

SECTION B — PERFORMING OPERATIONS; TRANSPORTING

B21 MECHANICAL METAL-WORKING WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING METAL

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

Note(s)

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.

Subclass index

TREATMENT CHARACTERISED BY FUNCTION

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Straightening; Restoring form; Bending; Corrugating; Flanging

- 1/00 Straightening, restoring form or removing local distortions of sheet metal or specific articles made therefrom (B21D 3/00 takes precedence); Stretching sheet metal combined with rolling [2]**
- 1/02 • by rollers (B21D 1/06 takes precedence)
- 1/05 • Stretching combined with rolling [2]
- 1/06 • Removing local distortions
- 1/08 • • of hollow bodies made from sheet metal (of substantially open bodies B21D 1/10)
- 1/10 • • of specific articles made from sheet metal, e.g. mudguards
- 1/12 • Straightening vehicle body parts or bodies (B21D 1/14 takes precedence)
- 1/14 • Straightening frame structures
- 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**
- 3/02 • by rollers

- 3/04 • • arranged on axes skew to the path of the work
- 3/05 • • arranged on axes rectangular to the path of the work [2]
- 3/06 • • arranged inclined to a revolving flier rolling frame
- 3/08 • • which move in an orbit without rotating round the work
- 3/10 • between rams and anvils or abutments
- 3/12 • by stretching with or without twisting
- 3/14 • Recontouring
- 3/16 • of specific articles made from metal rods, tubes, or profiles, e.g. crankshafts, by specially-adapted methods or means
- 5/00 Bending sheet metal along straight lines, e.g. to form simple curves (B21D 11/06-B21D 11/18 take precedence)**
- 5/01 • between rams and anvils or abutments
- 5/02 • on press brakes without making use of clamping means
- 5/04 • on brakes making use of clamping means on one side of the work
- 5/06 • by drawing procedure making use of dies or forming-rollers, e.g. making profiles

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- 5/08 • • making use of forming-rollers (B21D 5/12 takes precedence)
 - 5/10 • • for making tubes
 - 5/12 • • • making use of forming-rollers
 - 5/14 • by passing between rollers (B21D 5/06 takes precedence)
 - 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 [2]
 - 7/022 • • over a stationary forming member only [2]
 - 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
 - 7/08 • by passing between rollers or 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
 - 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 [2]
 - 9/05 • co-operating with forming members
 - 9/07 • • with one or more swinging forming members engaging tube ends only
 - 9/08 • in press brakes or between rams and anvils or abutments; Pliers with forming dies
 - 9/10 • by passing between rollers
 - 9/12 • by pushing over a curved mandrel; by pushing through a curved die
 - 9/14 • Wrinkle-bending, i.e. bending by corrugating
 - 9/15 • using filling material of indefinite shape, e.g. sand, plastic material [2]
 - 9/16 • Auxiliary equipment, e.g. 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; Twisting [2]**
 - 11/02 • Bending by stretching or pulling over a die
 - 11/06 • Bending into helical or spiral form; Forming a succession of return bends, e.g. serpentine form
 - 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)
 - 11/10 • Bending specially adapted to produce specific articles, e.g. leaf springs
 - 11/12 • • the articles being reinforcements for concrete
 - 11/14 • Twisting
 - 11/15 • • Reinforcing rods for concrete
 - 11/16 • • Crankshafts
 - 11/18 • Joggling
 - 11/20 • Bending sheet metal, not otherwise provided for
 - 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**
 - 13/02 • by pressing
 - 13/04 • by rolling
 - 13/06 • by drawing
 - 13/08 • by combined methods
 - 13/10 • into a peculiar profiling shape
 - 15/00 Corrugating tubes [2]**
 - 15/02 • longitudinally
 - 15/03 • • by applying fluid pressure
 - 15/04 • transversely, e.g. helically
 - 15/06 • • annularly
 - 15/10 • • by applying fluid pressure
 - 15/12 • Bending tubes into wave form
 - 17/00 Forming single grooves in sheet metal or tubular or hollow articles**
 - 17/02 • by pressing
 - 17/04 • by rolling
 - 19/00 Flanging or other edge treatment, e.g. of tubes**
 - 19/02 • by continuously-acting tools moving along the edge
 - 19/04 • • shaped as rollers
 - 19/06 • • • working inwardly
 - 19/08 • by single or successive action of pressing tools, e.g. vice jaws
 - 19/10 • • working inwardly
 - 19/12 • Edge-curling
 - 19/14 • • Reinforcing edges, e.g. by armouring
 - 19/16 • Reverse flanging of tube ends
 - 21/00 Combined processes according to methods covered by groups B21D 1/00-B21D 19/00**
- Stamping; Spinning; Deep-drawing; Working sheet metal of limited length by stretching; Punching**
- 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)
 - 22/02 • Stamping using rigid devices or tools
 - 22/04 • • for dimpling (combined with perforating B21D 28/24)
 - 22/06 • • having relatively-movable die parts
 - 22/08 • • with die parts on rotating carriers
 - 22/10 • Stamping using yieldable or resilient pads
 - 22/12 • • using enclosed flexible chambers
 - 22/14 • Spinning
 - 22/16 • • over shaping mandrels or formers
 - 22/18 • • using tools guided to produce the required profile
 - 22/20 • Deep-drawing (special deep-drawing arrangements in, or in connection with, presses B21D 24/00)
 - 22/21 • • without fixing the border of the blank [2]
 - 22/22 • • with devices for holding the edge of the blanks (B21D 22/24-B21D 22/30 take precedence)
 - 22/24 • • involving two drawing operations having effects in opposite directions with respect to the blank

22/26	• • for making peculiarly, e.g. irregularly, shaped articles	26/10	• • • generated by evaporation, e.g. of wire, of liquids
22/28	• • of cylindrical articles using consecutive dies	26/12	• • • initiated by spark discharge [2]
22/30	• • to finish articles formed by deep-drawing	26/14	• applying magnetic forces
24/00	Special deep-drawing arrangements in, or in connection with, presses	28/00	Shaping by press-cutting; Perforating
24/02	• Die-cushions	28/02	• Punching blanks or articles with or without obtaining scrap; Notching
24/04	• Blank holders; Mounting means therefor	28/04	• • Centering the work; Positioning the tools
24/06	• • Mechanically spring-loaded blank holders	28/06	• • Making more than one part out of the same blank; Scrapless working
24/08	• • Pneumatically or hydraulically loaded blank holders	28/08	• • • Zig-zag sequence working
24/10	• Devices controlling or operating blank holders independently, or in conjunction with dies	28/10	• • Incompletely punching in such a manner that the parts are still coherent with the work
24/12	• • mechanically	28/12	• • Punching using rotatable carriers
24/14	• • pneumatically or hydraulically	28/14	• • Dies (ejecting or stripping-off devices arranged in punching tools B21D 45/00)
24/16	• Additional equipment in association with the tools, e.g. for shearing, for trimming	28/16	• • Shoulder or burr prevention
25/00	Working sheet metal of limited length by stretching, e.g. for straightening [2]	28/18	• • Yieldable, e.g. rubber, punching pads
25/02	• by pulling over a die [2]	28/20	• • Applications of drives
25/04	• Clamping arrangements [2]	28/22	• • Notching the peripheries of circular blanks, e.g. laminations for dynamo-electric machines
26/00	Shaping without cutting otherwise than by using rigid devices or tools or yieldable or resilient pads, e.g. shaping by applying fluid pressure or magnetic forces	28/24	• Perforating, i.e. punching holes
26/02	• by applying fluid pressure [2, 2011.01]	28/26	• • in sheets or flat parts
26/021	• • Deforming sheet bodies [2011.01]	28/28	• • in tubes or other hollow bodies
26/023	• • • including an additional treatment performed by fluid pressure, e.g. perforating [2011.01]	28/30	• • in annular parts, e.g. rims
26/025	• • • Means for controlling the clamping or opening of the moulds [2011.01]	28/32	• • in other articles of special shape
26/027	• • • Means for controlling fluid parameters, e.g. pressure or temperature [2011.01]	28/34	• • Perforating tools; Die holders
26/029	• • • Closing or sealing means [2011.01]	28/36	• • using rotatable work or tool holders
26/031	• • • Mould construction (B21D 26/025-B21D 26/029 take precedence) [2011.01]		
26/033	• • Deforming tubular bodies (corrugating tubes by applying fluid pressure B21D 15/03, B21D 15/10) [2011.01]	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; embossing decorations or marks B44B 5/00)
26/035	• • • including an additional treatment performed by fluid pressure, e.g. perforating [2011.01]	31/02	• Stabbing or piercing, e.g. for making sieves
26/037	• • • Forming branched tubes [2011.01]	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) [2]
26/039	• • • Means for controlling the clamping or opening of the moulds [2011.01]	31/06	• Deforming sheet metal, tubes or profiles by sequential impacts, e.g. hammering, beating, peen forming
26/041	• • • Means for controlling fluid parameters, e.g. pressure or temperature [2011.01]	33/00	Special measures in connection with working metal foils, e.g. gold foils (cutting or perforating of metal foil analogous to paper B26)
26/043	• • • Means for controlling the axial pusher [2011.01]	35/00	Combined processes according to methods covered by groups B21D 1/00-B21D 31/00 (B21D 21/00 takes precedence)
26/045	• • • Closing or sealing means [2011.01]	37/00	Tools as parts of machines covered by this subclass (forms or constructions of tools uniquely adapted for particular operations, <u>see</u> in the relevant groups for the operations)
26/047	• • • Mould construction (B21D 26/037-B21D 26/045 take precedence) [2011.01]	37/01	• Selection of materials [2]
26/049	• • • Deforming bodies having a closed end [2011.01]	37/02	• Die constructions enabling assembly of the die parts in different ways (B21D 37/06 takes precedence)
26/051	• • • Deforming double-walled bodies [2011.01]	37/04	• Movable or exchangeable mountings for tools
26/053	• • characterised by the material of the blanks [2011.01]	37/06	• • Pivotaly-arranged tools, e.g. disengageable (die sets with dies pivoted to one another B21D 37/12)
26/055	• • • Blanks having super-plastic properties [2011.01]	37/08	• Dies with different parts for several steps in a process
26/057	• • • Tailored blanks [2011.01]	37/10	• Die sets; Pillar guides
26/059	• • • Layered blanks [2011.01]	37/12	• • Particular guiding equipment; Special arrangements for interconnection or cooperation of dies
26/06	• • by shock waves		
26/08	• • • generated by explosives, e.g. chemical explosives		

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- 37/14 • Particular arrangements for handling and holding in place complete dies
- 37/16 • Heating or cooling
- 37/18 • Lubricating
- 37/20 • Making tools by operations not covered a single other subclass

39/00 Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating (riveting B21J; uniting components by forging or pressing to form integral members B21K 25/00); Tube expanders

- 39/02 • of sheet metal by folding, e.g. connecting edges of a sheet to form a cylinder
- 39/03 • of sheet metal otherwise than by folding [2]
- 39/04 • of tubes with tubes; of tubes with rods
- 39/06 • of tubes in openings, e.g. rolling-in
- 39/08 • Tube expanders
 - 39/10 • • with rollers for expanding only
 - 39/12 • • with rollers for expanding and flanging
 - 39/14 • • with balls
 - 39/16 • • with torque limiting devices
 - 39/18 • • Rollers of special shape
 - 39/20 • • with mandrels, e.g. expandable [2]

41/00 Application of procedures in order to alter the diameter of tube ends (B21D 39/00 takes precedence)

- 41/02 • Enlarging
- 41/04 • Reducing; Closing

43/00 Feeding, positioning or storing devices combined with, or arranged in, or specially adapted for use in connection with, apparatus for working or processing sheet metal, metal tubes or metal profiles; Associations therewith of cutting devices (cutting devices associated with the tool, see the relevant group for the tool)

- 43/02 • Advancing work in relation to the stroke of the die or tool
- 43/04 • • by means in mechanical engagement with the work
 - 43/05 • • • specially adapted for multi-stage presses
 - 43/06 • • • by positive or negative engaging parts co-operating with corresponding parts of the sheet or the like to be processed, e.g. carrier bolts or grooved section in the carriers
- 43/08 • • • by rollers
- 43/09 • • • • by one or more pairs of rollers for feeding sheet or strip material [2]
- 43/10 • • • by grippers
- 43/11 • • • • for feeding sheet or strip material [2]
- 43/12 • • • by chains or belts
- 43/13 • • • by linearly moving tables [2]
- 43/14 • • • by turning devices, e.g. turn-tables
- 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
- 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

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

- 45/02 • Ejecting devices [2]
- 45/04 • • interrelated with motion of tool [2]

- 45/06 • Stripping-off devices [2]
- 45/08 • • interrelated with motion of tool [2]
- 45/10 • Combined ejecting and stripping-off devices [2]

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

- 47/01 • beams or pillars [2]
- 47/02 • • by expanding [2]
- 47/04 • composite sheet metal profiles

49/00 Sheathing or stiffening 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

Note(s) [2009.01]

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; Subsequent re-forming
- 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 cans or tins in a permanent manner (making outlet arrangements B21D 51/38) [2]
 - 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
 - 51/38 • • Making inlet or outlet arrangements of cans, tins, baths, bottles or other vessels; Making can ends; Making closures
 - 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 them B67B)
 - 51/46 • • • • Placing sealings or sealing material
 - 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 chains or chain parts B21L)

53/02	• heat exchangers, e.g. radiators, condensers (making finned or ribbed tubes by fixing strip material or the like to tubes B21C 37/22) [2]	53/54	• • • slides
53/04	• • of sheet metal	53/56	• • • stops
53/06	• • of metal tubes	53/58	• end-pieces for laces or ropes
53/08	• • of both metal tubes and sheet metal	53/60	• cutlery wares; garden tools or the like
53/10	• parts of bearings; sleeves; valve seats or the like	53/62	• • spoons; table forks
53/12	• • cages for bearings	53/64	• • knives; scissors; cutting blades (B21D 53/72 takes precedence; handle portions B21D 53/70)
53/14	• belts, e.g. machine-gun belts	53/66	• • spades; shovels (handle portions B21D 53/70)
53/16	• rings, e.g. barrel hoops	53/68	• • rakes, garden forks, or the like (handle portions B21D 53/70)
53/18	• • of hollow or C-shaped cross-section, e.g. for curtains, for eyelets	53/70	• • handle portions (B21D 53/72 takes precedence)
53/20	• • washers, e.g. for sealing	53/72	• • sickles; scythes
53/22	• • • with means for preventing rotation	53/74	• frames for openings, e.g. for windows, doors, handbags
53/24	• nuts or like thread-engaging members	53/76	• writing or drawing instruments, e.g. writing pens, erasing pens
53/26	• wheels or the like	53/78	• propeller blades; turbine blades
53/28	• • gear wheels	53/80	• dustproof covers; safety covers
53/30	• • wheel rims	53/82	• perforated music sheets; pattern sheets, e.g. for control purposes, stencils
53/32	• • wheel covers	53/84	• other parts for engines, e.g. connecting-rods
53/34	• • brake drums	53/86	• other parts for bicycles or motorcycles
53/36	• clips, clamps, or like fastening or attaching devices, e.g. for electric installation	53/88	• other parts for vehicles, e.g. cowlings, mudguards
53/38	• locksmith's goods, e.g. handles	53/90	• • axle-housings
53/40	• • hinges, e.g. door hinge plates	53/92	• other parts for aircraft
53/42	• • keys		
53/44	• fancy goods, e.g. jewellery products		
53/46	• haberdashery, e.g. buckles, combs; pronged fasteners, e.g. staples		
53/48	• • buttons, e.g. press-buttons, snap fasteners		
53/50	• • metal slide-fastener parts		
53/52	• • • fastener elements; Attaching such elements so far as this procedure is combined with the process for making the elements		
		55/00	Safety devices protecting the machine or the operator, specially adapted for apparatus or machines dealt with in this subclass