

CPC COOPERATIVE PATENT CLASSIFICATION

B PERFORMING OPERATIONS; TRANSPORTING

(NOTES omitted)

SHAPING

B21 MECHANICAL METAL-WORKING WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING METAL (casting, powder metallurgy [B22](#); shearing [B23D](#); working of metal by the action of a high concentration of electric current [B23H](#); soldering, welding, flame-cutting [B23K](#); other working of metal [B23P](#); punching sheet material in general [B26F](#); processes for changing of physical properties of metals [C21D](#), [C22F](#); electroforming [C25D 1/00](#))

(NOTES omitted)

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

NOTES

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

<u>Straightening; Restoring form; Bending; Corrugating; Flanging</u>	3/06	. . arranged inclined to a revolving flier rolling frame
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)	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)
1/02 . by rollers (B21D 1/06 takes precedence)	3/14	. Recontouring
1/05 . Stretching combined with rolling	3/16	. of specific articles made from metal rods, tubes, or profiles, e.g. crankshafts, by specially adapted methods or means
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 })	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)
1/10 . . of specific articles made from sheet metal, e.g. mudguards	5/002	. {Positioning devices}
1/12 . Straightening vehicle body parts or bodies (B21D 1/14 takes precedence)	5/004	. {with program control}
1/14 . Straightening frame structures	5/006	. {combined with measuring of bends}
1/145 . . {Clamps therefor}	5/008	. {combined with heating or cooling of the bends}
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 })	5/01	. between rams and anvils or abutments
	5/015	. . {for making tubes}
3/005 . {by eccentric turning members}	5/02	. on press brakes without making use of clamping means
3/02 . by rollers	5/0209	. . {Tools therefor}
3/04 . . arranged on axes skew to the path of the work	5/0218	. . . {Length adjustment of the punch}
3/045 . . . {Workpiece feed channels therefor}	5/0227	. . . {Length adjustment of the die}
3/05 . . arranged on axes rectangular to the path of the work	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 . . Juggling
- 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	22/208	. . {by heating the blank or deep-drawing associated with heat treatment (C21D takes precedence)}
15/105	. . . {by applying elastic material}	22/21	. . without fixing the border of the blank
15/12	. Bending tubes into wave form	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)
17/00	Forming single grooves in sheet metal or tubular or hollow articles	22/225	. . . {with members for radially pushing the blanks}
17/02	. by pressing (grooving or notching of bolts, studs, or the like B21K 1/54)	22/24	. . involving two drawing operations having effects in opposite directions with respect to the blank
17/025	. . {by pressing tubes axially}	22/26	. . for making peculiarly, e.g. irregularly, shaped articles
17/04	. by rolling	22/28	. . of cylindrical articles using consecutive dies
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)	22/283	. . . {with ram and dies aligning means}
19/005	. {Edge deburring or smoothing}	22/286	. . . {with lubricating or cooling means}
19/02	. by continuously-acting tools moving along the edge (edge-curling B21D 19/12)	22/30	. . to finish articles formed by deep-drawing
19/04	. . shaped as rollers	24/00	Special deep-drawing arrangements in, or in connection with, presses
19/043	. . . {for flanging edges of plates}	24/005	. {Multi-stage presses}
19/046	. . . {for flanging edges of tubular products}	24/02	. Die-cushions
19/06	. . . working inwardly	24/04	. Blank holders; Mounting means therefor
19/08	. by single or successive action of pressing tools, e.g. vice jaws	24/06	. . Mechanically spring-loaded blank holders
19/082	. . {for making negative angles}	24/08	. . Pneumatically or hydraulically loaded blank holders
19/084	. . . {with linear cams, e.g. aerial cams}	24/10	. Devices controlling or operating blank holders independently, or in conjunction with dies
19/086	. . . {with rotary cams}	24/12	. . mechanically
19/088	. . {for flanging holes}	24/14	. . pneumatically or hydraulically
19/10	. . working inwardly	24/16	. Additional equipment in association with the tools, e.g. for shearing, for trimming
19/12	. Edge-curling	25/00	Working sheet metal of limited length by stretching, e.g. for straightening
19/14	. . Reinforcing edges, e.g. armouring same	25/02	. by pulling over a die
19/16	. Reverse flanging of tube ends	25/04	. Clamping arrangements
21/00	Combined processes according to methods covered by groups B21D 1/00 - B21D 19/00	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)
Stamping, Spinning, Deep-drawing; Working sheet metal of limited length by stretching; Punching		26/02	. by applying fluid pressure
22/00	Shaping without cutting, by stamping, spinning, or deep-drawing (otherwise than using rigid devices or tools or yieldable or resilient pads B21D 26/00)	26/021	. . Deforming sheet bodies
22/02	. Stamping using rigid devices or tools	26/023	. . . including an additional treatment performed by fluid pressure, e.g. perforating
22/022	. . {by heating the blank or stamping associated with heat treatment (C21D takes precedence)}	26/025	. . . Means for controlling the clamping or opening of the moulds
22/025	. . {for tubular articles}	26/027	. . . Means for controlling fluid parameters, e.g. pressure or temperature
22/027	. . {for flattening the ends of corrugated sheets}	26/029	. . . Closing or sealing means
22/04	. . for dimpling (combined with perforating B21D 28/24)	26/031	. . . Mould construction (B21D 26/025 - B21D 26/029 take precedence)
22/06	. . having relatively-movable die parts	26/033	. . Deforming tubular bodies (corrugating tubes by applying fluid pressure B21D 15/03 , B21D 15/10)
22/08	. . with die parts on rotating carriers	26/035	. . . including an additional treatment performed by fluid pressure, e.g. perforating
22/10	. Stamping using yieldable or resilient pads	26/037	. . . Forming branched tubes
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)		

- 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
- 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](#))**

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| <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 B21C 37/22)</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 B21D 39/06)</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 (B21D 53/261 takes precedence)}</p> <p>53/265 . . {parts of wheels (B21D 53/28, B21D 53/30 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 B23P 15/005)}</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 (B21D 53/72 takes precedence; handle portions B21D 53/70)</p> <p>53/642 . . . {scissors}</p> <p>53/645 . . . {safety razor blades}</p> <p>53/647 . . . {mower blades}</p> | <p>53/66 . . spades; shovels (handle portions B21D 53/70)</p> <p>53/68 . . rakes, garden forks, or the like (handle portions B21D 53/70)</p> <p>53/70 . . handle portions (B21D 53/72 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>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)</p> |
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