

ECLA EUROPEAN 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) [C9412]**

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

Guide heading: **Straightening; Restoring form; Bending; Corrugating; Flanging**

- B21D1/00** **Straightening, restoring form or removing local distortions of sheet metal or specific articles made therefrom ([B21D3/00](#) takes precedence); Stretching sheet metal combined with rolling (working sheet metal of limited length by stretching [B21D25/00](#); by localised hammering [B21D31/06](#))**
- [B21D1/02](#) . by rollers ([B21D1/06](#) takes precedence)
- [B21D1/05](#) . Stretching combined with rolling
- [B21D1/06](#) . Removing local distortions
- [B21D1/06B](#) . . [N: by hammering] [N1204]
- [B21D1/08](#) . . of hollow bodies made from sheet metal (of substantially open bodies [B21D1/10](#); [N: flattening hollow objects for transport and reforming [B21D51/14](#)])
- [B21D1/10](#) . . of specific articles made from sheet metal, e.g. mudguards
- [B21D1/12](#) . Straightening vehicle body parts or bodies ([B21D1/14](#) takes precedence)
- [B21D1/14](#) . Straightening frame structures
- [B21D1/14C](#) . . [N: Clamps therefor]
- B21D3/00** **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; [N: straightening rails or rail joints E01B31/08]) [N1204]**
- [B21D3/00B](#) . [N: by eccentric turning members]
- [B21D3/02](#) . by rollers
- [B21D3/04](#) . . arranged on axes skew to the path of the work

- B21D3/04B . . . [N: Workpiece feed channels therefor]
- B21D3/05 . . arranged on axes rectangular to the path of the work
- B21D3/06 . . arranged inclined to a revolving flier rolling frame
- B21D3/08 . . which move in an orbit without rotating round the work

- B21D3/10 . between rams and anvils or abutments
- B21D3/12 . by stretching with or without twisting (by twisting only [B21D11/14](#))
- B21D3/14 . Recontouring
- B21D3/16 . of specific articles made from metal rods, tubes, or profiles, e.g. crankshafts, by specially adapted methods or means [M1111]

- B21D5/00** **Bending sheet metal along straight lines, e.g. to form simple curves ([B21D11/06](#) to [B21D11/18](#) take precedence; corrugating sheet metal [B21D13/00](#); as edge treatment [B21D19/00](#))**

- B21D5/00B . [N: Positioning devices]
- B21D5/00C . [N: with program control] [N1204]
- B21D5/00D . [N: combined with measuring of bends] [N1204]
- B21D5/00E . [N: combined with heating or cooling of the bends] [N1204]
- B21D5/01 . between rams and anvils or abutments
- B21D5/01B . . [N: for making tubes]

- B21D5/02 . on press brakes without making use of clamping means
- B21D5/02B . . [N: Tools therefor]
- B21D5/02B1 . . . [N: Length adjustment of the punch] [N1204]
- B21D5/02B2 . . . [N: Length adjustment of the die] [N1204]
- B21D5/02B3 . . . [N: Tool clamping] [N1204]
- B21D5/02B3B [N: Fluid operated] [N1204]
- B21D5/02B4 . . . [N: Tool exchanging] [N1204]
- B21D5/02B5 . . . [N: Die with two oscillating halves] [N1204]
- B21D5/02C . . [N: Deflection compensating means]
- B21D5/02D . . [N: Workpiece supporting devices]
- B21D5/02E . . [N: with shearing devices]

- B21D5/04 . on brakes making use of clamping means on one side of the work
- B21D5/04B . . [N: With a rotational movement of the bending blade] [N1204]
- B21D5/04C . . [N: With a wiping movement of the bending blade] [N1204]
- B21D5/04D . . [N: Length adjustment of the clamping means] [N1204]

- B21D5/06 . by drawing procedure making use of dies or forming-rollers, e.g. making profiles

- B21D5/08 . . . making use of forming-rollers ([B21D5/12](#) takes precedence)
- B21D5/08B [N: for obtaining profiles with changing cross-sectional configuration]
- B21D5/08C [N: for obtaining closed hollow profiles]
- B21D5/10 . . . for making tubes
- B21D5/12 making use of forming-rollers

- B21D5/14 . . . by passing between rollers ([B21D5/06](#) takes precedence)
- B21D5/14B [N: making use of a mandrel]
- B21D5/14C [N: one roll being covered with deformable material]

- B21D5/16 . . . Folding; Pleating

- B21D7/00** **Bending rods, profiles, or tubes** ([B21D11/02](#) to [B21D11/18](#) take precedence; using mandrels or the like [B21D9/00](#))

- B21D7/02 . . . over a stationary forming member; by use of a swinging forming member or abutment
- B21D7/02B [N: Construction of forming members having more than one groove]
- B21D7/022 over a stationary forming member only
- B21D7/022B [N: using pulling members]
- B21D7/024 by a swinging forming member
- B21D7/025 and pulling or pushing the ends of the work
- B21D7/028 and altering the profile at the same time, e.g. forming bumpers
- B21D7/03 Apparatus with means to keep the profile in shape

- B21D7/04 . . . over a movably-arranged forming member ([B21D7/02](#) takes precedence)

- B21D7/06 . . . in press brakes or between rams and anvils or abutments; Pliers with forming dies
- B21D7/06B [N: Pliers with forming dies]
- B21D7/06C [N: combined with oscillating members]

- B21D7/08 . . . by passing between rollers or through a curved die
- B21D7/08B [N: by passing through a curved die]

- B21D7/10 . . . by abutting members and flexible bending means, e.g. with chains, ropes

- B21D7/12 . . . with programme control

- B21D7/14 . . . combined with measuring of bends or lengths

- B21D7/16 . . . Auxiliary equipment, e.g. for heating or cooling of bends
- B21D7/16C [N: Heating equipment]
- B21D7/16D [N: Cooling equipment]
- B21D7/16E [N: Greasing]

- B21D9/00** **Bending tubes using mandrels or the like** ([B21D11/02](#) to [B21D11/18](#) take precedence)

- B21D9/01 . . . the mandrel being flexible and engaging the entire tube length

- B21D9/03 . . and built-up from loose elements, e.g. series of balls
- B21D9/04 . the mandrel being rigid
- B21D9/05 . co-operating with forming members
- B21D9/05B . . [N: Construction of forming members having more than one groove]
- B21D9/07 . . with one or more swinging forming members engaging tube ends only
- B21D9/07B . . . [N: with one swinging forming member]
- B21D9/07C . . . [N: with more swinging forming members]
- B21D9/08 . in press brakes or between rams and anvils or abutments; Pliers with forming dies
- B21D9/08B . . [N: Pliers with forming dies]
- B21D9/10 . by passing between rollers
- B21D9/12 . by pushing over a curved mandrel; by pushing through a curved die
- B21D9/12B . . [N: by pushing through a curved die]
- B21D9/14 . Wrinkle-bending, i.e. bending by corrugating
- B21D9/15 . using filling material of indefinite shape, e.g. sand, plastic material (filling of tubes with such material [B21D9/16](#))
- B21D9/16 . Auxiliary equipment, e.g. machines for filling tubes with sand
- B21D9/16B . . [N: Machines for filling tubes with sand]
- B21D9/18 . . for heating or cooling of bends
- B21D11/00** **Bending not restricted to forms of material mentioned in only one of groups [B21D5/00](#), [B21D7/00](#), [B21D9/00](#); Bending not provided for in groups [B21D5/00](#) to [B21D9/00](#) (corrugating or bending into wave form [B21D13/00](#), [B21D15/00](#); flanging [B21D19/00](#)); Twisting**
- B21D11/02 . Bending by stretching or pulling over a die (working sheet metal of limited length by stretching [B21D25/00](#))
- B21D11/06 . Bending into helical or spiral form; Forming a succession of return bends, e.g. serpentine form (making helically seamed tubing [B21C37/12](#))
- B21D11/07 . . Making serpentine-shaped articles by bending essentially in one plane
- B21D11/08 . Bending by altering the thickness of part of the cross-section of the work ([B21D11/06](#) takes precedence)
- B21D11/08B . . [N: by locally stretching or upsetting]
- B21D11/10 . Bending specially adapted to produce specific articles, e.g. leaf springs [N: (making or bending leaf springs [B21D53/88C](#))]
- B21D11/12 . . the articles being reinforcements for concrete
- B21D11/12B . . . [N: Bending wire nets]
- B21D11/14 . Twisting

- B21D11/15 . . Reinforcing rods for concrete [M1111]
- B21D11/16 . . Crankshafts [M1111]
- B21D11/18 . Juggling
- B21D11/20 . Bending sheet metal, not otherwise provided for
- B21D11/20A . . [N: Round bending] [N0004]
- B21D11/20B . . [N: Curving corrugated sheets] [N1204]
- B21D11/22 . Auxiliary equipment, e.g. positioning devices

- B21D13/00** **Corrugating sheet metal, rods or profiles; Bending sheet metal, rods or profiles into wave form (tubes [B21D15/00](#))**
- B21D13/02 . by pressing
- B21D13/04 . by rolling
- B21D13/04B . . [N: the corrugations being parallel to the feeding movement]
- B21D13/06 . by drawing
- B21D13/08 . by combined methods
- B21D13/10 . into a peculiar profiling shape

- B21D15/00** **Corrugating tubes (wrinkle-bending using mandrels or the like [B21D9/14](#))**
- B21D15/02 . longitudinally
- B21D15/03 . . by applying fluid pressure
- B21D15/04 . transversely, e.g. helically
- B21D15/06 . . annularly [N: (with thinning [B21C37/20C](#))]
- B21D15/10 . . by applying fluid pressure
- B21D15/10A . . . [N: by applying elastic material]
- B21D15/12 . Bending tubes into wave form

- B21D17/00** **Forming single grooves in sheet metal or tubular or hollow articles**
- B21D17/02 . by pressing (grooving or notching of bolts, studs, or the like [B21K1/54](#))
- B21D17/02B . . [N: by pressing tubes axially] [N9503]
- B21D17/04 . by rolling

- B21D19/00** **Flanging or other edge treatment, e.g. of tubes (connecting by making use of folds [B21D39/00](#); flaring-out tube ends [B21D41/02](#))**
- B21D19/00B . [N: Edge deburring or smoothing]

- B21D19/02 . by continuously-acting tools moving along the edge ([edge-curling B21D19/12](#))
- B21D19/04 . . shaped as rollers
- B21D19/04A . . . [N: for flanging edges of plates]
- B21D19/04B . . . [N: for flanging edges of tubular products]
- B21D19/06 . . . working inwardly

- B21D19/08 . by single or successive action of pressing tools, e.g. vice jaws
- B21D19/08B . . [N: for making negative angles] [N1204]
- B21D19/08B1 . . . [N: with linear cams, e.g. aerial cams] [N1204]
- B21D19/08B2 . . . [N: with rotary cams] [N1204]
- B21D19/08H . . [N: for flanging holes] [N1204]
- B21D19/10 . . working inwardly

- B21D19/12 . Edge-curling
- B21D19/14 . . Reinforcing edges, e.g. armouring same

- B21D19/16 . Reverse flanging of tube ends

B21D21/00 **Combined processes according to methods covered by groups [B21D1/00](#) to [B21D19/00](#)**

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

B21D22/00 **Shaping without cutting, by stamping, spinning, or deep-drawing (otherwise than using rigid devices or tools or yieldable or resilient pads [B21D26/00](#))**

- B21D22/02 . Stamping using rigid devices or tools
- B21D22/02H . . [N: by heating the blank or stamping associated with heat treatment (C21D takes precedence)] [N1204]
- B21D22/02T . . [N: for tubular articles]
- B21D22/02V . . [N: for flattening the ends of corrugated sheets] [N1204]
- B21D22/04 . . for dimpling ([combined with perforating B21D28/24](#))
- B21D22/06 . . having relatively-movable die parts
- B21D22/08 . . with die parts on rotating carriers

- B21D22/10 . Stamping using yieldable or resilient pads
- B21D22/10H . . [N: of tubular products]
- B21D22/12 . . using enclosed flexible chambers
- B21D22/12H . . . [N: of tubular products] [M1111]

- B21D22/14 . Spinning
- B21D22/16 . . over shaping mandrels or formers
- B21D22/18 . . using tools guided to produce the required profile

- B21D22/18A . . . [N: making bombed objects]
- B21D22/20 . Deep-drawing (special deep-drawing arrangements in, or in connection with, presses [B21D24/00](#))
- B21D22/20B . . [N: Work-pieces; preparation of the work-pieces, e.g. lubricating, coating]
- B21D22/20C . . [N: of compound articles]
- B21D22/20D . . [N: Hydro-mechanical deep-drawing]
- B21D22/20E . . [N: articles from a strip in several steps, the articles being coherent with the strip during the operation]
- B21D22/20H . . [N: by heating the blank or deep-drawing associated with heat treatment (C21D takes precedence)] [N1204]
- B21D22/21 . . without fixing the border of the blank
- B21D22/22 . . with devices for holding the edge of the blanks ([B21D22/24](#) to [B21D22/30](#) take precedence; shaping over a die without external former [B21D11/02](#))
- B21D22/22B . . . [N: with members for radially pushing the blanks]
- B21D22/24 . . involving two drawing operations having effects in opposite directions with respect to the blank
- B21D22/26 . . for making peculiarly, e.g. irregularly, shaped articles
- B21D22/28 . . of cylindrical articles using consecutive dies
- B21D22/28B . . . [N: with ram and dies aligning means] [N1204]
- B21D22/28C . . . [N: with lubricating or cooling means] [N1204]
- B21D22/30 . . to finish articles formed by deep-drawing

B21D24/00 Special deep-drawing arrangements in, or in connection with, presses

- B21D24/00C . [N: Multi-stage presses]
- B21D24/02 . Die-cushions
- B21D24/04 . Blank holders; Mounting means therefor
- B21D24/06 . . Mechanically spring-loaded blank holders
- B21D24/08 . . Pneumatically or hydraulically loaded blank holders
- B21D24/10 . Devices controlling or operating blank holders independently, or in conjunction with dies
- B21D24/12 . . mechanically
- B21D24/14 . . pneumatically or hydraulically
- B21D24/16 . Additional equipment in association with the tools e.g. for shearing, for trimming

B21D25/00 Working sheet metal of limited length by stretching, e.g. for straightening

- B21D25/02 . by pulling over a die
- B21D25/04 . Clamping arrangements

B21D26/00 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 [B21D22/10](#))

- B21D26/02 . by applying fluid pressure [M2010.12]
- B21D26/021 . . Deforming sheet bodies [N1003]
- B21D26/023 . . . including an additional treatment performed by fluid pressure, e.g. perforating [N1103]
- B21D26/025 . . . Means for controlling the clamping or opening of the moulds [N1003]
- B21D26/027 . . . Means for controlling fluid parameters, e.g. pressure or temperature [N1003]
- B21D26/029 . . . Closing or sealing means [N1003]
- B21D26/031 . . . Mould construction ([B21D26/025](#) - [B21D26/029](#) take precedence) [N1003]
- B21D26/033 . . Deforming tubular bodies ([corrugating tubes by applying fluid pressure B21D15/03, B21D15/10](#)) [N1003]
- B21D26/035 . . . including an additional treatment performed by fluid pressure, e.g. perforating [N1103]
- B21D26/037 . . . Forming branched tubes [N1003]
- B21D26/039 . . . Means for controlling the clamping or opening of the moulds [N1003]
- B21D26/041 . . . Means for controlling fluid parameters, e.g. pressure or temperature [N1003]
- B21D26/043 . . . Means for controlling the axial pusher [N1003]
- B21D26/045 . . . Closing or sealing means [N1003]
- B21D26/047 . . . Mould construction ([B21D26/037](#) - [B21D26/045](#) take precedence) [N1003]
- B21D26/049 . . . Deforming bodies having a closed end [N1003]
- B21D26/051 . . . Deforming double-walled bodies [N1003]
- B21D26/053 . . characterised by the material of the blanks [N1003]
- B21D26/055 . . . Blanks having super-plastic properties [N1003]
- B21D26/057 . . . Tailored blanks [N1003]
- B21D26/059 . . . Layered blanks [N1003]
- B21D26/06 . . by shock waves
- B21D26/08 . . . generated by explosives, e.g. chemical explosives
- B21D26/10 . . . generated by evaporation, e.g. of wire, of liquids
- B21D26/12 . . . initiated by spark discharge
- B21D26/14 . applying magnetic forces

B21D28/00 Shaping by press-cutting; Perforating

- B21D28/00B . [N: Drive of the tools ([B21D28/00C](#) and [B21D28/20](#) take precedence)]
- B21D28/00B2 . . [N: Adjustment of the punch stroke for compensating wear] [N1204]
- B21D28/00C . [N: Explosive cutting or perforating]
- B21D28/02 . Punching blanks or articles with or without obtaining scrap ([cutting nails or pins from strips or sheet material B21G3/26](#)); Notching [M1111]
- B21D28/04 . . Centering the work; Positioning the tools
- B21D28/06 . . Making more than one part out of the same blank; Scrapless working

- B21D28/08 . . . Zig-zag sequence working
- B21D28/10 . . Incompletely punching in such a manner that the parts are still coherent with the work
- B21D28/12 . . Punching using rotatable carriers
- B21D28/12B . . . [N: with multi-tools] [N1204]
- B21D28/14 . . Dies (ejecting or stripping-off devices arranged in punching machines or tools [B21D45/00](#))
- B21D28/14B . . . [N: with means for slug retention, e.g. a groove] [N1204]
- B21D28/16 . . Shoulder or burr prevention [N:, e.g. fine-blanking] [N1204]
- B21D28/18 . . Yieldable, e.g. rubber, punching pads [M1111]
- B21D28/20 . . Applications of drives [N: for reducing noise or wear] [N1204]
- B21D28/22 . . Notching the peripheries of circular blanks, e.g. laminations for dynamo-electric machines [M1111]

- B21D28/24 . Perforating, i.e. punching holes
- B21D28/24B . . [N: in profiles]
- B21D28/24C . . [N: Selection of punches]
- B21D28/26 . . in sheets or flat parts
- B21D28/26B . . . [N: with relative movement of sheet and tools enabling the punching of holes in predetermined locations of the sheet, e.g. holes punching with template]
- B21D28/28 . . in tubes or other hollow bodies
- B21D28/28B . . . [N: punching outwards] [N1204]
- B21D28/30 . . in annular parts, e.g. rims
- B21D28/32 . . in other articles of special shape
- B21D28/32B . . . [N: using cam or wedge mechanisms, e.g. aerial cams] [N1204]
- B21D28/34 . . Perforating tools; Die holders [M1111]
- B21D28/34A . . . [N: Draw punches]
- B21D28/34B . . . [N: length adjustable perforating tools] [N1204]
- B21D28/36 . . using rotatable work or tool holders

- B21D31/00** **Other methods for working sheet metal, metal tubes, metal profiles (deforming one surface of tubes helically by rolling [B21H3/00](#); upsetting [B21J5/08](#); working metal by removing material therefrom [B23](#); embossing [B44B](#))**

- B21D31/00B . [N: Incremental shaping or bending, e.g. stepwise moving a shaping tool along the surface of the workpiece ([B21D22/14](#) takes precedence)] [N1204]

- B21D31/02 . Stabbing or piercing, e.g. for making sieves (dimpling [B21D22/04](#); perforating by punching [B21D28/24](#))

- B21D31/04 . Expanding other than provided for in groups [B21D1/00](#) to [B21D28/00](#), e.g. for making expanded metal ([B21D47/00](#) takes precedence; enlarging tube ends [B21D41/02](#))
- B21D31/04A . . [N: Making use of slitting discs or punch cutters]
- B21D31/04B . . [N: making use of rotating cutters]

- B21D31/06 . Deforming sheet metal, tubes or profiles by sequential impacts, e.g. hammering, beating, peen forming (forging hammers [B21J7/00](#)) [M1111]

- B21D33/00** **Special measures in connection with working metal foils, e.g. gold foils (cutting or perforating of metal foil analogous to paper [B26](#))**
- B21D35/00** **Combined processes according to [N: or processes combined with] methods covered by groups B21D1/00 to B21D31/00 (B21D21/00 takes precedence) [\[N1204\]](#)**
- B21D35/00A . [N: Shaping combined with punching, e.g. stamping and perforating] [\[N1204\]](#)
- B21D35/00B . [N: Processes combined with methods covered by groups B21D1/00 to B21D31/00] [\[N1204\]](#)
- B21D35/00B2 . . [N: Simultaneous forming, e.g. making more than one part per stroke (B21D26/06 takes precedence)] [\[N1204\]](#)
- B21D35/00B4 . . [N: characterized by the material of the blank or the workpiece (B21D26/053 takes precedence)] [\[N1204\]](#)
- B21D35/00B4B . . . [N: Blanks having varying thickness, e.g. tailored blanks] [\[N1204\]](#)
- B21D35/00B4D . . . [N: Layered blanks (B21D22/20C takes precedence; joining superposed plates B21D39/03B, B21D39/03C, B21D39/03D)] [\[N1204\]](#)
- B21D35/00B6 . . [N: involving vibration, e.g. ultrasonic] [\[N1204\]](#)
- B21D37/00** **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) [\[M1111\]](#)**
- B21D37/01 . Selection of materials
- B21D37/02 . Die constructions enabling assembly of the die parts in different ways ([B21D37/06 takes precedence](#))
- B21D37/04 . Movable or exchangeable mountings for tools
- B21D37/06 . . Pivotaly-arranged tools, e.g. disengageable ([die sets with dies pivoted to one another \[B21D37/12\]\(#\)](#))
- B21D37/08 . Dies with different parts for several steps in a process
- B21D37/10 . Die sets; Pillar guides
- B21D37/12 . . Particular guiding equipment, [\[N: e.g. pliers\]](#); Special arrangements for interconnection or co-operation of dies
- B21D37/14 . Particular arrangements for handling and holding in place complete dies
- B21D37/14B . . [\[N: Spotting presses\]](#)
- B21D37/14C . . [\[N: Die storage magazines\]](#)
- B21D37/14D . . [N: Tool exchange carts] [\[N1204\]](#)
- B21D37/16 . Heating or cooling
- B21D37/18 . Lubricating, [\[N: e.g. lubricating tool and workpiece simultaneously \(lubricating workpieces for deep-drawing \[B21D22/20B\]\(#\)\)\]](#) [\[M1111\]](#)
- B21D37/20 . Making tools by operations not covered by a single other subclass

- B21D37/20B . . [N: Making cutting tools]

- B21D39/00** **Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating** ([N: joining mitred profiles [B21D53/74B](#);) riveting B21J; uniting components by forging or pressing to form integral members [B21K25/00](#); welding B23K; press-fitting, force-fitting, or shrinking in general [B23P11/00](#), [B21D19/00](#); by adhesives [F16B11/00](#); [N: Connections as such F16L, F16B]); **Tube expanders [M1207]**

- B21D39/02 . . of sheet metal by folding, e.g. connecting edges of a sheet to form a cylinder
- B21D39/02B . . [N: for panels, e.g. vehicle doors]
- B21D39/02B2 . . . [N: using rollers] [N1204]
- B21D39/02C . . [N: Hand tools]
- B21D39/02D . . [N: Reinforcing the connection by locally deforming] [N1204]
- B21D39/02E . . [N: Reinforcing the connection otherwise than by deforming, e.g. welding] [N1204]

- B21D39/03 . . of sheet metal otherwise than by folding
- B21D39/03B . . [N: Joining superposed plates by locally deforming without slitting or piercing]
- B21D39/03B1 . . . [N: by fitting a projecting part integral with one plate in a hole of the other plate] [N9903]
- B21D39/03C . . [N: Joining superposed plates by piercing] [N9903]
- B21D39/03D . . [N: Joining superposed plates by slitting] [N9903]
- B21D39/03E . . [N: Interlocking butt joints] [N9903]
- B21D39/03F . . [N: Perpendicular plate connections]

- B21D39/04 . . of tubes with tubes; of tubes with rods [N: (crimped pipe joints as such F16L13/14)] [N1204]
- B21D39/04B . . [N: using explosives (by explosive welding [B23K20/08](#))]
- B21D39/04C . . [N: perpendicular]
- B21D39/04D . . [N: Connecting tubes to tube-like fittings]
- B21D39/04E . . [N: using presses for radially crimping tubular elements]

- B21D39/06 . . of tubes in openings, e.g. rolling-in
- B21D39/06B . . [N: for assembling ladders]
- B21D39/06C . . [N: using explosives]

- B21D39/08 . . Tube expanders
- B21D39/10 . . with rollers for expanding only
- B21D39/12 . . with rollers for expanding and flanging
- B21D39/14 . . with balls
- B21D39/16 . . with torque limiting devices
- B21D39/18 . . Rollers of special shape
- B21D39/20 . . with mandrels, e.g. expandable
- B21D39/20B . . . [N: expandable by fluid or elastic material]
- B21D39/20B2 [N: by axially compressing the elastic material] [N1204]

- B21D41/00** **Application of procedures in order to alter the diameter of tube ends (B21D39/00**

takes precedence; [N: plastic tubes B29C57/08]) [N1204]

- B21D41/02 . Enlarging
- B21D41/02B . . [N: by means of tube-flaring hand tools]
- B21D41/02B1 . . . [N: comprising rolling elements]
- B21D41/02C . . [N: by means of impact-type swaging hand tools]
- B21D41/02D . . [N: by means of mandrels] [N1204]
- B21D41/02D2 . . . [N: expandable mandrels] [N1204]

- B21D41/04 . Reducing; Closing
- B21D41/04B . . [N: Closing]

- B21D43/00** **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)**

- B21D43/00B . [N: Positioning devices ([B21D28/04](#) and [B21D28/26B](#) take precedence; stops [B21D43/26](#); centering moving strips [B21D43/02B4](#))]

- B21D43/00C . [N: Feeding elongated articles, such as tubes, bars, or profiles]

- B21D43/02 . Advancing work in relation to the stroke of the die or tool
- B21D43/02B . . [N: Control or correction devices in association with moving strips]
- B21D43/02B2 . . . [N: Loop-control]
- B21D43/02B4 . . . [N: Centering devices, e.g. edge guiding]
- B21D43/02C . . [N: Fault detection, e.g. misfeed detection]
- B21D43/02D . . [N: Combination of two or more feeding devices provided for in [B21D43/04](#) to [B21D43/18](#)]
- B21D43/02E . . [N: Combined feeding and ejecting devices]
- B21D43/02F . . [N: Tools travelling with material, e.g. flying punching machines]
- B21D43/04 . . by means in mechanical engagement with the work
- B21D43/05 . . . specially adapted for multi-stage presses [N: ([B21D43/14B](#) takes precedence)]
- B21D43/05A [N: Devices having a cross bar] [N1204]
- B21D43/05B [N: Devices comprising a pair of longitudinally and laterally movable parallel transfer bars]
- B21D43/05C [N: Devices for exchanging transfer bars or grippers; Idle stages, e.g. exchangeable]
- B21D43/06 . . . 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
- B21D43/08 . . . by rollers [N: ([B21D43/14B](#) takes precedence)]
- B21D43/09 by one or more pairs of rollers for feeding sheet or strip material
- B21D43/10 . . . by grippers [N: ([B21D43/05B](#), [B21D43/05C](#), [B21D43/14B](#) take precedence)]
- B21D43/10B [N: Manipulators, i.e. mechanical arms carrying a gripper element having several degrees of freedom]

- B21D43/11 for feeding sheet or strip material
- B21D43/12 . . . by chains or belts [N: (B21D43/14B takes precedence)]
- B21D43/13 . . . by linearly moving tables
- B21D43/14 . . . by turning devices, e.g. turn-tables
- B21D43/14B [N: Turnover devices, i.e. by turning about a substantially horizontal axis]
- B21D43/16 . . by gravity, e.g. chutes
- B21D43/18 . . by means in pneumatic or magnetic engagement with the work

- B21D43/20 . Storage arrangements; Piling or unpling (in general B65G, [N: B65H])
- B21D43/22 . . Devices for piling sheets
- B21D43/24 . . Devices for removing sheets from a stack

- B21D43/26 . Stops

- B21D43/28 . Associations of cutting devices therewith
- B21D43/28B . . [N: Discharging crop ends or the like]
- B21D43/28C . . [N: Devices for handling elongated articles, e.g. bars, tubes or profiles (B21D43/28B, B21D43/28D take precedence)]
- B21D43/28D . . [N: Devices for handling sheet or strip material (B21D43/28B takes precedence)]

B21D45/00 Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass

- B21D45/00B . [N: in punching machines or punching tools]
- B21D45/00B2 . . [N: Stripping-off devices]

- B21D45/02 . Ejecting devices
- B21D45/04 . . interrelated with motion of tool

- B21D45/06 . Stripping-off devices
- B21D45/06C . . [N: for deep-drawn cans; e.g. using stripping fingers] [N1204]
- B21D45/08 . . interrelated with motion of tool

- B21D45/10 . Combined ejecting and stripping-off devices

Guide heading: Processing sheet metal or metal tubes, or processing metal profiles according to any of groups B21D1/00 - B21D45/00, in the manufacture of finished or semi-finished articles [M1111]

B21D47/00 Making rigid structural elements or units, e.g. honeycomb structures [M1111]

- B21D47/00B . [N: Making gratings]

- B21D47/01 . beams or pillars
- B21D47/02 . . by expanding

- B21D47/04 . composite sheet metal profiles

- B21D49/00** **Sheathing or stiffening objects** (by winding wire or tape thereon [B65H54/00](#), [B65H81/00](#); specially adapted for manufacturing conductors or cables [H01B13/26](#))
- [B21D49/00B](#) . [\[N: Hollow objects\]](#)
- B21D51/00** **Making hollow objects** (from thick-walled or non uniform tubes [B21K21/00](#))
- [B21D51/02](#) . characterised by the structure of the objects [\[N: \(\[B21D51/26\]\(#\) takes precedence\)\]](#) [\[M1111\]](#)
- Note** [\[N1111\]](#)
 Making hollow objects characterised both by their structure and by their use is classified only in group [B21D51/16](#)
- [B21D51/04](#) . . built-up objects, e.g. objects with rigidly-attached bottom or cover
- [B21D51/06](#) . . folded objects
- [B21D51/08](#) . . ball-shaped objects
- [B21D51/10](#) . . conically or cylindrically shaped objects
- [B21D51/12](#) . . objects with corrugated walls
- [B21D51/14](#) . . Flattening hollow objects for transport or storage; Re-forming same ([making tubes from doubled flat material \[B21C37/14\]\(#\)](#)) [\[M1111\]](#)
- [B21D51/16](#) . characterised by the use of the objects ([making heat exchangers \[B21D53/02\]\(#\)](#)) [\[M1111\]](#)
- [B21D51/18](#) . . vessels, e.g. tubs, vats, tanks, sinks, or the like
- [B21D51/20](#) . . . barrels
- [B21D51/22](#) . . . pots, e.g. for cooking
- [B21D51/24](#) . . high-pressure containers, e.g. boilers, bottles
- [B21D51/26](#) . . cans or tins; Closing same in a permanent manner ([making outlet arrangements \[B21D51/38\]\(#\); welding or soldering \[B23K\]\(#\)](#))
- [B21D51/26A](#) . . . [\[N: Locally embossing the walls of formed can bodies \(B44B5/00, B44C1/24, B44C3/08D take precedence; bulging B21D51/26C\)\]](#) [\[N1204\]](#)
- [B21D51/26B](#) . . . [\[N: Edge treatment of cans or tins\]](#)
- [B21D51/26B2](#) [\[N: Curling\]](#) [\[N1204\]](#)
- [B21D51/26B3](#) [\[N: Flanging\]](#) [\[N1204\]](#)
- [B21D51/26B4](#) [\[N: Necking\]](#) [\[N1204\]](#)
- [B21D51/26C](#) . . . [\[N: Of particular non cylindrical shape, e.g. conical, rectangular, polygonal, bulged\]](#)
- [B21D51/26D](#) . . . [\[N: Methods or machines for closing cans by applying caps or bottoms\]](#)
- [B21D51/26D1](#) [\[N: Sealing or closing means therefor\]](#)
- [B21D51/26E](#) . . . [\[N: Transforming the shape of formed can bodies; Forming can bodies from flattened tubular blanks; Flattening can bodies\]](#)
- [B21D51/26L](#) . . . [\[N: Cans or tins having longitudinal or helical seams\]](#)
- [B21D51/26M](#) . . . [\[N: Cans or tins having circumferential side seams\]](#)
- [B21D51/26T](#) . . . [\[N: Manipulating, e.g. feeding and positioning devices; Control systems\]](#)
- [B21D51/28](#) . . . Folding the longitudinal seam
- [B21D51/30](#) . . . Folding the circumferential seam

- B21D51/32 by rolling
- B21D51/34 by pressing
- B21D51/36 . . collapsible or like thin-walled tubes, e.g. for toothpaste
- B21D51/36B . . . [N: involving fixing closure members to the tubes, e.g. nozzles]
- B21D51/38 . . Making inlet or outlet arrangements of cans, tins, baths, bottles, or other vessels; Making can ends; Making closures [M1111]
- B21D51/38B . . . [N: scoring lines, tear strips or pulling tabs]
- B21D51/38B1 [N: on the side-wall of containers]
- B21D51/40 . . . Making outlet openings, e.g. bung holes
- B21D51/42 Making or attaching spouts
- B21D51/44 . . . Making closures, e.g. caps (folded of thin metal foils in the way of making paper caps [B31D5/00](#); making closures in conjunction with applying same B67B) [M1111]
- B21D51/44B [N: easily removable closures, e.g. by means of tear strips]
- B21D51/44T [N: Feeding or removal of material] [N0004]
- B21D51/46 Placing sealings or sealing material [N: (moulding plastic sealing material into closure members [B29C67/18E2](#))]
- B21D51/48 Making crown caps
- B21D51/50 Making screw caps
- B21D51/52 . . boxes, cigarette cases, or the like
- B21D51/54 . . cartridge cases, e.g. for ammunition, for letter carriers in pneumatic-tube plants

- B21D53/00** **Making other particular articles (making wire fabrics B21F; making chains or chain parts B21L) [M1111]**

- B21D53/02 . . heat exchangers [N: or parts thereof], e.g. radiators, condensers [N: fins, headers] (making finned or ribbed tubes by fixing strip material or the like to tubes [B21C37/22](#)) [N1204]
- B21D53/02A . . [N: Making the fins] [N1204]
- B21D53/02A2 . . . [N: Louvered fins] [N1204]
- B21D53/02B . . [N: by helically or spirally winding elongated elements]
- B21D53/04 . . of sheet metal
- B21D53/04A . . . [N: by inflating partially united plates]
- B21D53/06 . . of metal tubes
- B21D53/08 . . of both metal tubes and sheet metal (connecting tubes in openings [B21D39/06](#))
- B21D53/08B . . . [N: with fins places on zig-zag tubes or parallel tubes]

- B21D53/10 . . parts of bearings; sleeves; valve seats or the like
- B21D53/12 . . cages for bearings

- B21D53/14 . . belts, e.g. machine-gun belts

- B21D53/16 . . rings, e.g. barrel hoops
- B21D53/18 . . of hollow or C-shaped cross-section, e.g. for curtains, for eyelets
- B21D53/20 . . washers, e.g. for sealing

- B21D53/22 . . . with means for preventing rotation
- B21D53/24 . nuts or like thread-engaging members
- B21D53/26 . wheels or the like
- B21D53/26B . . [N: pulleys] [M1111]
- B21D53/26C . . [N: with inscriptions or the like, e.g. printing wheels]
- B21D53/26M . . [N: wheels out of a single piece ([B21D53/26B](#) takes precedence)] [M1111]
- B21D53/26N . . [N: parts of wheels ([B21D53/28](#), [B21D53/30](#) take precedence)] [M1111]
- B21D53/26P . . [N: blower wheels, i.e. wheels provided with fan elements] [M1111]
- B21D53/26S . . [N: wheels having spokes] [M1111]
- B21D53/28 . . gear wheels
- B21D53/30 . . wheel rims
- B21D53/32 . . wheel covers
- B21D53/34 . . brake drums
- B21D53/36 . clips, clamps, or like fastening or attaching devices, e.g. for electric installation
- B21D53/38 . locksmith`s goods, e.g. handles
- B21D53/40 . . hinges, e.g. door hinge plates
- B21D53/42 . . keys [N: (making keys by combined operations [B23P15/00D](#))] [C9603]
- B21D53/44 . fancy goods, e.g. jewellery products [M1111]
- B21D53/46 . haberdashery, e.g. buckles, combs; pronged fasteners, e.g. staples
- B21D53/48 . . buttons, e.g. press-buttons, snap fasteners
- B21D53/50 . . metal slide-fastener parts
- B21D53/52 . . . fastener elements; Attaching such elements so far as this procedure is combined with the process for making the elements
- B21D53/54 . . . slides
- B21D53/56 . . . stops
- B21D53/58 . end-pieces for laces or ropes
- B21D53/60 . cutlery wares; garden tools or the like [M1111]
- B21D53/62 . . spoons; table forks
- B21D53/64 . . knives; scissors; cutting blades ([B21D53/72](#) takes precedence; handle portions [B21D53/70](#)) [M1111]
- B21D53/64B . . . [N: scissors] [N9703] [M1111]
- B21D53/64C . . . [N: safety razor blades] [N9703] [M1111]
- B21D53/64D . . . [N: mower blades] [N9703] [M1111]
- B21D53/66 . . spades; shovels (handle portions [B21D53/70](#))
- B21D53/68 . . rakes, garden forks, or the like (handle portions [B21D53/70](#))
- B21D53/70 . . handle portions ([B21D53/72](#) takes precedence)
- B21D53/72 . . sickles; scythes
- B21D53/74 . frames for openings, e.g. for windows, doors, handbags

- B21D53/74B
 - . . [N: Joining mitred profiles comprising punching the profiles on a corner-angle connecting piece]
- B21D53/76
 - . writing or drawing instruments, e.g. writing pens, erasing pens
- B21D53/78
 - . propeller blades; turbine blades
- B21D53/80
 - . dustproof covers; safety covers
- B21D53/82
 - . perforated music sheets; pattern sheets, e.g. for control purposes, stencils
- B21D53/84
 - . other parts for engines, e.g. connecting-rods
- B21D53/84A
 - . . [N: Making camshafts]
- B21D53/86
 - . other parts for bicycles or motorcycles
- B21D53/88
 - . other parts for vehicles, e.g. cowlings, mudguards
- B21D53/88B
 - . . [N: reflectors]
- B21D53/88C
 - . . [N: leaf springs]
- B21D53/90
 - . . axle-housings
- B21D53/92
 - . other parts for aircraft
- B21D55/00**
 - 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](#))**