

CPC**COOPERATIVE PATENT CLASSIFICATION****B21D**

WORKING OR PROCESSING OF SHEET METAL OR METAL TUBES, RODS OR PROFILES WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING(operations of the kind involved in the manufacture of such products [B21B](#), [B21C](#); working or processing of wire [B21F](#); cutting or severing devices or machines in general [B26](#); presses in general [B30B](#))

NOTE

This subclass covers cutting or perforating of sheet metal or other stock material

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](#)

Guidance heading: Straightening; Restoring form; Bending; Corrugating; Flanging

- B21D 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](#))
- [B21D 1/02](#) . by rollers([B21D 1/06](#) takes precedence)
- [B21D 1/05](#) . Stretching combined with rolling
- [B21D 1/06](#) . Removing local distortions
- [B21D 1/065](#) .. {by hammering}
- [B21D 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](#)})
- [B21D 1/10](#) .. of specific articles made from sheet metal, e.g. mudguards
- [B21D 1/12](#) . Straightening vehicle body parts or bodies([B21D 1/14](#) takes precedence)
- [B21D 1/14](#) . Straightening frame structures
- [B21D 1/145](#) .. {Clamps therefor}
- B21D 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](#)})
- [B21D 3/005](#) . {by eccentric turning members}
- [B21D 3/02](#) . by rollers
- [B21D 3/04](#) .. arranged on axes skew to the path of the work

- B21D 3/045 . . . {Workpiece feed channels therefor}
- B21D 3/05 . . arranged on axes rectangular to the path of the work
- B21D 3/06 . . arranged inclined to a revolving flier rolling frame
- B21D 3/08 . . which move in an orbit without rotating round the work

- B21D 3/10 . between rams and anvils or abutments
- B21D 3/12 . by stretching with or without twisting(by twisting only [B21D 11/14](#))
- B21D 3/14 . Recontouring
- B21D 3/16 . of specific articles made from metal rods, tubes, or profiles, e.g. crankshafts, by specially adapted methods or means

- B21D 5/00** **Bending sheet metal along straight lines, e.g. to form simple curves**([B21D 11/06](#) to [B21D 11/18](#) take precedence; corrugating sheet metal [B21D 13/00](#) ; as edge treatment [B21D 19/00](#))

- B21D 5/002 . {Positioning devices}
- B21D 5/004 . {with program control}
- B21D 5/006 . {combined with measuring of bends}
- B21D 5/008 . {combined with heating or cooling of the bends}
- B21D 5/01 . between rams and anvils or abutments
- B21D 5/015 . . {for making tubes}

- B21D 5/02 . on press brakes without making use of clamping means
- B21D 5/0209 . . {Tools therefor}
- B21D 5/0218 . . . {Length adjustment of the punch}
- B21D 5/0227 . . . {Length adjustment of the die}
- B21D 5/0236 . . . {Tool clamping}
- B21D 5/0245 {Fluid operated}
- B21D 5/0254 . . . {Tool exchanging}
- B21D 5/0263 . . . {Die with two oscillating halves}
- B21D 5/0272 . . {Deflection compensating means}
- B21D 5/0281 . . {Workpiece supporting devices}
- B21D 5/029 . . {with shearing devices}

- B21D 5/04 . on brakes making use of clamping means on one side of the work
- B21D 5/042 . . {With a rotational movement of the bending blade}
- B21D 5/045 . . {With a wiping movement of the bending blade}
- B21D 5/047 . . {Length adjustment of the clamping means}

- B21D 5/06 . by drawing procedure making use of dies or forming-rollers, e.g. making profiles
- B21D 5/08 .. making use of forming-rollers(B21D 5/12 takes precedence)
- B21D 5/083 ... {for obtaining profiles with changing cross-sectional configuration}
- B21D 5/086 ... {for obtaining closed hollow profiles}
- B21D 5/10 .. for making tubes
- B21D 5/12 ... making use of forming-rollers

- B21D 5/14 . by passing between rollers(B21D 5/06 takes precedence)
- B21D 5/143 .. {making use of a mandrel}
- B21D 5/146 .. {one roll being covered with deformable material}

- B21D 5/16 . Folding; Pleating

- B21D 7/00** **Bending rods, profiles, or tubes**(B21D 11/02 to B21D 11/18 take precedence; using mandrels or the like B21D 9/00)

- B21D 7/02 . over a stationary forming member; by use of a swinging forming member or abutment
- B21D 7/021 .. {Construction of forming members having more than one groove}
- B21D 7/022 .. over a stationary forming member only
- B21D 7/0225 ... {using pulling members}
- B21D 7/024 .. by a swinging forming member
- B21D 7/025 ... and pulling or pushing the ends of the work
- B21D 7/028 ... and altering the profile at the same time, e.g. forming bumpers
- B21D 7/03 .. Apparatus with means to keep the profile in shape

- B21D 7/04 . over a movably-arranged forming member(B21D 7/02 takes precedence)

- B21D 7/06 . in press brakes or between rams and anvils or abutments; Pliers with forming dies
- B21D 7/063 .. {Pliers with forming dies}
- B21D 7/066 .. {combined with oscillating members}

- B21D 7/08 . by passing between rollers or through a curved die
- B21D 7/085 .. {by passing through a curved die}

- B21D 7/10 . by abutting members and flexible bending means, e.g. with chains, ropes

- B21D 7/12 . with programme control

- B21D 7/14 . combined with measuring of bends or lengths

- B21D 7/16 . Auxiliary equipment, e.g. for heating or cooling of bends
- B21D 7/162 .. {Heating equipment}
- B21D 7/165 .. {Cooling equipment}

- B21D 7/167 . . {Greasing}
- B21D 9/00** **Bending tubes using mandrels or the like**([B21D 11/02](#) to [B21D 11/18](#) take precedence)
- B21D 9/01 . the mandrel being flexible and engaging the entire tube length
- B21D 9/03 . . and built-up from loose elements, e.g. series of balls
- B21D 9/04 . the mandrel being rigid
- B21D 9/05 . co-operating with forming members
- B21D 9/055 . . {Construction of forming members having more than one groove}
- B21D 9/07 . . with one or more swinging forming members engaging tube ends only
- B21D 9/073 . . . {with one swinging forming member}
- B21D 9/076 . . . {with more swinging forming members}
- B21D 9/08 . in press brakes or between rams and anvils or abutments; Pliers with forming dies
- B21D 9/085 . . {Pliers with forming dies}
- B21D 9/10 . by passing between rollers
- B21D 9/12 . by pushing over a curved mandrel; by pushing through a curved die
- B21D 9/125 . . {by pushing through a curved die}
- B21D 9/14 . Wrinkle-bending, i.e. bending by corrugating
- B21D 9/15 . using filling material of indefinite shape, e.g. sand, plastic material([filling of tubes with such material B21D 9/16](#))
- B21D 9/16 . Auxiliary equipment, e.g. machines for filling tubes with sand
- B21D 9/165 . . {Machines for filling tubes with sand}
- B21D 9/18 . . for heating or cooling of bends
- B21D 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](#) to [B21D 9/00](#)(corrugating or bending into wave form [B21D 13/00](#) , [B21D 15/00](#) ; flanging [B21D 19/00](#)); Twisting**
- B21D 11/02 . Bending by stretching or pulling over a die([working sheet metal of limited length by stretching B21D 25/00](#))
- B21D 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](#))
- B21D 11/07 . . Making serpentine-shaped articles by bending essentially in one plane
- B21D 11/08 . Bending by altering the thickness of part of the cross-section of the work([B21D 11/06 takes precedence](#))

- B21D 11/085 . . {by locally stretching or upsetting}
- B21D 11/10 . Bending specially adapted to produce specific articles, e.g. leaf springs{(making or bending leaf springs [B21D 53/886](#))}
- B21D 11/12 . . the articles being reinforcements for concrete
- B21D 11/125 . . . {Bending wire nets}
- B21D 11/14 . Twisting
- B21D 11/15 . . Reinforcing rods for concrete
- B21D 11/16 . . Crankshafts
- B21D 11/18 . Jogging
- B21D 11/20 . Bending sheet metal, not otherwise provided for
- B21D 11/203 . . {Round bending}
- B21D 11/206 . . {Curving corrugated sheets}
- B21D 11/22 . Auxiliary equipment, e.g. positioning devices
- B21D 13/00** **Corrugating sheet metal, rods or profiles; Bending sheet metal, rods or profiles into wave form(tubes [B21D 15/00](#))**
- B21D 13/02 . by pressing
- B21D 13/04 . by rolling
- B21D 13/045 . . {the corrugations being parallel to the feeding movement}
- B21D 13/06 . by drawing
- B21D 13/08 . by combined methods
- B21D 13/10 . into a peculiar profiling shape
- B21D 15/00** **Corrugating tubes(wrinkle-bending using mandrels or the like [B21D 9/14](#))**
- B21D 15/02 . longitudinally
- B21D 15/03 . . by applying fluid pressure
- B21D 15/04 . transversely, e.g. helically
- B21D 15/06 . . annularly{(with thinning [B21C 37/205](#))}
- B21D 15/10 . . by applying fluid pressure
- B21D 15/105 . . . {by applying elastic material}
- B21D 15/12 . Bending tubes into wave form

B21D 17/00 **Forming single grooves in sheet metal or tubular or hollow articles**

- B21D 17/02 . by pressing([grooving or notching of bolts, studs, or the like B21K 1/54](#))
- B21D 17/025 .. {by pressing tubes axially}
- B21D 17/04 . by rolling

B21D 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](#))

- B21D 19/005 . {Edge deburring or smoothing}
- B21D 19/02 . by continuously-acting tools moving along the edge([edge-curling B21D 19/12](#))
- B21D 19/04 .. shaped as rollers
- B21D 19/043 ... {for flanging edges of plates}
- B21D 19/046 ... {for flanging edges of tubular products}
- B21D 19/06 ... working inwardly
- B21D 19/08 . by single or successive action of pressing tools, e.g. vice jaws
- B21D 19/082 .. {for making negative angles}
- B21D 19/084 ... {with linear cams, e.g. aerial cams}
- B21D 19/086 ... {with rotary cams}
- B21D 19/088 .. {for flanging holes}
- B21D 19/10 .. working inwardly
- B21D 19/12 . Edge-curling
- B21D 19/14 .. Reinforcing edges, e.g. armouring same
- B21D 19/16 . Reverse flanging of tube ends

B21D 21/00 **Combined processes according to methods covered by groups [B21D 1/00](#) to [B21D 19/00](#)**

Guidance heading: **Stamping, Spinning, Deep-drawing; Working sheet metal of limited length by stretching; Punching**

B21D 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](#))

- B21D 22/02 . Stamping using rigid devices or tools
- B21D 22/022 .. {by heating the blank or stamping associated with heat treatment([C21D](#) takes precedence)}
- B21D 22/025 .. {for tubular articles}

- B21D 22/027 .. {for flattening the ends of corrugated sheets}
- B21D 22/04 .. for dimpling(combined with perforating [B21D 28/24](#))
- B21D 22/06 .. having relatively-movable die parts
- B21D 22/08 .. with die parts on rotating carriers

- B21D 22/10 . Stamping using yieldable or resilient pads
- B21D 22/105 .. {of tubular products}
- B21D 22/12 .. using enclosed flexible chambers
- B21D 22/125 ... {of tubular products}

- B21D 22/14 . Spinning
- B21D 22/16 .. over shaping mandrels or formers
- B21D 22/18 .. using tools guided to produce the required profile
- B21D 22/185 ... {making bombed objects}

- B21D 22/20 . Deep-drawing([special deep-drawing arrangements in, or in connection with, presses B21D 24/00](#))
- B21D 22/201 .. {Work-pieces; preparation of the work-pieces, e.g. lubricating, coating}
- B21D 22/203 .. {of compound articles}
- B21D 22/205 .. {Hydro-mechanical deep-drawing}
- B21D 22/206 .. {articles from a strip in several steps, the articles being coherent with the strip during the operation}
- B21D 22/208 .. {by heating the blank or deep-drawing associated with heat treatment([C21D takes precedence](#))}
- B21D 22/21 .. without fixing the border of the blank
- B21D 22/22 .. with devices for holding the edge of the blanks([B21D 22/24 to B21D 22/30 take precedence; shaping over a die without external former B21D 11/02](#))
- B21D 22/225 ... {with members for radially pushing the blanks}
- B21D 22/24 .. involving two drawing operations having effects in opposite directions with respect to the blank
- B21D 22/26 .. for making peculiarly, e.g. irregularly, shaped articles
- B21D 22/28 .. of cylindrical articles using consecutive dies
- B21D 22/283 ... {with ram and dies aligning means}
- B21D 22/286 ... {with lubricating or cooling means}
- B21D 22/30 .. to finish articles formed by deep-drawing

- B21D 24/00 **Special deep-drawing arrangements in, or in connection with, presses****

- B21D 24/005 . {Multi-stage presses}

- B21D 24/02 . Die-cushions

- B21D 24/04 . Blank holders; Mounting means therefor
- B21D 24/06 .. Mechanically spring-loaded blank holders

- B21D 24/08 . . Pneumatically or hydraulically loaded blank holders
- B21D 24/10 . Devices controlling or operating blank holders independently, or in conjunction with dies
- B21D 24/12 . . mechanically
- B21D 24/14 . . pneumatically or hydraulically
- B21D 24/16 . Additional equipment in association with the tools e.g. for shearing, for trimming
- B21D 25/00 Working sheet metal of limited length by stretching, e.g. for straightening**
- B21D 25/02 . by pulling over a die
- B21D 25/04 . Clamping arrangements
- B21D 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](#))**
- B21D 26/02 . by applying fluid pressure
- B21D 26/021 . . Deforming sheet bodies
- B21D 26/023 . . . including an additional treatment performed by fluid pressure, e.g. perforating
- B21D 26/025 . . . Means for controlling the clamping or opening of the moulds
- B21D 26/027 . . . Means for controlling fluid parameters, e.g. pressure or temperature
- B21D 26/029 . . . Closing or sealing means
- B21D 26/031 . . . Mould construction([B21D 26/025 - B21D 26/029 take precedence](#))
- B21D 26/033 . . Deforming tubular bodies([corrugating tubes by applying fluid pressure B21D 15/03](#) , [B21D 15/10](#))
- B21D 26/035 . . . including an additional treatment performed by fluid pressure, e.g. perforating
- B21D 26/037 . . . Forming branched tubes
- B21D 26/039 . . . Means for controlling the clamping or opening of the moulds
- B21D 26/041 . . . Means for controlling fluid parameters, e.g. pressure or temperature
- B21D 26/043 . . . Means for controlling the axial pusher
- B21D 26/045 . . . Closing or sealing means
- B21D 26/047 . . . Mould construction([B21D 26/037 - B21D 26/045 take precedence](#))
- B21D 26/049 . . . Deforming bodies having a closed end
- B21D 26/051 . . . Deforming double-walled bodies
- B21D 26/053 . . characterised by the material of the blanks
- B21D 26/055 . . . Blanks having super-plastic properties
- B21D 26/057 . . . Tailored blanks
- B21D 26/059 . . . Layered blanks
- B21D 26/06 . . by shock waves
- B21D 26/08 . . . generated by explosives, e.g. chemical explosives

- B21D 26/10 . . . generated by evaporation, e.g. of wire, of liquids
- B21D 26/12 . . . initiated by spark discharge
- B21D 26/14 . applying magnetic forces
- B21D 28/00 Shaping by press-cutting; Perforating**
- B21D 28/002 . {Drive of the tools(B21D 28/007 and B21D 28/20 take precedence)}
- B21D 28/005 . . {Adjustment of the punch stroke for compensating wear}
- B21D 28/007 . {Explosive cutting or perforating}
- B21D 28/02 . Punching blanks or articles with or without obtaining scrap(cutting nails or pins from strips or sheet material B21G 3/26); Notching
- B21D 28/04 . . Centering the work; Positioning the tools
- B21D 28/06 . . Making more than one part out of the same blank; Scrapless working
- B21D 28/08 . . . Zig-zag sequence working
- B21D 28/10 . . Incompletely punching in such a manner that the parts are still coherent with the work
- B21D 28/12 . . Punching using rotatable carriers
- B21D 28/125 . . . {with multi-tools}
- B21D 28/14 . . Dies(ejecting or stripping-off devices arranged in punching machines or tools B21D 45/00)
- B21D 28/145 . . . {with means for slug retention, e.g. a groove}
- B21D 28/16 . . Shoulder or burr prevention{, e.g. fine-blanking}
- B21D 28/18 . . Yieldable, e.g. rubber, punching pads
- B21D 28/20 . . Applications of drives{for reducing noise or wear}
- B21D 28/22 . . Notching the peripheries of circular blanks, e.g. laminations for dynamo-electric machines
- B21D 28/24 . Perforating, i.e. punching holes
- B21D 28/243 . . {in profiles}
- B21D 28/246 . . {Selection of punches}
- B21D 28/26 . . in sheets or flat parts
- B21D 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}
- B21D 28/28 . . in tubes or other hollow bodies
- B21D 28/285 . . . {punching outwards}
- B21D 28/30 . . in annular parts, e.g. rims
- B21D 28/32 . . in other articles of special shape
- B21D 28/325 . . . {using cam or wedge mechanisms, e.g. aerial cams}
- B21D 28/34 . . Perforating tools; Die holders
- B21D 28/343 . . . {Draw punches}

B21D 28/346	... {length adjustable perforating tools}
B21D 28/36	.. using rotatable work or tool holders
B21D 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)
B21D 31/005	. {Incremental shaping or bending, e.g. stepwise moving a shaping tool along the surface of the workpiece(B21D 22/14 takes precedence)}
B21D 31/02	. Stabbing or piercing, e.g. for making sieves(dimpling B21D 22/04 ; perforating by punching B21D 28/24)
B21D 31/04	. Expanding other than provided for in groups B21D 1/00 to B21D 28/00 , e.g. for making expanded metal (B21D 47/00 takes precedence; enlarging tube ends B21D 41/02)
B21D 31/043	.. {Making use of slitting discs or punch cutters}
B21D 31/046	.. {making use of rotating cutters}
B21D 31/06	. Deforming sheet metal, tubes or profiles by sequential impacts, e.g. hammering, beating, peen forming(forging hammers B21J 7/00)
B21D 33/00	Special measures in connection with working metal foils, e.g. gold foils (cutting or perforating of metal foil analogous to paper B26)
B21D 35/00	Combined processes according to {or processes combined with} methods covered by groups B21D 1/00 to B21D 31/00 (B21D 21/00 takes precedence)
B21D 35/001	. {Shaping combined with punching, e.g. stamping and perforating}
B21D 35/002	. { Processes combined with methods covered by groups B21D 1/00 to B21D 31/00 }
B21D 35/003	.. {Simultaneous forming, e.g. making more than one part per stroke(B21D 26/06 takes precedence)}
B21D 35/005	.. {characterized by the material of the blank or the workpiece(B21D 26/053 takes precedence)}
B21D 35/006	... {Blanks having varying thickness, e.g. tailored blanks}
B21D 35/007	... {Layered blanks(B21D 22/203 takes precedence; joining superposed plates B21D 39/031 , B21D 39/034 , B21D 39/035)}
B21D 35/008	.. {involving vibration, e.g. ultrasonic}
B21D 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)
B21D 37/01	. Selection of materials
B21D 37/02	. Die constructions enabling assembly of the die parts in different ways(B21D 37/06 takes precedence)

- B21D 37/04 . Movable or exchangeable mountings for tools
- B21D 37/06 .. Pivotaly-arranged tools, e.g. disengageable([die sets with dies pivoted to one another B21D 37/12](#))
- B21D 37/08 . Dies with different parts for several steps in a process
- B21D 37/10 . Die sets; Pillar guides
- B21D 37/12 .. Particular guiding equipment,{e.g. [pliers](#)}; Special arrangements for interconnection or co-operation of dies
- B21D 37/14 . Particular arrangements for handling and holding in place complete dies
- B21D 37/142 .. {[Spotting presses](#)}
- B21D 37/145 .. {[Die storage magazines](#)}
- B21D 37/147 .. {[Tool exchange carts](#)}
- B21D 37/16 . Heating or cooling
- B21D 37/18 . Lubricating,{e.g. [lubricating tool and workpiece simultaneously](#)}([lubricating workpieces for deep-drawing B21D 22/201](#))}
- B21D 37/20 . Making tools by operations not covered by a single other subclass
- B21D 37/205 .. {[Making cutting tools](#)}
- B21D 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**
- B21D 39/02 . of sheet metal by folding, e.g. connecting edges of a sheet to form a cylinder
- B21D 39/021 .. {[for panels, e.g. vehicle doors](#)}
- B21D 39/023 ... {[using rollers](#)}
- B21D 39/025 .. {[Hand tools](#)}
- B21D 39/026 .. {[Reinforcing the connection by locally deforming](#)}
- B21D 39/028 .. {[Reinforcing the connection otherwise than by deforming, e.g. welding](#)}
- B21D 39/03 . of sheet metal otherwise than by folding
- B21D 39/031 .. {[Joining superposed plates by locally deforming without slitting or piercing](#)}
- B21D 39/032 ... {[by fitting a projecting part integral with one plate in a hole of the other plate](#)}
- B21D 39/034 .. {[Joining superposed plates by piercing](#)}
- B21D 39/035 .. {[Joining superposed plates by slitting](#)}
- B21D 39/037 .. {[Interlocking butt joints](#)}
- B21D 39/038 .. {[Perpendicular plate connections](#)}
- B21D 39/04 . of tubes with tubes; of tubes with rods{([crimped pipe joints as such F16L 13/14](#))}

- B21D 39/042 . . {using explosives(by explosive welding [B23K 20/08](#))}
- B21D 39/044 . . {perpendicular}
- B21D 39/046 . . {Connecting tubes to tube-like fittings}
- B21D 39/048 . . {using presses for radially crimping tubular elements}

- B21D 39/06 . of tubes in openings, e.g. rolling-in
- B21D 39/063 . . {for assembling ladders}
- B21D 39/066 . . {using explosives}

- B21D 39/08 . Tube expanders
- B21D 39/10 . . with rollers for expanding only
- B21D 39/12 . . with rollers for expanding and flanging
- B21D 39/14 . . with balls
- B21D 39/16 . . with torque limiting devices
- B21D 39/18 . . Rollers of special shape
- B21D 39/20 . . with mandrels, e.g. expandable
- B21D 39/203 . . . {expandable by fluid or elastic material}
- B21D 39/206 {by axially compressing the elastic material}

B21D 41/00 **Application of procedures in order to alter the diameter of tube ends**([B21D 39/00](#) takes precedence; { plastic tubes [B29C 57/08](#))

- B21D 41/02 . Enlarging
- B21D 41/021 . . {by means of tube-flaring hand tools}
- B21D 41/023 . . . {comprising rolling elements}
- B21D 41/025 . . {by means of impact-type swaging hand tools}
- B21D 41/026 . . {by means of mandrels}
- B21D 41/028 . . . {expandable mandrels}
- B21D 41/04 . Reducing; Closing
- B21D 41/045 . . {Closing}

B21D 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](#))

- B21D 43/003 . {Positioning devices([B21D 28/04](#) and [B21D 28/265](#) take precedence; stops [B21D 43/26](#) ; centering moving strips [B21D 43/023](#))}
- B21D 43/006 . {Feeding elongated articles, such as tubes, bars, or profiles}
- B21D 43/02 . Advancing work in relation to the stroke of the die or tool
- B21D 43/021 . . {Control or correction devices in association with moving strips}

- B21D 43/022 . . . {Loop-control}
- B21D 43/023 . . . {Centering devices, e.g. edge guiding}
- B21D 43/025 . . {Fault detection, e.g. misfeed detection}
- B21D 43/026 . . {Combination of two or more feeding devices provided for in [B21D 43/04](#) to [B21D 43/18](#)}
- B21D 43/027 . . {Combined feeding and ejecting devices}
- B21D 43/028 . . {Tools travelling with material, e.g. flying punching machines}
- B21D 43/04 . . by means in mechanical engagement with the work
- B21D 43/05 . . . specially adapted for multi-stage presses([B21D 43/145](#) takes precedence)}
- B21D 43/052 {Devices having a cross bar}
- B21D 43/055 {Devices comprising a pair of longitudinally and laterally movable parallel transfer bars}
- B21D 43/057 {Devices for exchanging transfer bars or grippers; Idle stages, e.g. exchangeable}
- B21D 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
- B21D 43/08 . . . by rollers([B21D 43/145](#) takes precedence)}
- B21D 43/09 by one or more pairs of rollers for feeding sheet or strip material
- B21D 43/10 . . . by grippers([B21D 43/055](#) , [B21D 43/057](#) , [B21D 43/145](#) take precedence)}
- B21D 43/105 {Manipulators, i.e. mechanical arms carrying a gripper element having several degrees of freedom}
- B21D 43/11 for feeding sheet or strip material
- B21D 43/12 . . . by chains or belts([B21D 43/145](#) takes precedence)}
- B21D 43/13 . . . by linearly moving tables
- B21D 43/14 . . . by turning devices, e.g. turn-tables
- B21D 43/145 {Turnover devices, i.e. by turning about a substantially horizontal axis}
- B21D 43/16 . . by gravity, e.g. chutes
- B21D 43/18 . . by means in pneumatic or magnetic engagement with the work
- B21D 43/20 . Storage arrangements; Piling or unpling(in general [B65G](#) , {[B65H](#)})
- B21D 43/22 . . Devices for piling sheets
- B21D 43/24 . . Devices for removing sheets from a stack
- B21D 43/26 . Stops
- B21D 43/28 . Associations of cutting devices therewith
- B21D 43/282 . . {Discharging crop ends or the like}
- B21D 43/285 . . {Devices for handling elongated articles, e.g. bars, tubes or profiles([B21D 43/282](#) , [B21D 43/287](#) take precedence)}
- B21D 43/287 . . {Devices for handling sheet or strip material([B21D 43/282](#) takes precedence)}

B21D 45/00 **Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass**

- B21D 45/003 . {in punching machines or punching tools}
- B21D 45/006 .. {Stripping-off devices}
- B21D 45/02 . Ejecting devices
- B21D 45/04 .. interrelated with motion of tool
- B21D 45/06 . Stripping-off devices
- B21D 45/065 .. {for deep-drawn cans; e.g. using stripping fingers}
- B21D 45/08 .. interrelated with motion of tool
- B21D 45/10 . Combined ejecting and stripping-off devices

Guidance heading: 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

B21D 47/00 **Making rigid structural elements or units, e.g. honeycomb structures**

- B21D 47/005 . {Making gratings}
- B21D 47/01 . beams or pillars
- B21D 47/02 .. by expanding
- B21D 47/04 . composite sheet metal profiles

B21D 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](#))

- B21D 49/005 . {Hollow objects}

B21D 51/00 **Making hollow objects**(from thick-walled or non uniform tubes [B21K 21/00](#))

- B21D 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](#)

- B21D 51/04 .. built-up objects, e.g. objects with rigidly-attached bottom or cover
- B21D 51/06 .. folded objects
- B21D 51/08 .. ball-shaped objects

B21D 51/10	..	conically or cylindrically shaped objects
B21D 51/12	..	objects with corrugated walls
B21D 51/14	..	Flattening hollow objects for transport or storage; Re-forming same(making tubes from doubled flat material B21C 37/14)
B21D 51/16	.	characterised by the use of the objects(making heat exchangers B21D 53/02)
B21D 51/18	..	vessels, e.g. tubs, vats, tanks, sinks, or the like
B21D 51/20	...	barrels
B21D 51/22	...	pots, e.g. for cooking
B21D 51/24	..	high-pressure containers, e.g. boilers, bottles
B21D 51/26	..	cans or tins; Closing same in a permanent manner(making outlet arrangements B21D 51/38 ; welding or soldering B23K)
B21D 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) }
B21D 51/2615	...	{ Edge treatment of cans or tins }
B21D 51/2623	....	{Curling }
B21D 51/263	....	{Flanging }
B21D 51/2638	....	{Necking }
B21D 51/2646	...	{ Of particular non cylindrical shape, e.g. conical, rectangular, polygonal, bulged }
B21D 51/2653	...	{ Methods or machines for closing cans by applying caps or bottoms }
B21D 51/2661	....	{Sealing or closing means therefor }
B21D 51/2669	...	{ Transforming the shape of formed can bodies; Forming can bodies from flattened tubular blanks; Flattening can bodies }
B21D 51/2676	...	{ Cans or tins having longitudinal or helical seams }
B21D 51/2684	...	{ Cans or tins having circumferential side seams }
B21D 51/2692	...	{ Manipulating, e.g. feeding and positioning devices; Control systems }
B21D 51/28	...	Folding the longitudinal seam
B21D 51/30	...	Folding the circumferential seam
B21D 51/32	....	by rolling
B21D 51/34	....	by pressing
B21D 51/36	..	collapsible or like thin-walled tubes, e.g. for toothpaste
B21D 51/365	...	{ involving fixing closure members to the tubes, e.g. nozzles }
B21D 51/38	..	Making inlet or outlet arrangements of cans, tins, baths, bottles, or other vessels; Making can ends; Making closures
B21D 51/383	...	{ scoring lines, tear strips or pulling tabs }
B21D 51/386	....	{on the side-wall of containers }
B21D 51/40	...	Making outlet openings, e.g. bung holes
B21D 51/42	....	Making or attaching spouts
B21D 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)
B21D 51/443	....	{easily removable closures, e.g. by means of tear strips }
B21D 51/446	....	{Feeding or removal of material }

B21D 51/46	....	Placing sealings or sealing material{(moulding plastic sealing material into closure members B29C 70/80)}
B21D 51/48	....	Making crown caps
B21D 51/50	....	Making screw caps
B21D 51/52	..	boxes, cigarette cases, or the like
B21D 51/54	..	cartridge cases, e.g. for ammunition, for letter carriers in pneumatic-tube plants
B21D 53/00		Making other particular articles (making wire fabrics B21F ; making chains or chain parts B21L)
B21D 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)
B21D 53/022	..	{Making the fins}
B21D 53/025	...	{Louvered fins}
B21D 53/027	..	{by helically or spirally winding elongated elements}
B21D 53/04	..	of sheet metal
B21D 53/045	...	{by inflating partially united plates}
B21D 53/06	..	of metal tubes
B21D 53/08	..	of both metal tubes and sheet metal(connecting tubes in openings B21D 39/06)
B21D 53/085	...	{with fins places on zig-zag tubes or parallel tubes}
B21D 53/10	.	parts of bearings; sleeves; valve seats or the like
B21D 53/12	..	cages for bearings
B21D 53/14	.	belts, e.g. machine-gun belts
B21D 53/16	.	rings, e.g. barrel hoops
B21D 53/18	..	of hollow or C-shaped cross-section, e.g. for curtains, for eyelets
B21D 53/20	..	washers, e.g. for sealing
B21D 53/22	...	with means for preventing rotation
B21D 53/24	.	nuts or like thread-engaging members
B21D 53/26	.	wheels or the like
B21D 53/261	..	{pulleys}
B21D 53/262	..	{with inscriptions or the like, e.g. printing wheels}
B21D 53/264	..	{wheels out of a single piece(B21D 53/261 takes precedence)}
B21D 53/265	..	{parts of wheels(B21D 53/28 , B21D 53/30 take precedence)}
B21D 53/267	..	{blower wheels, i.e. wheels provided with fan elements}
B21D 53/268	..	{wheels having spokes}
B21D 53/28	..	gear wheels
B21D 53/30	..	wheel rims
B21D 53/32	..	wheel covers

B21D 53/34	.. brake drums
B21D 53/36	. clips, clamps, or like fastening or attaching devices, e.g. for electric installation
B21D 53/38	. locksmith`s goods, e.g. handles
B21D 53/40	.. hinges, e.g. door hinge plates
B21D 53/42	.. keys{(making keys by combined operations B23P 15/005)}
B21D 53/44	. fancy goods, e.g. jewellery products
B21D 53/46	. haberdashery, e.g. buckles, combs; pronged fasteners, e.g. staples
B21D 53/48	.. buttons, e.g. press-buttons, snap fasteners
B21D 53/50	.. metal slide-fastener parts
B21D 53/52	... fastener elements; Attaching such elements so far as this procedure is combined with the process for making the elements
B21D 53/54	... slides
B21D 53/56	... stops
B21D 53/58	. end-pieces for laces or ropes
B21D 53/60	. cutlery wares; garden tools or the like
B21D 53/62	.. spoons; table forks
B21D 53/64	.. knives; scissors; cutting blades(B21D 53/72 takes precedence ; handle portions B21D 53/70)
B21D 53/642	... {scissors}
B21D 53/645	... {safety razor blades}
B21D 53/647	... {mower blades}
B21D 53/66	.. spades; shovels(handle portions B21D 53/70)
B21D 53/68	.. rakes, garden forks, or the like(handle portions B21D 53/70)
B21D 53/70	.. handle portions(B21D 53/72 takes precedence)
B21D 53/72	.. sickles; scythes
B21D 53/74	. frames for openings, e.g. for windows, doors, handbags
B21D 53/745	.. { Joining mitred profiles comprising punching the profiles on a corner-angle connecting piece }
B21D 53/76	. writing or drawing instruments, e.g. writing pens, erasing pens
B21D 53/78	. propeller blades; turbine blades
B21D 53/80	. dustproof covers; safety covers
B21D 53/82	. perforated music sheets; pattern sheets, e.g. for control purposes, stencils
B21D 53/84	. other parts for engines, e.g. connecting-rods
B21D 53/845	.. { Making camshafts }

- B21D 53/86
 - . other parts for bicycles or motorcycles
- B21D 53/88
 - . other parts for vehicles, e.g. cowlings, mudguards
- B21D 53/883
 - . . {reflectors}
- B21D 53/886
 - . . {leaf springs}
- B21D 53/90
 - . . axle-housings
- B21D 53/92
 - . other parts for aircraft
- B21D 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](#))