**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]
Bending tubes using mandrels or the like

Bending rods, profiles, or tubes

Apparatus with means to keep the profile in shape

Apparatus with rotating mandrel

Apparatus with oscillating mandrel

Apparatus or tool for preventing movement of parts of the work during bending

Apparatus for bending tubes through a curved die

Auxiliary equipment, e.g. machines for filling tubes with sand

Corrugating sheet metal, rods or profiles; Bending sheet metal, rods or profiles into wave form (tubes

Crankshafts

Bending tubes using mandrels or the like

Corrugation of tubes

Corrugating sheet metal, rods or profiles; Bending sheet metal, rods or profiles into wave form (tubes

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Straightening; Restoring form; Bending; Corrugating; Flanging

B21D

22/00 Shaping without cutting, by stamping, spinning, or deep-drawing otherwise than using rigid devices or tools or yieldable or resilient pads.

22/02 . . . Stamping using rigid devices or tools

22/022 . . . [by heating the blank or stamping associated with heat treatment (C21D takes precedence)]

22/025 . . . [for tubular articles]

22/027 . . . [for flattening the ends of corrugated sheets]

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]

22/12 . . . using enclosed flexible chambers

22/125 . . . [of tubular products]

22/14 . . . Spinning

22/16 . . . over shaping mandrels or formers

22/18 . . . using tools guided to produce the required profile

22/185 . . . [making bombed objects]

22/20 . . . Deep-drawing (special deep-drawing arrangements in, or in connection with, presses B21D 24/00)

22/201 . . . [Work-pieces; preparation of the work-pieces, e.g. lubricating, coating]

22/203 . . . [of compound articles]

22/205 . . . [Hydro-mechanical deep-drawing]

22/206 . . . [articles from a strip in several steps, the articles being coherent with the strip during the operation]

22/208 . . . [by heating the blank or deep-drawing associated with heat treatment (C21D takes precedence)]

22/21 . . . without fixing the border of the blank

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)

22/225 . . . [with members for radially pushing the blanks]

22/24 . . . involving two drawing operations having effects in opposite directions with respect to the blank

22/26 . . . for making peculiarly, e.g. irregularly, shaped articles

22/28 . . . of cylindrical articles using consecutive dies

22/283 . . . . . [with ram and dies aligning means]

22/286 . . . . . [with lubricating or cooling means]

22/30 . . . to finish articles formed by deep-drawing

24/00 Special deep-drawing arrangements in, or in connection with, presses

24/005 . . . [Multi-stage presses]

24/02 . . . Die-cushions

24/04 . . . Blank holders; Mounting means therefor

24/06 . . . Mechanically spring-loaded blank holders

24/08 . . . Pneumatically or hydraulically loaded blank holders

24/10 . . . Devices controlling or operating blank holders independently, or in conjunction with dies

24/12 . . . mechanically

24/14 . . . pneumatically or hydraulically

24/16 . . . Additional equipment in association with the tools, e.g. for shearing, for trimming

25/00 Working sheet metal of limited length by stretching, e.g. for straightening

25/02 . . . by pulling over a die

25/04 . . . Clamping arrangements

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)

26/02 . . . by applying fluid pressure

26/021 . . . Deforming sheet bodies

26/023 . . . . . including an additional treatment performed by fluid pressure, e.g. perforating

26/025 . . . . . Means for controlling the clamping or opening of the moulds

26/027 . . . . . Means for controlling fluid parameters, e.g. pressure or temperature

26/029 . . . . . Closing or sealing means

26/031 . . . . . Mould construction

26/033 . . . . . Deforming tubular bodies (corrugating tubes by applying fluid pressure B21D 15/03, B21D 15/10)

26/035 . . . . . including an additional treatment performed by fluid pressure, e.g. perforating

26/037 . . . . . Forming branched tubes
Stamping, Spinning, Deep-drawing; Working sheet metal of limited length by stretching; Punching

26/039 . . . Means for controlling the clamping or opening of the moulds
26/041 . . . Means for controlling fluid parameters, e.g. pressure or temperature
26/043 . . . Means for controlling the axial pusher
26/045 . . . Closing or sealing means
26/047 . . . Mould construction
(B21D 26/039 - B21D 26/045 take precedence)
26/049 . . . Deforming bodies having a closed end
26/051 . . . Deforming double-walled bodies
26/053 . . . characterised by the material of the blanks
26/055 . . . Blanks having super-plastic properties
26/057 . . . Tailored blanks
26/059 . . . Layered blanks
26/06 . . . by shock waves
26/08 . . . generated by explosives, e.g. chemical explosives
26/10 . . . generated by evaporation, e.g. of wire, of liquids
26/12 . . . initiated by spark discharge
26/14 . . . applying magnetic forces

28/00 Shaping by press-cutting; Perforating
28/002 . . . [Drive of the tools (B21D 28/002 and B21D 28/20 take precedence)]
28/005 . . . [Adjustment of the punch stroke for compensating wear]
28/007 . . . [Explosive cutting or perforating]
28/02 . . . Punching blanks or articles with or without obtaining scrap (cutting nails or pins from strips or sheet material B21G 3/26); Notching
28/04 . . . Centering the work; Positioning the tools
28/06 . . . Making more than one part out of the same blank; Scrapless working
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
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

28/343 . . . [Draw punches]
28/346 . . . [length adjustable perforating tools]
28/36 . . . using rotatable work or tool holders

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)
31/005 . . . [Incremental shaping or bending, e.g. stepwise moving a shaping tool along the surface of the workpiece (B21D 22/14 takes precedence)]
31/02 . . . Stabbing or piercing, e.g. for making sieves (dimpling B21D 22/04; perforating by punching B21D 28/24)
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)
31/043 . . . [Making use of slitting discs or punch cutters]
31/046 . . . [making use of rotating cutters]
31/06 . . . Deforming sheet metal, tubes or profiles by sequential impacts, e.g. hammering, beating, peen forming (forging hammers B21J 7/00)

33/00 Special measures in connection with working metal foils, e.g. gold foils (cutting or perforating of metal foil analogous to paper B26)

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)
35/001 . . . [Shaping combined with punching, e.g. stamping and perforating]
35/002 . . . [Processes combined with methods covered by groups B21D 1/00 - B21D 31/00]
35/003 . . . [Simultaneous forming, e.g. making more than one part per stroke (B21D 26/06 takes precedence)]
35/005 . . . [characterized by the material of the blank or the workpiece (B21D 26/053 takes precedence)]
35/006 . . . [Blanks having varying thickness, e.g. tailored blanks]
35/007 . . . [Layered blanks (B21D 22/203 takes precedence; joining superposed plates B21D 39/031, B21D 39/034, B21D 39/035)]
35/008 . . . [involving vibration, e.g. ultrasonic]

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)
37/01 . . . Selection of materials
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 . . . Pivotal-arranged tools, e.g. disengagable (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
Stamping, Spinning, Deep-drawing; Working sheet metal of limited length by stretching; Punching

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 B21F 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

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)

Feeding elongated articles, such as tubes, bars, or profiles

Advancing work in relation to the stroke of the die or tool

[Control or correction devices in association with moving strips]

[Loop-control]

[Centering devices, e.g. edge guiding]

[Fault detection, e.g. misfeed detection]

[Combination of two or more feeding devices provided for in B21D 43/04 - B21D 43/18]

[Combined feeding and ejecting devices]

[Tools travelling with material, e.g. flying punching machines]

by means in mechanical engagement with the work

[Control or correction devices in association with moving strips]

[specially adapted for multi-stage presses (B21D 43/145 takes precedence)]

[Devices having a cross bar]

[Devices comprising a pair of longitudinally and laterally movable parallel transfer bars]

[Devices for exchanging transfer bars or grippers; Idler stages, e.g. exchangeable]

[by positive or negative engaging parts cooperating with corresponding parts of the sheet or the like to be processed, e.g. carrier bolts or grooved section in the carriers]

[by rollers (B21D 43/145 takes precedence)]

[by one or more pairs of rollers for feeding sheet or strip material]

[by grippers (B21D 43/055, B21D 43/057, B21D 43/145 take precedence)]

[Manipulators, i.e. mechanical arms carrying a gripper element having several degrees of freedom]

[for feeding sheet or strip material]

[by chains or belts (B21D 43/145 takes precedence)]

[elsewhere]

[by linearly moving tables]

[by turning devices, e.g. turn-tables]

[Turnover devices, i.e. by turning about a substantially horizontal axis]
profiles according to any of groups B21D 1/00 - B21D 45/00, in the manufacture of finished or semi-finished articles

47/00 Making rigid structural elements or units, e.g. honeycomb structures
47/005 . . . (Making gratings)
47/01 . . . beams or pillars
47/02 . . . by expanding
47/04 . . . composite sheet metal profiles

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 11/26)
49/005 . . . [Hollow objects]

51/00 Making hollow objects (from thick-walled or non uniform tubes B21K 21/00)
51/02 . . . characterised by the structure of the objects (B21D 51/26 takes precedence))

NOTE
Making hollow objects characterised both by their structure and by their use is classified only in group B21D 51/16

51/04 . . . built-up objects, e.g. objects with rigidly-attached bottom or cover
51/06 . . . folded objects
51/08 . . . ball-shaped objects
51/10 . . . conically or cylindrically shaped objects
51/12 . . . objects with corrugated walls
51/14 . . . Flattening hollow objects for transport or storage; Re-forming same (making tubes from doubled flat material B21C 37/14)
51/16 . . . characterised by the use of the objects (making heat exchangers B21D 53/02)

51/18 . . . vessels, e.g. tubs, vats, tanks, sinks, or the like
51/20 . . . barrels
51/22 . . . pots, e.g. for cooking
51/24 . . . high-pressure containers, e.g. boilers, bottles
51/26 . . . cans or tins; Closing same in a permanent manner (making outlet arrangements B21D 51/38; welding or soldering B23K)
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)]
51/2615 . . . [Edge treatment of cans or tins]
51/2623 . . . [Curling]
51/263 . . . [Flanging]
51/2638 . . . [Necking]
51/2646 . . . [Of particular non cylindrical shape, e.g. conical, rectangular, polygonal, bulged]
51/2653 . . . [Methods or machines for closing cans by applying caps or bottoms]
51/2661 . . . [Sealing or closing means therefor]
51/2669 . . . [Transforming the shape of formed can bodies; Forming can bodies from flattened tubular blanks; Flatting can bodies]
51/2676 . . . [Cans or tins having longitudinal or helical seams]
51/2684 . . . [Cans or tins having circumferential side seams]
51/2692 . . . [Manipulating, e.g. feeding and positioning devices; Control systems]
51/28 . . . Folding the longitudinal seam
51/30 . . . Folding the circumferential seam
51/32 . . . by rolling
51/34 . . . by pressing
51/36 . . . collapsible or like thin-walled tubes, e.g. for toothpaste
51/365 . . . [involving fixing closure members to the tubes, e.g. nozzles]
51/38 . . . Making inlet or outlet arrangements of cans, tins, baths, bottles, or other vessels; Making can ends; Making closures
51/383 . . . [scoring lines, tear strips or pulling tabs]
51/386 . . . [on the side-wall of containers]
51/40 . . . Making outlet openings, e.g. bung holes
51/42 . . . Making or attaching spouts
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)
51/443 . . . [easily removable closures, e.g. by means of tear strips]
51/446 . . . [Feeding or removal of material]
51/46 . . . Placing sealings or sealing material ((moulding plastic sealing material into closure members B29C 70/80))
51/48 . . . Making crown caps
51/50 . . . Making screw caps
51/52 . . . boxes, cigarette cases, or the like
51/54 . . . cartridge cases, e.g. for ammunition, for letter carriers in pneumatic-tube plants

53/00 Making other particular articles (making wire fabrics B21F; making chains or chain parts B21L)
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)
53/02/2 . (Making the fins)
53/02/5 . (Louvered fins)
53/02/7 . (by helically or spirally winding elongated elements)
53/04 . of sheet metal
53/04/5 . . . (by inflating partially united plates)
53/06 . . . of metal tubes
53/08 . . . of both metal tubes and sheet metal (connecting tubes in openings B21D 39/06)
53/08/5 . . . (with fins places on zig-zag tubes or parallel tubes)
53/10 . . parts of bearings; sleeves; valve seats or the like
53/12 . . . cages for bearings
53/14 . . . belts, e.g. machine-gun belts
53/16 . . . rings, e.g. barrel hoops
53/18 . . . of hollow or C-shaped cross-section, e.g. for curtains, for eyelets
53/20 . . . washers, e.g. for sealing
53/22 . . . with means for preventing rotation
53/24 . . . nuts or like thread-engaging members
53/26 . . . wheels or the like
53/26/1 . . . (pulleys)
53/26/2 . . . (with inscriptions or the like, e.g. printing wheels)
53/26/4 . . . (wheels out of a single piece (B21D 53/26/1 takes precedence))
53/26/5 . . . (parts of wheels (B21D 53/28, B21D 53/30 take precedence))
53/26/7 . . . (blower wheels, i.e. wheels provided with fan elements)
53/26/8 . . . (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
53/52 . . . fastener elements; Attaching such elements so far as this procedure is combined with the process for making the elements
53/54 . . . slides
53/56 . . . stops
53/58 . . . end-pieces for laces or ropes
53/60 . . . cutlery wares; garden tools or the like
53/62 . . . spoons; table forks
53/64 . . . knives; scissors; cutting blades (B21D 53/72 takes precedence; handle portions B21D 53/70)
53/64/2 . . . (scissors)
53/64/5 . . . (safety razor blades)
53/64/7 . . . (mower blades)
53/66 . . . spades; shovels (handle portions B21D 53/70)
53/68 . . . rakes, garden forks, or the like (handle portions B21D 53/70)
53/70 . . . handle portions (B21D 53/72 takes precedence)
53/72 . . . sickles; scythes
53/74 . . . frames for openings, e.g. for windows, doors, handbags
53/74/5 . . . (Joining mitred profiles comprising punching the profiles on a corner-angle connecting piece)
53/76 . . . writing or drawing instruments, e.g. writing pens, erasing pens
53/78 . . . propeller blades; turbine blades
53/80 . . . dustproof covers; safety covers
53/82 . . . perforated music sheets; pattern sheets, e.g. for control purposes, stencils
53/84 . . . other parts for engines, e.g. connecting-rods
53/84/5 . . . (Making camshafts)
53/86 . . . other parts for bicycles or motorcycles
53/88 . . . other parts for vehicles, e.g. cowlings, mudguards
53/88/3 . . . . (reflectors)
53/88/6 . . . . (leaf springs)
53/90 . . . . axle-housings
53/92 . . . . other parts for aircraft
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)