D 9/00](#))
- 7/02 . over a stationary forming member; by use of a swinging forming member or abutment
- 7/021 . . {Construction of forming members having more than one groove}
- 7/022 . . over a stationary forming member only
- 7/0225 . . . {using pulling members}
- 7/024 . . by a swinging forming member
- 7/025 . . . and pulling or pushing the ends of the work
- 7/028 . . . and altering the profile at the same time, e.g. forming bumpers
- 7/03 . . Apparatus with means to keep the profile in shape
- 7/04 . over a movably-arranged forming member
([B21D 7/02 takes precedence](#))
- 7/06 . in press brakes or between rams and anvils or abutments; Pliers with forming dies
- 7/063 . . {Pliers with forming dies}
- 7/066 . . {combined with oscillating members}
- 7/08 . by passing between rollers or through a curved die
- 7/085 . . {by passing through a curved die}
- 7/10 . by abutting members and flexible bending means, e.g. with chains, ropes
- 7/12 . with programme control
- 7/14 . combined with measuring of bends or lengths
- 7/16 . Auxiliary equipment, e.g. for heating or cooling of bends
- 7/162 . . {Heating equipment}
- 7/165 . . {Cooling equipment}
- 7/167 . . {Greasing}
- 9/00 Bending tubes using mandrels or the like**
([B21D 11/02 - B21D 11/18 take precedence](#))
- 9/01 . the mandrel being flexible and engaging the entire tube length
- 9/03 . . and built-up from loose elements, e.g. series of balls
- 9/04 . the mandrel being rigid
- 9/05 . co-operating with forming members
- 9/055 . . {Construction of forming members having more than one groove}
- 9/07 . . with one or more swinging forming members engaging tube ends only
- 9/073 . . . {with one swinging forming member}
- 9/076 . . . {with more swinging forming members}
- 9/08 . in press brakes or between rams and anvils or abutments; Pliers with forming dies
- 9/085 . . {Pliers with forming dies}
- 9/10 . by passing between rollers
- 9/12 . by pushing over a curved mandrel; by pushing through a curved die
- 9/125 . . {by pushing through a curved die}
- 9/14 . Wrinkle-bending, i.e. bending by corrugating
- 9/15 . using filling material of indefinite shape, e.g. sand, plastic material ([filling of tubes with such material B21D 9/16](#))
- 9/16 . Auxiliary equipment, e.g. machines for filling tubes with sand
- 9/165 . . {Machines for filling tubes with sand}
- 9/18 . . for heating or cooling of bends
- 11/00 Bending not restricted to forms of material mentioned in only one of groups [B21D 5/00](#), [B21D 7/00](#), [B21D 9/00](#); Bending not provided for in groups [B21D 5/00 - B21D 9/00](#) (corrugating or bending into wave form [B21D 13/00](#), [B21D 15/00](#); flanging [B21D 19/00](#)); Twisting**
- 11/02 . Bending by stretching or pulling over a die
([working sheet metal of limited length by stretching B21D 25/00](#))
- 11/06 . Bending into helical or spiral form; Forming a succession of return bends, e.g. serpentine form
([making helically seamed tubing B21C 37/12](#))
- 11/07 . . Making serpentine-shaped articles by bending essentially in one plane
- 11/08 . Bending by altering the thickness of part of the cross-section of the work ([B21D 11/06 takes precedence](#))
- 11/085 . . {by locally stretching or upsetting}
- 11/10 . Bending specially adapted to produce specific articles, e.g. leaf springs {([making or bending leaf springs B21D 53/886](#))}
- 11/12 . . the articles being reinforcements for concrete
- 11/125 . . . {Bending wire nets}
- 11/14 . Twisting
- 11/15 . . Reinforcing rods for concrete
- 11/16 . . Crankshafts
- 11/18 . Jogging
- 11/20 . Bending sheet metal, not otherwise provided for
- 11/203 . . {Round bending}
- 11/206 . . {Curving corrugated sheets}
- 11/22 . Auxiliary equipment, e.g. positioning devices
- 13/00 Corrugating sheet metal, rods or profiles; Bending sheet metal, rods or profiles into wave form ([tubes B21D 15/00](#))**
- 13/02 . by pressing

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| 13/04 | . by rolling | 22/12 | . . using enclosed flexible chambers |
| 13/045 | . . {the corrugations being parallel to the feeding movement} | 22/125 | . . . {of tubular products} |
| 13/06 | . by drawing | 22/14 | . Spinning |
| 13/08 | . by combined methods | 22/16 | . . over shaping mandrels or formers |
| 13/10 | . into a peculiar profiling shape | 22/18 | . . using tools guided to produce the required profile |
| 15/00 | Corrugating tubes (wrinkle-bending using mandrels or the like B21D 9/14) | 22/185 | . . . {making bombed objects} |
| 15/02 | . longitudinally | 22/20 | . Deep-drawing (special deep-drawing arrangements in, or in connection with, presses B21D 24/00) |
| 15/03 | . . by applying fluid pressure | 22/201 | . . {Work-pieces; preparation of the work-pieces, e.g. lubricating, coating} |
| 15/04 | . transversely, e.g. helically | 22/203 | . . {of compound articles} |
| 15/06 | . . annularly {(with thinning B21C 37/205)} | 22/205 | . . {Hydro-mechanical deep-drawing} |
| 15/10 | . . by applying fluid pressure | 22/206 | . . {articles from a strip in several steps, the articles being coherent with the strip during the operation} |
| 15/105 | . . . {by applying elastic material} | 22/208 | . . {by heating the blank or deep-drawing associated with heat treatment (C21D takes precedence)} |
| 15/12 | . Bending tubes into wave form | 22/21 | . . without fixing the border of the blank |
| 17/00 | Forming single grooves in sheet metal or tubular or hollow articles | 22/22 | . . with devices for holding the edge of the blanks (B21D 22/24 - B21D 22/30 take precedence; shaping over a die without external former B21D 11/02) |
| 17/02 | . by pressing (grooving or notching of bolts, studs, or the like B21K 1/54) | 22/225 | . . . {with members for radially pushing the blanks} |
| 17/025 | . . {by pressing tubes axially} | 22/24 | . . involving two drawing operations having effects in opposite directions with respect to the blank |
| 17/04 | . by rolling | 22/26 | . . for making peculiarly, e.g. irregularly, shaped articles |
| 19/00 | Flanging or other edge treatment, e.g. of tubes (connecting by making use of folds B21D 39/00; flaring-out tube ends B21D 41/02) | 22/28 | . . of cylindrical articles using consecutive dies |
| 19/005 | . {Edge deburring or smoothing} | 22/283 | . . . {with ram and dies aligning means} |
| 19/02 | . by continuously-acting tools moving along the edge (edge-curling B21D 19/12) | 22/286 | . . . {with lubricating or cooling means} |
| 19/04 | . . shaped as rollers | 22/30 | . . to finish articles formed by deep-drawing |
| 19/043 | . . . {for flanging edges of plates} | 24/00 | Special deep-drawing arrangements in, or in connection with, presses |
| 19/046 | . . . {for flanging edges of tubular products} | 24/005 | . {Multi-stage presses} |
| 19/06 | . . . working inwardly | 24/02 | . Die-cushions |
| 19/08 | . by single or successive action of pressing tools, e.g. vice jaws | 24/04 | . Blank holders; Mounting means therefor |
| 19/082 | . . {for making negative angles} | 24/06 | . . Mechanically spring-loaded blank holders |
| 19/084 | . . . {with linear cams, e.g. aerial cams} | 24/08 | . . Pneumatically or hydraulically loaded blank holders |
| 19/086 | . . . {with rotary cams} | 24/10 | . Devices controlling or operating blank holders independently, or in conjunction with dies |
| 19/088 | . . {for flanging holes} | 24/12 | . . mechanically |
| 19/10 | . . working inwardly | 24/14 | . . pneumatically or hydraulically |
| 19/12 | . Edge-curling | 24/16 | . Additional equipment in association with the tools, e.g. for shearing, for trimming |
| 19/14 | . . Reinforcing edges, e.g. armouring same | 25/00 | Working sheet metal of limited length by stretching, e.g. for straightening |
| 19/16 | . Reverse flanging of tube ends | 25/02 | . by pulling over a die |
| 21/00 | Combined processes according to methods covered by groups B21D 1/00 - B21D 19/00 | 25/04 | . Clamping arrangements |
| <u>Stamping, Spinning, Deep-drawing; Working sheet metal of limited length by stretching; Punching</u> | | 26/00 | Shaping without cutting otherwise than using rigid devices or tools or yieldable or resilient pads, i.e. applying fluid pressure or magnetic forces (stamping using resilient pads B21D 22/10) |
| 22/00 | Shaping without cutting, by stamping, spinning, or deep-drawing (otherwise than using rigid devices or tools or yieldable or resilient pads B21D 26/00) | 26/02 | . by applying fluid pressure |
| 22/02 | . Stamping using rigid devices or tools | 26/021 | . . Deforming sheet bodies |
| 22/022 | . . {by heating the blank or stamping associated with heat treatment (C21D takes precedence)} | 26/023 | . . . including an additional treatment performed by fluid pressure, e.g. perforating |
| 22/025 | . . {for tubular articles} | 26/025 | . . . Means for controlling the clamping or opening of the moulds |
| 22/027 | . . {for flattening the ends of corrugated sheets} | 26/027 | . . . Means for controlling fluid parameters, e.g. pressure or temperature |
| 22/04 | . . for dimpling (combined with perforating B21D 28/24) | | |
| 22/06 | . . having relatively-movable die parts | | |
| 22/08 | . . with die parts on rotating carriers | | |
| 22/10 | . Stamping using yieldable or resilient pads | | |
| 22/105 | . . {of tubular products} | | |

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| 26/029 | . . . Closing or sealing means | 28/265 | . . . {with relative movement of sheet and tools enabling the punching of holes in predetermined locations of the sheet, e.g. holes punching with template} |
| 26/031 | . . . Mould construction (B21D 26/025 - B21D 26/029 take precedence) | 28/28 | . . . in tubes or other hollow bodies |
| 26/033 | . . Deforming tubular bodies (corrugating tubes by applying fluid pressure B21D 15/03, B21D 15/10) | 28/285 | . . . {punching outwards} |
| 26/035 | . . . including an additional treatment performed by fluid pressure, e.g. perforating | 28/30 | . . in annular parts, e.g. rims |
| 26/037 | . . . Forming branched tubes | 28/32 | . . in other articles of special shape |
| 26/039 | . . . Means for controlling the clamping or opening of the moulds | 28/325 | . . . {using cam or wedge mechanisms, e.g. aerial cams} |
| 26/041 | . . . Means for controlling fluid parameters, e.g. pressure or temperature | 28/34 | . . Perforating tools; Die holders |
| 26/043 | . . . Means for controlling the axial pusher | 28/343 | . . . {Draw punches} |
| 26/045 | . . . Closing or sealing means | 28/346 | . . . {length adjustable perforating tools} |
| 26/047 | . . . Mould construction (B21D 26/037 - B21D 26/045 take precedence) | 28/36 | . . using rotatable work or tool holders |
| 26/049 | . . . Deforming bodies having a closed end | 31/00 | Other methods for working sheet metal, metal tubes, metal profiles (deforming one surface of tubes helically by rolling B21H 3/00; upsetting B21J 5/08; working metal by removing material therefrom B23; embossing B44B) |
| 26/051 | . . . Deforming double-walled bodies | 31/005 | . {Incremental shaping or bending, e.g. stepwise moving a shaping tool along the surface of the workpiece (B21D 22/14 takes precedence)} |
| 26/053 | . . characterised by the material of the blanks | 31/02 | . Stabbing or piercing, e.g. for making sieves (dimpling B21D 22/04; perforating by punching B21D 28/24) |
| 26/055 | . . . Blanks having super-plastic properties | 31/04 | . Expanding other than provided for in groups B21D 1/00 - B21D 28/00 , e.g. for making expanded metal (B21D 47/00 takes precedence; enlarging tube ends B21D 41/02) |
| 26/057 | . . . Tailored blanks | 31/043 | . . {Making use of slitting discs or punch cutters} |
| 26/059 | . . . Layered blanks | 31/046 | . . {making use of rotating cutters} |
| 26/06 | . . by shock waves | 31/06 | . Deforming sheet metal, tubes or profiles by sequential impacts, e.g. hammering, beating, peen forming (forging hammers B21J 7/00) |
| 26/08 | . . . generated by explosives, e.g. chemical explosives | 33/00 | Special measures in connection with working metal foils, e.g. gold foils (cutting or perforating of metal foil analogous to paper B26) |
| 26/10 | . . . generated by evaporation, e.g. of wire, of liquids | 35/00 | Combined processes according to {or processes combined with} methods covered by groups B21D 1/00 - B21D 31/00 (B21D 21/00 takes precedence) |
| 26/12 | . . . initiated by spark discharge | 35/001 | . {Shaping combined with punching, e.g. stamping and perforating} |
| 26/14 | . applying magnetic forces | 35/002 | . {Processes combined with methods covered by groups B21D 1/00 - B21D 31/00 } |
| 28/00 | Shaping by press-cutting; Perforating | 35/003 | . . {Simultaneous forming, e.g. making more than one part per stroke (B21D 26/06 takes precedence)} |
| 28/002 | . {Drive of the tools (B21D 28/007 and B21D 28/20 take precedence)} | 35/005 | . . {characterized by the material of the blank or the workpiece (B21D 26/053 takes precedence)} |
| 28/005 | . . {Adjustment of the punch stroke for compensating wear} | 35/006 | . . . {Blanks having varying thickness, e.g. tailored blanks} |
| 28/007 | . {Explosive cutting or perforating} | 35/007 | . . . {Layered blanks (B21D 22/203 takes precedence; joining superposed plates B21D 39/031, B21D 39/034, B21D 39/035)} |
| 28/02 | . Punching blanks or articles with or without obtaining scrap (cutting nails or pins from strips or sheet material B21G 3/26); Notching | 35/008 | . . {involving vibration, e.g. ultrasonic} |
| 28/04 | . . Centering the work; Positioning the tools | 37/00 | Tools as parts of machines covered by this subclass (forms or constructions of tools uniquely adapted for particular operations, see the relevant groups for the operations) |
| 28/06 | . . Making more than one part out of the same blank; Scrapless working | 37/01 | . Selection of materials |
| 28/08 | . . . Zig-zag sequence working | | |
| 28/10 | . . Incompletely punching in such a manner that the parts are still coherent with the work | | |
| 28/12 | . . Punching using rotatable carriers | | |
| 28/125 | . . . {with multi-tools} | | |
| 28/14 | . . Dies (ejecting or stripping-off devices arranged in punching machines or tools B21D 45/00) | | |
| 28/145 | . . . {with means for slug retention, e.g. a groove} | | |
| 28/16 | . . Shoulder or burr prevention {, e.g. fine-blanking} | | |
| 28/18 | . . Yieldable, e.g. rubber, punching pads | | |
| 28/20 | . . Applications of drives {for reducing noise or wear} | | |
| 28/22 | . . Notching the peripheries of circular blanks, e.g. laminations for dynamo-electric machines | | |
| 28/24 | . Perforating, i.e. punching holes | | |
| 28/243 | . . {in profiles} | | |
| 28/246 | . . {Selection of punches} | | |
| 28/26 | . . in sheets or flat parts | | |

- 37/02 . Die constructions enabling assembly of the die parts in different ways ([B21D 37/06 takes precedence](#))
- 37/04 . Movable or exchangeable mountings for tools
- 37/06 . . Pivotaly-arranged tools, e.g. disengageable ([die sets with dies pivoted to one another B21D 37/12](#))
- 37/08 . Dies with different parts for several steps in a process
- 37/10 . Die sets; Pillar guides
- 37/12 . . Particular guiding equipment, {e.g. pliers}; Special arrangements for interconnection or cooperation of dies
- 37/14 . Particular arrangements for handling and holding in place complete dies
- 37/142 . . {Spotting presses}
- 37/145 . . {Die storage magazines}
- 37/147 . . {Tool exchange carts}
- 37/16 . Heating or cooling
- 37/18 . Lubricating {, e.g. lubricating tool and workpiece simultaneously ([lubricating workpieces for deep-drawing B21D 22/201](#))}
- 37/20 . Making tools by operations not covered by a single other subclass
- 37/205 . . {Making cutting tools}
- 39/00 Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating ({joining mitred profiles [B21D 53/745](#); } riveting [B21J](#); uniting components by forging or pressing to form integral members [B21K 25/00](#); welding [B23K](#); press-fitting, force-fitting, or shrinking in general [B23P 11/00](#), [B21D 19/00](#); by adhesives [F16B 11/00](#) {; Connections as such [F16L](#), [F16B](#)}); Tube expanders**
- 39/02 . of sheet metal by folding, e.g. connecting edges of a sheet to form a cylinder
- 39/021 . . {for panels, e.g. vehicle doors}
- 39/023 . . . {using rollers}
- 39/025 . . {Hand tools}
- 39/026 . . {Reinforcing the connection by locally deforming}
- 39/028 . . {Reinforcing the connection otherwise than by deforming, e.g. welding}
- 39/03 . of sheet metal otherwise than by folding
- 39/031 . . {Joining superposed plates by locally deforming without slitting or piercing}
- 39/032 . . . {by fitting a projecting part integral with one plate in a hole of the other plate}
- 39/034 . . {Joining superposed plates by piercing}
- 39/035 . . {Joining superposed plates by slitting}
- 39/037 . . {Interlocking butt joints}
- 39/038 . . {Perpendicular plate connections}
- 39/04 . of tubes with tubes; of tubes with rods {([crimped pipe joints as such \[F16L 13/14\]\(#\)](#))}
- 39/042 . . {using explosives ([by explosive welding \[B23K 20/08\]\(#\)](#))}
- 39/044 . . {perpendicular}
- 39/046 . . {Connecting tubes to tube-like fittings}
- 39/048 . . {using presses for radially crimping tubular elements}
- 39/06 . of tubes in openings, e.g. rolling-in
- 39/063 . . {for assembling ladders}
- 39/066 . . {using explosives}
- 39/08 . Tube expanders
- 39/10 . . with rollers for expanding only
- 39/12 . . with rollers for expanding and flanging
- 39/14 . . with balls
- 39/16 . . with torque limiting devices
- 39/18 . . Rollers of special shape
- 39/20 . . with mandrels, e.g. expandable
- 39/203 . . . {expandable by fluid or elastic material}
- 39/206 {by axially compressing the elastic material}
- 41/00 Application of procedures in order to alter the diameter of tube ends ([B21D 39/00 takes precedence](#) {; plastic tubes [B29C 57/08](#))}**
- 41/02 . Enlarging
- 41/021 . . {by means of tube-flaring hand tools}
- 41/023 . . . {comprising rolling elements}
- 41/025 . . {by means of impact-type swaging hand tools}
- 41/026 . . {by means of mandrels}
- 41/028 . . . {expandable mandrels}
- 41/04 . Reducing; Closing
- 41/045 . . {Closing}
- 43/00 Feeding, positioning or storing devices combined with, or arranged in, or specially adapted for use in connection with, apparatus for working or processing sheet metal, metal tubes or metal profiles; Associations therewith of cutting devices ([cutting devices associated with the tool, see the relevant group for the tool](#))**
- 43/003 . {Positioning devices ([B21D 28/04](#) and [B21D 28/265](#) take precedence; stops [B21D 43/26](#); centering moving strips [B21D 43/023](#))}
- 43/006 . {Feeding elongated articles, such as tubes, bars, or profiles}
- 43/02 . Advancing work in relation to the stroke of the die or tool
- 43/021 . . {Control or correction devices in association with moving strips}
- 43/022 . . . {Loop-control}
- 43/023 . . . {Centering devices, e.g. edge guiding}
- 43/025 . . {Fault detection, e.g. misfeed detection}
- 43/026 . . {Combination of two or more feeding devices provided for in [B21D 43/04](#) - [B21D 43/18](#)}
- 43/027 . . {Combined feeding and ejecting devices}
- 43/028 . . {Tools travelling with material, e.g. flying punching machines}
- 43/04 . . by means in mechanical engagement with the work
- 43/05 . . . specially adapted for multi-stage presses {([B21D 43/145 takes precedence](#))}
- 43/052 {Devices having a cross bar}
- 43/055 {Devices comprising a pair of longitudinally and laterally movable parallel transfer bars}
- 43/057 {Devices for exchanging transfer bars or grippers; Idle stages, e.g. exchangeable}
- 43/06 . . . by positive or negative engaging parts co-operating with corresponding parts of the sheet or the like to be processed, e.g. carrier bolts or grooved section in the carriers
- 43/08 . . . by rollers {([B21D 43/145 takes precedence](#))}
- 43/09 by one or more pairs of rollers for feeding sheet or strip material
- 43/10 . . . by grippers {([B21D 43/055](#), [B21D 43/057](#), [B21D 43/145 take precedence](#))}

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| 43/105 | {Manipulators, i.e. mechanical arms carrying a gripper element having several degrees of freedom} | 51/04 | . . built-up objects, e.g. objects with rigidly-attached bottom or cover |
| 43/11 | for feeding sheet or strip material | 51/06 | . . folded objects |
| 43/12 | . . . by chains or belts { (B21D 43/145 takes precedence) } | 51/08 | . . ball-shaped objects |
| 43/13 | . . . by linearly moving tables | 51/10 | . . conically or cylindrically shaped objects |
| 43/14 | . . . by turning devices, e.g. turn-tables | 51/12 | . . objects with corrugated walls |
| 43/145 | {Turnover devices, i.e. by turning about a substantially horizontal axis} | 51/14 | . . Flattening hollow objects for transport or storage; Re-forming same (making tubes from doubled flat material B21C 37/14) |
| 43/16 | . . by gravity, e.g. chutes | 51/16 | . characterised by the use of the objects (making heat exchangers B21D 53/02) |
| 43/18 | . . by means in pneumatic or magnetic engagement with the work | 51/18 | . . vessels, e.g. tubs, vats, tanks, sinks, or the like |
| 43/20 | . Storage arrangements; Piling or unpiling (in general B65G, {B65H}) | 51/20 | . . . barrels |
| 43/22 | . . Devices for piling sheets | 51/22 | . . . pots, e.g. for cooking |
| 43/24 | . . Devices for removing sheets from a stack | 51/24 | . . high-pressure containers, e.g. boilers, bottles |
| 43/26 | . Stops | 51/26 | . . cans or tins; Closing same in a permanent manner (making outlet arrangements B21D 51/38; welding or soldering B23K) |
| 43/28 | . Associations of cutting devices therewith | 51/2607 | . . . {Locally embossing the walls of formed can bodies (B44B 5/00, B44C 1/24, B44C 3/085 take precedence; bulging B21D 51/2646)} |
| 43/282 | . . {Discharging crop ends or the like} | 51/2615 | . . . {Edge treatment of cans or tins} |
| 43/285 | . . {Devices for handling elongated articles, e.g. bars, tubes or profiles (B21D 43/282, B21D 43/287 take precedence)} | 51/2623 | {Curling} |
| 43/287 | . . {Devices for handling sheet or strip material (B21D 43/282 takes precedence)} | 51/263 | {Flanging} |
| 45/00 | Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass | 51/2638 | {Necking} |
| 45/003 | . {in punching machines or punching tools} | 51/2646 | . . . {Of particular non cylindrical shape, e.g. conical, rectangular, polygonal, bulged} |
| 45/006 | . . {Stripping-off devices} | 51/2653 | . . . {Methods or machines for closing cans by applying caps or bottoms} |
| 45/02 | . Ejecting devices | 51/2661 | {Sealing or closing means therefor} |
| 45/04 | . . interrelated with motion of tool | 51/2669 | . . . {Transforming the shape of formed can bodies; Forming can bodies from flattened tubular blanks; Flattening can bodies} |
| 45/06 | . Stripping-off devices | 51/2676 | . . . {Cans or tins having longitudinal or helical seams} |
| 45/065 | . . {for deep-drawn cans, e.g. using stripping fingers} | 51/2684 | . . . {Cans or tins having circumferential side seams} |
| 45/08 | . . interrelated with motion of tool | 51/2692 | . . . {Manipulating, e.g. feeding and positioning devices; Control systems} |
| 45/10 | . Combined ejecting and stripping-off devices | 51/28 | . . . Folding the longitudinal seam |
| <u>Processing sheet metal or metal tubes, or processing metal profiles according to any of groups B21D 1/00 - B21D 45/00, in the manufacture of finished or semi-finished articles</u> | | 51/30 | . . . Folding the circumferential seam |
| 47/00 | Making rigid structural elements or units, e.g. honeycomb structures | 51/32 | by rolling |
| 47/005 | . { Making gratings } | 51/34 | by pressing |
| 47/01 | . beams or pillars | 51/36 | . . collapsible or like thin-walled tubes, e.g. for toothpaste |
| 47/02 | . . by expanding | 51/365 | . . . {involving fixing closure members to the tubes, e.g. nozzles} |
| 47/04 | . composite sheet metal profiles | 51/38 | . . Making inlet or outlet arrangements of cans, tins, baths, bottles, or other vessels; Making can ends; Making closures |
| 49/00 | Sheathing or stiffening objects (by winding wire or tape thereon B65H 54/00, B65H 81/00; specially adapted for manufacturing conductors or cables H01B 13/26) | 51/383 | . . . {scoring lines, tear strips or pulling tabs} |
| 49/005 | . { Hollow objects } | 51/386 | {on the side-wall of containers} |
| 51/00 | Making hollow objects (from thick-walled or non uniform tubes B21K 21/00) | 51/40 | . . . Making outlet openings, e.g. bung holes |
| 51/02 | . characterised by the structure of the objects { (B21D 51/26 takes precedence) } | 51/42 | Making or attaching spouts |
| | NOTE | 51/44 | . . . Making closures, e.g. caps (folded of thin metal foils in the way of making paper caps B31D 5/00; making closures in conjunction with applying same B67B) |
| | Making hollow objects characterised both by their structure and by their use is classified only in group B21D 51/16 | 51/443 | {easily removable closures, e.g. by means of tear strips} |
| | | 51/446 | {Feeding or removal of material} |

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| 51/46 | Placing sealings or sealing material {(moulding plastic sealing material into closure members B29C 70/80)} | 53/52 | . . . fastener elements; Attaching such elements so far as this procedure is combined with the process for making the elements |
| 51/48 | Making crown caps | 53/54 | . . . slides |
| 51/50 | Making screw caps | 53/56 | . . . stops |
| 51/52 | . . boxes, cigarette cases, or the like | 53/58 | . end-pieces for laces or ropes |
| 51/54 | . . cartridge cases, e.g. for ammunition, for letter carriers in pneumatic-tube plants | 53/60 | . cutlery wares; garden tools or the like |
| 53/00 | Making other particular articles (making wire fabrics B21F; making chains or chain parts B21L) | 53/62 | . . spoons; table forks |
| 53/02 | . heat exchangers {or parts thereof}, e.g. radiators, condensers {fins, headers} (making finned or ribbed tubes by fixing strip material or the like to tubes B21C 37/22) | 53/64 | . . knives; scissors; cutting blades (B21D 53/72 takes precedence; handle portions B21D 53/70) |
| 53/022 | . . {Making the fins} | 53/642 | . . . {scissors} |
| 53/025 | . . . {Louvered fins} | 53/645 | . . . {safety razor blades} |
| 53/027 | . . {by helically or spirally winding elongated elements} | 53/647 | . . . {mower blades} |
| 53/04 | . . of sheet metal | 53/66 | . . spades; shovels (handle portions B21D 53/70) |
| 53/045 | . . . {by inflating partially united plates} | 53/68 | . . rakes, garden forks, or the like (handle portions B21D 53/70) |
| 53/06 | . . of metal tubes | 53/70 | . . handle portions (B21D 53/72 takes precedence) |
| 53/08 | . . of both metal tubes and sheet metal (connecting tubes in openings B21D 39/06) | 53/72 | . . sickles; scythes |
| 53/085 | . . . {with fins places on zig-zag tubes or parallel tubes} | 53/74 | . frames for openings, e.g. for windows, doors, handbags |
| 53/10 | . parts of bearings; sleeves; valve seats or the like | 53/745 | . . {Joining mitred profiles comprising punching the profiles on a corner-angle connecting piece} |
| 53/12 | . . cages for bearings | 53/76 | . writing or drawing instruments, e.g. writing pens, erasing pens |
| 53/14 | . belts, e.g. machine-gun belts | 53/78 | . propeller blades; turbine blades |
| 53/16 | . rings, e.g. barrel hoops | 53/80 | . dustproof covers; safety covers |
| 53/18 | . . of hollow or C-shaped cross-section, e.g. for curtains, for eyelets | 53/82 | . perforated music sheets; pattern sheets, e.g. for control purposes, stencils |
| 53/20 | . . washers, e.g. for sealing | 53/84 | . other parts for engines, e.g. connecting-rods |
| 53/22 | . . . with means for preventing rotation | 53/845 | . . {Making camshafts} |
| 53/24 | . nuts or like thread-engaging members | 53/86 | . other parts for bicycles or motorcycles |
| 53/26 | . wheels or the like | 53/88 | . other parts for vehicles, e.g. cowlings, mudguards |
| 53/261 | . . {pulleys} | 53/883 | . . {reflectors} |
| 53/262 | . . {with inscriptions or the like, e.g. printing wheels} | 53/886 | . . {leaf springs} |
| 53/264 | . . {wheels out of a single piece (B21D 53/261 takes precedence)} | 53/90 | . . axle-housings |
| 53/265 | . . {parts of wheels (B21D 53/28 , B21D 53/30 take precedence)} | 53/92 | . other parts for aircraft |
| 53/267 | . . {blower wheels, i.e. wheels provided with fan elements} | 55/00 | Safety devices protecting the machine or the operator, specially adapted for apparatus or machines dealt with in this subclass (for presses in general B30B; safety devices in general F16P) |
| 53/268 | . . {wheels having spokes} | | |
| 53/28 | . . gear wheels | | |
| 53/30 | . . wheel rims | | |
| 53/32 | . . wheel covers | | |
| 53/34 | . . brake drums | | |
| 53/36 | . clips, clamps, or like fastening or attaching devices, e.g. for electric installation | | |
| 53/38 | . locksmith's goods, e.g. handles | | |
| 53/40 | . . hinges, e.g. door hinge plates | | |
| 53/42 | . . keys {(making keys by combined operations B23P 15/005)} | | |
| 53/44 | . fancy goods, e.g. jewellery products | | |
| 53/46 | . haberdashery, e.g. buckles, combs; pronged fasteners, e.g. staples | | |
| 53/48 | . . buttons, e.g. press-buttons, snap fasteners | | |
| 53/50 | . . metal slide-fastener parts | | |