

CPC COOPERATIVE PATENT CLASSIFICATION

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](#)

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
- 15/03 . . by applying fluid pressure
- 15/04 . transversely, e.g. helically
- 15/06 . . annularly ([with thinning B21C 37/205](#))
- 15/10 . . by applying fluid pressure
- 15/105 . . . {by applying elastic material}
- 15/12 . Bending tubes into wave form
- 17/00 Forming single grooves in sheet metal or tubular or hollow articles**
- 17/02 . by pressing ([grooving or notching of bolts, studs, or the like B21K 1/54](#))
- 17/025 . . {by pressing tubes axially}
- 17/04 . by rolling
- 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](#))
- 19/005 . {Edge deburring or smoothing}
- 19/02 . by continuously-acting tools moving along the edge ([edge-curling B21D 19/12](#))
- 19/04 . . shaped as rollers
- 19/043 . . . {for flanging edges of plates}
- 19/046 . . . {for flanging edges of tubular products}
- 19/06 . . . working inwardly
- 19/08 . by single or successive action of pressing tools, e.g. vice jaws
- 19/082 . . {for making negative angles}
- 19/084 . . . {with linear cams, e.g. aerial cams}

19/086	. . . {with rotary cams}	24/06	. . Mechanically spring-loaded blank holders
19/088	. . {for flanging holes}	24/08	. . Pneumatically or hydraulically loaded blank holders
19/10	. . working inwardly		
19/12	. Edge-curling	24/10	. Devices controlling or operating blank holders independently, or in conjunction with dies
19/14	. . Reinforcing edges, e.g. armouring same	24/12	. . mechanically
19/16	. Reverse flanging of tube ends	24/14	. . pneumatically or hydraulically
21/00	Combined processes according to methods covered by groups B21D 1/00 - B21D 19/00	24/16	. Additional equipment in association with the tools, e.g. for shearing, for trimming
<u>Stamping, Spinning, Deep-drawing; Working sheet metal of limited length by stretching; Punching</u>		25/00	Working sheet metal of limited length by stretching, e.g. for straightening
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)	25/02	. by pulling over a die
22/02	. Stamping using rigid devices or tools	25/04	. Clamping arrangements
22/022	. . {by heating the blank or stamping associated with heat treatment (C21D takes precedence)}	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)
22/025	. . {for tubular articles}	26/02	. by applying fluid pressure
22/027	. . {for flattening the ends of corrugated sheets}	26/021	. . Deforming sheet bodies
22/04	. . for dimpling (combined with perforating B21D 28/24)	26/023	. . . including an additional treatment performed by fluid pressure, e.g. perforating
22/06	. . having relatively-movable die parts	26/025	. . . Means for controlling the clamping or opening of the moulds
22/08	. . with die parts on rotating carriers	26/027	. . . Means for controlling fluid parameters, e.g. pressure or temperature
22/10	. Stamping using yieldable or resilient pads	26/029	. . . Closing or sealing means
22/105	. . {of tubular products}	26/031	. . . Mould construction (B21D 26/025 - B21D 26/029 take precedence)
22/12	. . using enclosed flexible chambers	26/033	. . Deforming tubular bodies (corrugating tubes by applying fluid pressure B21D 15/03 , B21D 15/10)
22/125	. . . {of tubular products}	26/035	. . . including an additional treatment performed by fluid pressure, e.g. perforating
22/14	. Spinning	26/037	. . . Forming branched tubes
22/16	. . over shaping mandrels or formers	26/039	. . . Means for controlling the clamping or opening of the moulds
22/18	. . using tools guided to produce the required profile	26/041	. . . Means for controlling fluid parameters, e.g. pressure or temperature
22/185	. . . {making bombed objects}	26/043	. . . Means for controlling the axial pusher
22/20	. Deep-drawing (special deep-drawing arrangements in, or in connection with, presses B21D 24/00)	26/045	. . . Closing or sealing means
22/201	. . {Work-pieces; preparation of the work-pieces, e.g. lubricating, coating}	26/047	. . . Mould construction (B21D 26/037 - B21D 26/045 take precedence)
22/203	. . {of compound articles}	26/049	. . . Deforming bodies having a closed end
22/205	. . {Hydro-mechanical deep-drawing}	26/051	. . . Deforming double-walled bodies
22/206	. . {articles from a strip in several steps, the articles being coherent with the strip during the operation}	26/053	. . characterised by the material of the blanks
22/208	. . {by heating the blank or deep-drawing associated with heat treatment (C21D takes precedence)}	26/055	. . . Blanks having super-plastic properties
22/21	. . without fixing the border of the blank	26/057	. . . Tailored blanks
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)	26/059	. . . Layered blanks
22/225	. . . {with members for radially pushing the blanks}	26/06	. . by shock waves
22/24	. . involving two drawing operations having effects in opposite directions with respect to the blank	26/08	. . . generated by explosives, e.g. chemical explosives
22/26	. . for making peculiarly, e.g. irregularly, shaped articles	26/10	. . . generated by evaporation, e.g. of wire, of liquids
22/28	. . of cylindrical articles using consecutive dies	26/12	. . . initiated by spark discharge
22/283	. . . {with ram and dies aligning means}	26/14	. applying magnetic forces
22/286	. . . {with lubricating or cooling means}	28/00	Shaping by press-cutting; Perforating
22/30	. . to finish articles formed by deep-drawing	28/002	. {Drive of the tools (B21D 28/007 and B21D 28/20 take precedence)}
24/00	Special deep-drawing arrangements in, or in connection with, presses	28/005	. . {Adjustment of the punch stroke for compensating wear}
24/005	. {Multi-stage presses}	28/007	. {Explosive cutting or perforating}
24/02	. Die-cushions		
24/04	. Blank holders; Mounting means therefor		

28/02	• Punching blanks or articles with or without obtaining scrap (cutting nails or pins from strips or sheet material B21G 3/26); Notching	35/00	Combined processes according to {or processes combined with} methods covered by groups B21D 1/00 - B21D 31/00 (B21D 21/00 takes precedence)
28/04	• • Centering the work; Positioning the tools		
28/06	• • Making more than one part out of the same blank; Scrapless working	35/001	• {Shaping combined with punching, e.g. stamping and perforating}
28/08	• • • Zig-zag sequence working	35/002	• {Processes combined with methods covered by groups B21D 1/00 - B21D 31/00 }
28/10	• • Incompletely punching in such a manner that the parts are still coherent with the work	35/003	• • {Simultaneous forming, e.g. making more than one part per stroke (B21D 26/06 takes precedence)}
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)	35/005	• • {characterized by the material of the blank or the workpiece (B21D 26/053 takes precedence)}
28/145	• • • {with means for slug retention, e.g. a groove}	35/006	• • • {Blanks having varying thickness, e.g. tailored blanks}
28/16	• • Shoulder or burr prevention {, e.g. fine-blanking}	35/007	• • • {Layered blanks (B21D 22/203 takes precedence; joining superposed plates B21D 39/031 , B21D 39/034 , B21D 39/035)}
28/18	• • Yieldable, e.g. rubber, punching pads		
28/20	• • Applications of drives {for reducing noise or wear}	35/008	• • {involving vibration, e.g. ultrasonic}
28/22	• • Notching the peripheries of circular blanks, e.g. laminations for dynamo-electric machines	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)
28/24	• Perforating, i.e. punching holes		
28/243	• • {in profiles}		
28/246	• • {Selection of punches}		
28/26	• • in sheets or flat parts	37/01	• Selection of materials
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}	37/02	• Die constructions enabling assembly of the die parts in different ways (B21D 37/06 takes precedence)
28/28	• • in tubes or other hollow bodies	37/04	• Movable or exchangeable mountings for tools
28/285	• • • {punching outwards}	37/06	• • Pivotally-arranged tools, e.g. disengageable (die sets with dies pivoted to one another B21D 37/12)
28/30	• • in annular parts, e.g. rims	37/08	• Dies with different parts for several steps in a process
28/32	• • in other articles of special shape	37/10	• Die sets; Pillar guides
28/325	• • • {using cam or wedge mechanisms, e.g. aerial cams}	37/12	• • Particular guiding equipment, {e.g. pliers}; Special arrangements for interconnection or co-operation of dies
28/34	• • Perforating tools; Die holders		
28/343	• • • {Draw punches}	37/14	• Particular arrangements for handling and holding in place complete dies
28/346	• • • {length adjustable perforating tools}		
28/36	• • using rotatable work or tool holders	37/142	• • {Spotting presses}
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)	37/145	• • {Die storage magazines}
31/005	• {Incremental shaping or bending, e.g. stepwise moving a shaping tool along the surface of the workpiece (B21D 22/14 takes precedence)}	37/147	• • {Tool exchange carts}
31/02	• Stabbing or piercing, e.g. for making sieves (dimpling B21D 22/04 ; perforating by punching B21D 28/24)	37/16	• Heating or cooling
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)	37/18	• Lubricating, {e.g. lubricating tool and workpiece simultaneously (lubricating workpieces for deep-drawing B21D 22/201)}
31/043	• • {Making use of slitting discs or punch cutters}	37/20	• Making tools by operations not covered by a single other subclass
31/046	• • {making use of rotating cutters}	37/205	• • {Making cutting tools}
31/06	• Deforming sheet metal, tubes or profiles by sequential impacts, e.g. hammering, beating, peen forming (forging hammers B21J 7/00)	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
33/00	Special measures in connection with working metal foils, e.g. gold foils (cutting or perforating of metal foil analogous to paper B26)	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)}
- 43/105 {Manipulators, i.e. mechanical arms carrying a gripper element having several degrees of freedom}
- 43/11 for feeding sheet or strip material
- 43/12 by chains or belts {([B21D 43/145](#) takes precedence)}
- 43/13 by linearly moving tables
- 43/14 by turning devices, e.g. turn-tables
- 43/145 {Turnover devices, i.e. by turning about a substantially horizontal axis}
- 43/16 . . . by gravity, e.g. chutes
- 43/18 . . . by means in pneumatic or magnetic engagement with the work
- 43/20 . . Storage arrangements; Piling or unpling ([in general B65G](#), [B65H](#))
- 43/22 . . Devices for piling sheets
- 43/24 . . Devices for removing sheets from a stack
- 43/26 . . Stops
- 43/28 . . Associations of cutting devices therewith
- 43/282 . . . {Discharging crop ends or the like}
- 43/285 . . . {Devices for handling elongated articles, e.g. bars, tubes or profiles ([B21D 43/282](#), [B21D 43/287](#) take precedence)}
- 43/287 . . . {Devices for handling sheet or strip material ([B21D 43/282](#) takes precedence)}
- 45/00 Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass**
- 45/003 . . . {in punching machines or punching tools}
- 45/006 . . . {Stripping-off devices}
- 45/02 . . Ejecting devices
- 45/04 . . . interrelated with motion of tool
- 45/06 . . Stripping-off devices
- 45/065 . . . {for deep-drawn cans, e.g. using stripping fingers}
- 45/08 . . . interrelated with motion of tool
- 45/10 . . Combined ejecting and stripping-off devices

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

- 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 13/26)**
- 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; Flattening 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](#))
 - 53/022 . . {Making the fins}
 - 53/025 . . . {Louvered fins}
 - 53/027 . . {by helically or spirally winding elongated elements}
 - 53/04 . . of sheet metal
 - 53/045 . . . {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](#))
 - 53/085 . . . {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
 - 53/261 . . {pulleys}
 - 53/262 . . {with inscriptions or the like, e.g. printing wheels}

- 53/264 . . {wheels out of a single piece ([B21D 53/261](#) takes precedence)}
- 53/265 . . {parts of wheels ([B21D 53/28](#), [B21D 53/30](#) take precedence)}
- 53/267 . . {blower wheels, i.e. wheels provided with fan elements}
- 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
- 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](#))
- 53/642 . . . {scissors}
- 53/645 . . . {safety razor blades}
- 53/647 . . . {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
- 53/745 . . {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
- 53/845 . . {Making camshafts}
- 53/86 . other parts for bicycles or motorcycles
- 53/88 . other parts for vehicles, e.g. cowlings, mudguards
- 53/883 . . {reflectors}
- 53/886 . . {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](#))