

# CPC COOPERATIVE PATENT CLASSIFICATION

## B PERFORMING OPERATIONS; TRANSPORTING

(NOTES omitted)

### SHAPING

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

(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
- 13/04 . . by rolling
- 13/045 . . {the corrugations being parallel to the feeding movement}
- 13/06 . . by drawing
- 13/08 . . by combined methods
- 13/10 . . into a peculiar profiling shape
- 15/00 Corrugating tubes (wrinkle-bending using mandrels or the like [B21D 9/14](#))**

|   |  |              |   |
|---|--|--------------|---|
| 15/02   | . longitudinally   | 22/201       | . . {Work-pieces; preparation of the work-pieces, e.g. lubricating, coating}  |
| 15/03   | . . by applying fluid pressure   | 22/203       | . . {of compound articles}  |
| 15/04   | . transversely, e.g. helically   | 22/205       | . . {Hydro-mechanical deep-drawing}   |
| 15/06   | . . annularly {(with thinning <a href="#">B21C 37/205</a> )}   | 22/206       | . . {articles from a strip in several steps, the articles being coherent with the strip during the operation}   |
| 15/10   | . . by applying fluid pressure   |              |   |
| 15/105  | . . . {by applying elastic material}   | 22/208       | . . {by heating the blank or deep-drawing associated with heat treatment ( <a href="#">C21D</a> takes precedence)}  |
| 15/12   | . Bending tubes into wave form   | 22/21        | . . without fixing the border of the blank  |
| <b>17/00</b>  | <b>Forming single grooves in sheet metal or tubular or hollow articles</b>   | 22/22        | . . with devices for holding the edge of the blanks ( <a href="#">B21D 22/24</a> - <a href="#">B21D 22/30</a> take precedence; shaping over a die without external former <a href="#">B21D 11/02</a> )                |
| 17/02   | . by pressing (grooving or notching of bolts, studs, or the like <a href="#">B21K 1/54</a> )   |              |   |
| 17/025  | . . {by pressing tubes axially}  | 22/225       | . . . {with members for radially pushing the blanks}  |
| 17/04   | . by rolling   | 22/24        | . . involving two drawing operations having effects in opposite directions with respect to the blank  |
| <b>19/00</b>  | <b>Flanging or other edge treatment, e.g. of tubes (connecting by making use of folds <a href="#">B21D 39/00</a>; flaring-out tube ends <a href="#">B21D 41/02</a>)</b>        | 22/26        | . . for making peculiarly, e.g. irregularly, shaped articles  |
| 19/005  | . {Edge deburring or smoothing}  | 22/28        | . . of cylindrical articles using consecutive dies  |
| 19/02   | . by continuously-acting tools moving along the edge (edge-curling <a href="#">B21D 19/12</a> )  | 22/283       | . . . {with ram and dies aligning means}  |
| 19/04   | . . shaped as rollers  | 22/286       | . . . {with lubricating or cooling means}   |
| 19/043  | . . . {for flanging edges of plates}   | 22/30        | . . to finish articles formed by deep-drawing   |
| 19/046  | . . . {for flanging edges of tubular products}   | <b>24/00</b> | <b>Special deep-drawing arrangements in, or in connection with, presses</b>   |
| 19/06   | . . . working inwardly   | 24/005       | . {Multi-stage presses}   |
| 19/08   | . by single or successive action of pressing tools, e.g. vice jaws   | 24/02        | . Die-cushions  |
| 19/082  | . . {for making negative angles}   | 24/04        | . Blank holders; Mounting means therefor  |
| 19/084  | . . . {with linear cams, e.g. aerial cams}   | 24/06        | . . Mechanically spring-loaded blank holders  |
| 19/086  | . . . {with rotary cams}   | 24/08        | . . Pneumatically or hydraulically loaded blank holders   |
| 19/088  | . . {for flanging holes}   | 24/10        | . Devices controlling or operating blank holders independently, or in conjunction with dies   |
| 19/10   | . . working inwardly   | 24/12        | . . mechanically  |
| 19/12   | . Edge-curling   | 24/14        | . . pneumatically or hydraulically  |
| 19/14   | . . Reinforcing edges, e.g. armouring same   | 24/16        | . Additional equipment in association with the tools, e.g. for shearing, for trimming   |
| 19/16   | . Reverse flanging of tube ends  |              |   |
| <b>21/00</b>  | <b>Combined processes according to methods covered by groups <a href="#">B21D 1/00</a> - <a href="#">B21D 19/00</a></b>  | <b>25/00</b> | <b>Working sheet metal of limited length by stretching, e.g. for straightening</b>  |
| <b><u>Stamping, Spinning, Deep-drawing; Working sheet metal of limited length by stretching; Punching</u></b> |  | 25/02        | . by pulling over a die   |
| <b>22/00</b>  | <b>Shaping without cutting, by stamping, spinning, or deep-drawing (otherwise than using rigid devices or tools or yieldable or resilient pads <a href="#">B21D 26/00</a>)</b> | 25/04        | . Clamping arrangements   |
| 22/02   | . Stamping using rigid devices or tools  | <b>26/00</b> | <b>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 <a href="#">B21D 22/10</a>)</b> |
| 22/022  | . . {by heating the blank or stamping associated with heat treatment ( <a href="#">C21D</a> takes precedence)}   | 26/02        | . by applying fluid pressure  |
| 22/025  | . . {for tubular articles}   | 26/021       | . . Deforming sheet bodies  |
| 22/027  | . . {for flattening the ends of corrugated sheets}   | 26/023       | . . . including an additional treatment performed by fluid pressure, e.g. perforating   |
| 22/04   | . . for dimpling (combined with perforating <a href="#">B21D 28/24</a> )   | 26/025       | . . . Means for controlling the clamping or opening of the moulds   |
| 22/06   | . . having relatively-movable die parts  | 26/027       | . . . Means for controlling fluid parameters, e.g. pressure or temperature  |
| 22/08   | . . with die parts on rotating carriers  | 26/029       | . . . Closing or sealing means  |
| 22/10   | . Stamping using yieldable or resilient pads   | 26/031       | . . . Mould construction ( <a href="#">B21D 26/025</a> - <a href="#">B21D 26/029</a> take precedence)   |
| 22/105  | . . {of tubular products}  | 26/033       | . . Deforming tubular bodies (corrugating tubes by applying fluid pressure <a href="#">B21D 15/03</a> , <a href="#">B21D 15/10</a> )  |
| 22/12   | . . using enclosed flexible chambers   | 26/035       | . . . including an additional treatment performed by fluid pressure, e.g. perforating   |
| 22/125  | . . . {of tubular products}  | 26/037       | . . . Forming branched tubes  |
| 22/14   | . Spinning   |              |   |
| 22/16   | . . over shaping mandrels or formers   |              |   |
| 22/18   | . . using tools guided to produce the required profile   |              |   |
| 22/185  | . . . {making domed objects}   |              |   |
| 22/20   | . Deep-drawing (special deep-drawing arrangements in, or in connection with, presses <a href="#">B21D 24/00</a> )  |              |   |

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



|              |   |              |  |
|--------------|---|--------------|--|
| 37/14        | • Particular arrangements for handling and holding in place complete dies   | 41/00        | <b>Application of procedures in order to alter the diameter of tube ends (<a href="#">B21D 39/00</a> takes precedence {; plastic tubes <a href="#">B29C 57/08</a>)</b>   |
| 37/142       | • • {Spotting presses}  | 41/02        | • Enlarging  |
| 37/145       | • • {Die storage magazines}   | 41/021       | • • {by means of tube-flaring hand tools}  |
| 37/147       | • • {Tool exchange carts}   | 41/023       | • • • {comprising rolling elements}  |
| 37/16        | • Heating or cooling  | 41/025       | • • {by means of impact-type swaging hand tools}   |
| 37/18        | • Lubricating {, e.g. lubricating tool and workpiece simultaneously (lubricating workpieces for deep-drawing <a href="#">B21D 22/201</a> )}   | 41/026       | • • {by means of mandrels}   |
| 37/20        | • Making tools by operations not covered by a single other subclass   | 41/028       | • • • {expandable mandrels}  |
| 37/205       | • • {Making cutting tools}  | 41/04        | • Reducing; Closing  |
|              |   | 41/045       | • • {Closing}  |
| <b>39/00</b> | <b>Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating ({joining mitred profiles <a href="#">B21D 53/745</a>; } riveting <a href="#">B21J</a>; uniting components by forging or pressing to form integral members <a href="#">B21K 25/00</a>; welding <a href="#">B23K</a>; press-fitting, force-fitting, or shrinking in general <a href="#">B23P 11/00</a>, <a href="#">B21D 19/00</a>; by adhesives <a href="#">F16B 11/00</a> {; Connections as such <a href="#">F16L</a>, <a href="#">F16B</a>}); Tube expanders</b> | <b>43/00</b> | <b>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)</b> |
| 39/02        | • of sheet metal by folding, e.g. connecting edges of a sheet to form a cylinder  | 43/003       | • {Positioning devices ( <a href="#">B21D 28/04</a> and <a href="#">B21D 28/265</a> take precedence; stops <a href="#">B21D 43/26</a> ; centering moving strips <a href="#">B21D 43/023</a> )}   |
| 39/021       | • • {for panels, e.g. vehicle doors}  | 43/006       | • {Feeding elongated articles, such as tubes, bars, or profiles}   |
| 39/023       | • • • {using rollers}   | 43/02        | • Advancing work in relation to the stroke of the die or tool  |
| 39/025       | • • {Hand tools}  | 43/021       | • • {Control or correction devices in association with moving strips}  |
| 39/026       | • • {Reinforcing the connection by locally deforming}   | 43/022       | • • • {Loop-control}   |
| 39/028       | • • {Reinforcing the connection otherwise than by deforming, e.g. welding}  | 43/023       | • • • {Centering devices, e.g. edge guiding}   |
| 39/03        | • of sheet metal otherwise than by folding  | 43/025       | • • {Fault detection, e.g. misfeed detection}  |
| 39/031       | • • {Joining superposed plates by locally deforming without slitting or piercing}   | 43/026       | • • {Combination of two or more feeding devices provided for in <a href="#">B21D 43/04</a> - <a href="#">B21D 43/18</a> }  |
| 39/032       | • • • {by fitting a projecting part integral with one plate in a hole of the other plate}   | 43/027       | • • {Combined feeding and ejecting devices}  |
| 39/034       | • • {Joining superposed plates by piercing}   | 43/028       | • • {Tools travelling with material, e.g. flying punching machines}  |
| 39/035       | • • {Joining superposed plates by slitting}   | 43/04        | • • by means in mechanical engagement with the work  |
| 39/037       | • • {Interlocking butt joints}  | 43/05        | • • • specially adapted for multi-stage presses {( <a href="#">B21D 43/145</a> takes precedence)}  |
| 39/038       | • • {Perpendicular plate connections}   | 43/052       | • • • • {Devices having a cross bar}   |
| 39/04        | • of tubes with tubes; of tubes with rods {(crimped pipe joints as such <a href="#">F16L 13/14</a> )}   | 43/055       | • • • • {Devices comprising a pair of longitudinally and laterally movable parallel transfer bars}   |
| 39/042       | • • {using explosives (by explosive welding <a href="#">B23K 20/08</a> )}   | 43/057       | • • • • {Devices for exchanging transfer bars or grippers; Idle stages, e.g. exchangeable}   |
| 39/044       | • • {perpendicular}   | 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   |
| 39/046       | • • {Connecting tubes to tube-like fittings}  | 43/08        | • • • by rollers {( <a href="#">B21D 43/145</a> takes precedence)}   |
| 39/048       | • • {using presses for radially crimping tubular elements}  | 43/09        | • • • • by one or more pairs of rollers for feeding sheet or strip material  |
| 39/06        | • of tubes in openings, e.g. rolling-in   | 43/10        | • • • by grippers {( <a href="#">B21D 43/055</a> , <a href="#">B21D 43/057</a> , <a href="#">B21D 43/145</a> take precedence)}   |
| 39/063       | • • {for assembling ladders}  | 43/105       | • • • • {Manipulators, i.e. mechanical arms carrying a gripper element having several degrees of freedom}  |
| 39/066       | • • {using explosives}  | 43/11        | • • • • for feeding sheet or strip material  |
| 39/08        | • Tube expanders  | 43/12        | • • • by chains or belts {( <a href="#">B21D 43/145</a> takes precedence)}   |
| 39/10        | • • with rollers for expanding only   | 43/13        | • • • by linearly moving tables  |
| 39/12        | • • with rollers for expanding and flanging   | 43/14        | • • • by turning devices, e.g. turn-tables   |
| 39/14        | • • with balls  | 43/145       | • • • • {Turnover devices, i.e. by turning about a substantially horizontal axis}  |
| 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}   |              |  |

|  |  |              |   |
|--|--|--------------|---|
| 43/16  | . . by gravity, e.g. chutes  | 51/18        | . . vessels, e.g. tubs, vats, tanks, sinks, or the like   |
| 43/18  | . . by means in pneumatic or magnetic engagement with the work   | 51/20        | . . . barrels   |
| 43/20  | . Storage arrangements; Piling or unpling ( <a href="#">in general B65G, {B65H}</a> )  | 51/22        | . . . pots, e.g. for cooking  |
| 43/22  | . . Devices for piling sheets  | 51/24        | . . high-pressure containers, e.g. boilers, bottles   |
| 43/24  | . . Devices for removing sheets from a stack   | 51/26        | . . cans or tins; Closing same in a permanent manner ( <a href="#">making outlet arrangements B21D 51/38; welding or soldering B23K</a> )   |
| 43/26  | . Stops  | 51/2607      | . . . {Locally embossing the walls of formed can bodies ( <a href="#">B44B 5/00, B44C 1/24, B44C 3/085 take precedence; bulging B21D 51/2646</a> )}                               |
| 43/28  | . Associations of cutting devices therewith  | 51/2615      | . . . {Edge treatment of cans or tins}  |
| 43/282   | . . {Discharging crop ends or the like}  | 51/2623      | . . . . {Curling}   |
| 43/285   | . . {Devices for handling elongated articles, e.g. bars, tubes or profiles ( <a href="#">B21D 43/282, B21D 43/287 take precedence</a> )}   | 51/263       | . . . . {Flanging}  |
| 43/287   | . . {Devices for handling sheet or strip material ( <a href="#">B21D 43/282 takes precedence</a> )}  | 51/2638      | . . . . {Necking}   |
| <b>45/00</b>   | <b>Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass</b>   | 51/2646      | . . . {Of particular non cylindrical shape, e.g. conical, rectangular, polygonal, bulged}   |
| 45/003   | . {in punching machines or punching tools}   | 51/2653      | . . . {Methods or machines for closing cans by applying caps or bottoms}  |
| 45/006   | . . {Stripping-off devices}  | 51/2661      | . . . . {Sealing or closing means therefor}   |
| 45/02  | . Ejecting devices   | 51/2669      | . . . {Transforming the shape of formed can bodies; Forming can bodies from flattened tubular blanks; Flattening can bodies}  |
| 45/04  | . . interrelated with motion of tool   | 51/2676      | . . . {Cans or tins having longitudinal or helical seams}   |
| 45/06  | . Stripping-off devices  | 51/2684      | . . . {Cans or tins having circumferential side seams}  |
| 45/065   | . . {for deep-drawn cans, e.g. using stripping fingers}  | 51/2692      | . . . {Manipulating, e.g. feeding and positioning devices; Control systems}   |
| 45/08  | . . interrelated with motion of tool   | 51/28        | . . . Folding the longitudinal seam   |
| 45/10  | . Combined ejecting and stripping-off devices  | 51/30        | . . . Folding the circumferential seam  |
| <b>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</b> |  | 51/32        | . . . . by rolling  |
| <b>47/00</b>   | <b>Making rigid structural elements or units, e.g. honeycomb structures</b>  | 51/34        | . . . . by pressing   |
| 47/005   | . {Making gratings}  | 51/36        | . . collapsible or like thin-walled tubes, e.g. for toothpaste  |
| 47/01  | . beams or pillars   | 51/365       | . . . {involving fixing closure members to the tubes, e.g. nozzles}   |
| 47/02  | . . by expanding   | 51/38        | . . Making inlet or outlet arrangements of cans, tins, baths, bottles, or other vessels; Making can ends; Making closures   |
| 47/04  | . composite sheet metal profiles   | 51/383       | . . . {scoring lines, tear strips or pulling tabs}  |
| <b>49/00</b>   | <b>Sheathing or stiffening objects (by winding wire or tape thereon <a href="#">B65H 54/00, B65H 81/00</a>; specially adapted for manufacturing conductors or cables <a href="#">H01B 13/26</a>)</b> | 51/386       | . . . . {on the side-wall of containers}  |
| 49/005   | . {Hollow objects}   | 51/40        | . . . Making outlet openings, e.g. bung holes   |
| <b>51/00</b>   | <b>Making hollow objects (from thick-walled or non uniform tubes <a href="#">B21K 21/00</a>)</b>   | 51/42        | . . . . Making or attaching spouts  |
| 51/02  | . characterised by the structure of the objects ( <a href="#">{B21D 51/26 takes precedence}</a> )  | 51/44        | . . . Making closures, e.g. caps ( <a href="#">folded of thin metal foils in the way of making paper caps B31D 5/00; making closures in conjunction with applying same B67B</a> ) |
| <b>NOTE</b>  |  | 51/443       | . . . . {easily removable closures, e.g. by means of tear strips}   |
| Making hollow objects characterised both by their structure and by their use is classified only in group <a href="#">B21D 51/16</a>  |  | 51/446       | . . . . {Feeding or removal of material}  |
|  |  | 51/46        | . . . . Placing sealings or sealing material ( <a href="#">{moulding plastic sealing material into closure members B29C 70/80}</a> )  |
| 51/04  | . . built-up objects, e.g. objects with rigidly-attached bottom or cover   | 51/48        | . . . . Making crown caps   |
| 51/06  | . . folded objects   | 51/50        | . . . . Making screw caps   |
| 51/08  | . . ball-shaped objects  | 51/52        | . . boxes, cigarette cases, or the like   |
| 51/10  | . . conically or cylindrically shaped objects  | 51/54        | . . cartridge cases, e.g. for ammunition, for letter carriers in pneumatic-tube plants  |
| 51/12  | . . objects with corrugated walls  |              |   |
| 51/14  | . . Flattening hollow objects for transport or storage; Re-forming same ( <a href="#">making tubes from doubled flat material B21C 37/14</a> )   | <b>53/00</b> | <b>Making other particular articles (making wire fabrics <a href="#">B21F</a>; making chains or chain parts <a href="#">B21L</a>)</b>   |
| 51/16  | . characterised by the use of the objects ( <a href="#">making heat exchangers B21D 53/02</a> )  |              |   |

- B21D45/00,...

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