

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 B21C 37/205)}	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 (C21D takes precedence)}
15/12	. Bending tubes into wave form	22/21	. . without fixing the border of the blank
17/00	Forming single grooves in sheet metal or tubular or hollow articles	22/22	. . with devices for holding the edge of the blanks (B21D 22/24 - B21D 22/30 take precedence; shaping over a die without external former B21D 11/02)
17/02	. by pressing (grooving or notching of bolts, studs, or the like B21K 1/54)		
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
19/00	Flanging or other edge treatment, e.g. of tubes (connecting by making use of folds B21D 39/00; flaring-out tube ends B21D 41/02)	22/26	. . 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 B21D 19/12)	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}	24/00	Special deep-drawing arrangements in, or in connection with, presses
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		
21/00	Combined processes according to methods covered by groups B21D 1/00 - B21D 19/00	25/00	Working sheet metal of limited length by stretching, e.g. for straightening
<u>Stamping, Spinning, Deep-drawing; Working sheet metal of limited length by stretching; Punching</u>		25/02	. by pulling over a die
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)	25/04	. Clamping arrangements
22/02	. Stamping using rigid devices or tools	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)
22/022	. . {by heating the blank or stamping associated with heat treatment (C21D 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 B21D 28/24)	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 (B21D 26/025 - B21D 26/029 take precedence)
22/105	. . {of tubular products}	26/033	. . Deforming tubular bodies (corrugating tubes by applying fluid pressure B21D 15/03 , B21D 15/10)
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 bombed objects}		
22/20	. Deep-drawing (special deep-drawing arrangements in, or in connection with, presses B21D 24/00)		

- 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 26/037](#) - [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 28/007](#) 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 . . Pivotaly-arranged tools, e.g. disengageable ([die sets with dies pivoted to one another B21D 37/12](#))
- 37/08 . Dies with different parts for several steps in a process
- 37/10 . Die sets; Pillar guides
- 37/12 . . Particular guiding equipment, {e.g. pliers}; Special arrangements for interconnection or cooperation of dies

37/14	• Particular arrangements for handling and holding in place complete dies	41/00	Application of procedures in order to alter the diameter of tube ends (B21D 39/00 takes precedence {; plastic tubes B29C 57/08)
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 B21D 22/201)}	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}
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	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)
39/02	• of sheet metal by folding, e.g. connecting edges of a sheet to form a cylinder	43/003	• {Positioning devices (B21D 28/04 and B21D 28/265 take precedence; stops B21D 43/26 ; centering moving strips B21D 43/023)}
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 B21D 43/04 - B21D 43/18 }
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 {(B21D 43/145 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 F16L 13/14)}	43/055	• • • • {Devices comprising a pair of longitudinally and laterally movable parallel transfer bars}
39/042	• • {using explosives (by explosive welding B23K 20/08)}	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 {(B21D 43/145 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 {(B21D 43/055 , B21D 43/057 , B21D 43/145 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 {(B21D 43/145 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 (in general B65G, {B65H})	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 (making outlet arrangements B21D 51/38; welding or soldering B23K)
43/26	. Stops	51/2607	. . . {Locally embossing the walls of formed can bodies (B44B 5/00, B44C 1/24, B44C 3/085 take precedence; bulging B21D 51/2646)}
43/28	. 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 (B21D 43/282, B21D 43/287 take precedence)}	51/263	. . . . {Flanging}
43/287	. . {Devices for handling sheet or strip material (B21D 43/282 takes precedence)}	51/2638	. . . . {Necking}
45/00	Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass	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
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		51/32	. . . . by rolling
47/00	Making rigid structural elements or units, e.g. honeycomb structures	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}
49/00	Sheathing or stiffening objects (by winding wire or tape thereon B65H 54/00, B65H 81/00; specially adapted for manufacturing conductors or cables H01B 13/26)	51/386	. . . . {on the side-wall of containers}
49/005	. {Hollow objects}	51/40	. . . Making outlet openings, e.g. bung holes
51/00	Making hollow objects (from thick-walled or non uniform tubes B21K 21/00)	51/42	. . . . Making or attaching spouts
51/02	. characterised by the structure of the objects ({B21D 51/26 takes precedence})	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)
	NOTE	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 B21D 51/16	51/446	. . . . {Feeding or removal of material}
		51/46	. . . . Placing sealings or sealing material ({moulding plastic sealing material into closure members B29C 70/80})
51/04	. . 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 (making tubes from doubled flat material B21C 37/14)	53/00	Making other particular articles (making wire fabrics B21F; making chains or chain parts B21L)
51/16	. characterised by the use of the objects (making heat exchangers B21D 53/02)		

- B21D45/00,...

- 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](#))**