

SECTION B — PERFORMING OPERATIONS; TRANSPORTING

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

Note(s)

- This class does not cover:
 - combinations of operations covered by different subclasses of class B21, which are covered by subclass B23P;
 - combinations of operations covered by any particular subclass of class B21 with operations covered by other classes, e.g. with operations involving removal of material, which are also covered by subclass B23P, except that if the operations covered by the other classes are subsidiary to the operations properly covered by a single subclass of B21 the combination is classified in that subclass.
- Processes of a kind covered by this class but applied to non-metallic materials are classified in this class if they are applicable to metal and cannot be classified fully in another class.

B21B ROLLING OF METAL (auxiliary operations used in connection with metal-working operations covered in B21, see B21C; bending by rolling B21D; manufacture of particular objects, e.g. screws, wheels, rings, barrels, balls, by rolling B21H; pressure welding by means of a rolling mill B23K 20/04)

Note(s)

In this subclass, the following terms or expressions are used with the meanings indicated:

- "rolling" means rolling operations in which plastic deformations occur;
- "continuous process" means a process employing a mill train designed to have the workpiece enter one pair of rolls before leaving the preceding pair.

Subclass index

METAL ROLLING IN GENERAL

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ROLLING TO PRODUCE PARTICULAR SHAPES

Tubes

rolling methods.....	17/00-23/00
mandrels, accessories.....	25/00

Extending closed shapes.....5/00

SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS.....99/00

1/00	Metal rolling methods or mills for making semi-finished products of solid or profiled cross-section (B21B 17/00-B21B 23/00 take precedence; with respect to composition of material to be rolled B21B 3/00; extending closed shapes of metal bands by simultaneous rolling at two or more zones B21B 5/00; metal-rolling stands as units B21B 13/00; continuous casting into moulds having walls formed by moving rolls B22D 11/06); Sequence of operations in milling trains; Layout of rolling-mill plant, e.g. grouping of stands; Succession of passes or of sectional pass alternations	1/06	• • in a non-continuous process
		1/08	• for rolling work of special cross-section, e.g. angle steel (rolling metal of indefinite length in repetitive shapes specially designed for the manufacture of particular objects B21H 8/00) [1, 2006.01]
1/02	• for rolling heavy work, e.g. ingots, slabs, billets, in which the cross-sectional form is unimportant	1/082	• Piling sections having lateral edges specially adapted for interlocking with each other in order to build a wall [2006.01]
		1/085	• Rail sections [2006.01]
1/04	• • in a continuous process	1/088	• H- or I-sections [2006.01]
		1/09	• L-sections [2006.01]
		1/092	• T-sections [2006.01]
		1/095	• U- or channel sections [2006.01]
		1/098	• Z-sections [2006.01]

B21B

- 1/10 • • in a single two-high or universal rolling mill
 - 1/12 • • in a continuous process
 - 1/14 • • in a non-continuous process
 - 1/16 • for rolling wire or material of like small cross-section
 - 1/18 • • in a continuous process
 - 1/20 • • in a non-continuous process
 - 1/22 • for rolling bands or sheets of indefinite length (B21B 1/42 takes precedence)
 - 1/24 • • in a continuous process
 - 1/26 • • • by hot-rolling
 - 1/28 • • • by cold-rolling
 - 1/30 • • in a non-continuous process
 - 1/32 • • • in reversing mills, e.g. with intermediate storage reels for accumulating work
 - 1/34 • • • • by hot-rolling
 - 1/36 • • • • by cold-rolling
 - 1/38 • for rolling sheets of limited length, e.g. folded sheets, superimposed sheets (B21B 1/40 takes precedence; folding sheets before, or separating layers after, rolling B21B 47/00) [2]
 - 1/40 • for rolling foils which present special problems, e.g. because of thinness
 - 1/42 • for step-by-step or planetary rolling (making tubes by pilgrim-step rolling B21B 21/00)
 - 1/46 • for rolling metal immediately subsequent to continuous casting (metal-rolling stands B21B 13/22; continuous casting B22D 11/00, e.g. into moulds with rolls B22D 11/06) [3]
 - 3/00 Rolling materials of special alloys so far as the composition of the alloy requires or permits special rolling methods or sequences** (altering special metallurgical properties of alloys, other than structure consolidation or mechanical properties resulting therefrom C21D, C22F)
 - 3/02 • Rolling special iron alloys
 - 5/00 Extending closed shapes of metal bands by rolling** (manufacture of circular shapes, e.g. wheel rims, B21H 1/06)
 - 9/00 Measures for carrying out rolling operations under special conditions, e.g. in vacuum or inert atmosphere to prevent oxidation of work; Special measures for removing fumes from rolling mills**
 - 11/00 Subsidising the rolling processes by subjecting rollers or work to vibrations**
 - 13/00 Metal-rolling stands, i.e. an assembly composed of a stand frame, rolls, and accessories** (B21B 17/00-B21B 23/00 take precedence; details, component parts, accessories, auxiliary means, procedures in connection with metal rolling, see the relevant groups)
 - 13/02 • with axes of rolls arranged horizontally
 - 13/04 • • Three-high arrangement
 - 13/06 • with axes of rolls arranged vertically
 - 13/08 • with differently-directed roll axes, e.g. for the so-called "universal" rolling process
 - 13/10 • • all axes being arranged in one plane
 - 13/12 • • axes being arranged in different planes
 - 13/14 • having counter-pressure devices acting on rolls to inhibit deflection of same under load (counter-pressure devices as such B21B 29/00)
 - 13/16 • with alternatively operative rolls
 - 13/18 • for step-by-step or planetary rolling (methods B21B 1/42; making tubes by pilgrim-step rolling B21B 21/00)
 - 13/20 • • for planetary rolling
 - 13/22 • for rolling metal immediately subsequent to continuous casting (methods therefor B21B 1/46; continuous casting B22D 11/00, e.g. into moulds with rolls B22D 11/06)
 - 15/00 Arrangements for performing additional metal-working operations specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills**
 - 15/02 • in which work is subjected to permanent internal twisting, e.g. for producing reinforcement bars for concrete
- Rolling methods or mills specially designed for making or processing tubes**
- 17/00 Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling**
 - 17/02 • with mandrel (B21B 17/08 takes precedence) [2]
 - 17/04 • • in a continuous process
 - 17/06 • • in a discontinuous process
 - 17/08 • with mandrel having one or more protrusions [2]
 - 17/10 • • in a continuous process
 - 17/12 • • in a discontinuous process
 - 17/14 • without mandrel
 - 19/00 Tube-rolling by rollers arranged outside the work and having their axes not perpendicular to the axis of the work** (straightening by rollers B21D)
 - 19/02 • the axes of the rollers being arranged essentially diagonally to the axis of the work, e.g. "cross" tube-rolling
 - 19/04 • • Rolling basic material of solid, i.e. non-hollow, structure; Piercing
 - 19/06 • • Rolling hollow basic material (B21B 19/04 takes precedence; separating work from mandrel B21C 45/00)
 - 19/08 • • • Enlarging tube diameter
 - 19/10 • • • Finishing, e.g. smoothing, sizing
 - 19/12 • the axes of the rollers being arranged essentially parallel to the axis of the work
 - 19/14 • • Rolling tubes by means of additional rollers arranged inside the tubes
 - 19/16 • • Rolling tubes without additional rollers arranged inside the tubes
 - 21/00 Pilgrim-step tube-rolling**
 - 21/02 • Rollers therefor
 - 21/04 • Pilgrim-step feeding mechanisms (B21B 21/06 takes precedence)
 - 21/06 • Devices for revolving work between the steps
 - 23/00 Tube-rolling not restricted to methods provided for in only one of groups B21B 17/00-B21B 21/00, e.g. combined processes** (B21B 25/00 takes precedence)
 - 25/00 Mandrels for metal tube rolling mills, e.g. mandrels of the types used in the methods covered by group B21B 17/00; Accessories or auxiliary means therefor**
 - 25/02 • Guides, supports, or abutments for mandrels, e.g. carriages; Adjusting devices for mandrels
 - 25/04 • Cooling or lubricating mandrels during operation [2]
 - 25/06 • Interchanging mandrels

- 27/00** **Rolls** (shape of working surfaces required by special processes B21B 1/00); **Lubricating, cooling or heating rolls while in use**
- 27/02 • Shape or construction of rolls (for rolling metal of indefinite length in repetitive shapes specially designed for the manufacture of particular objects B21H 8/02)
- 27/03 • • Sleeved rolls [5]
- 27/05 • • • with deflectable sleeves [5]
- 27/06 • Lubricating, cooling, or heating rolls
- 27/08 • • internally
- 27/10 • • externally
- 28/00** **Maintaining rolls or rolling equipment in effective condition** (lubricating, cooling or heating rolls while in use B21B 27/06) [2]
- 28/02 • Maintaining rolls in effective condition, e.g. reconditioning [2]
- 28/04 • • while in use, e.g. polishing [2]
- 29/00** **Counter-pressure devices acting on rolls to inhibit deflection of same under load, e.g. backing rolls**
- 31/00** **Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames**
- 31/02 • Rolling stand frames; Roll mountings
- 31/04 • • with tie rods, e.g. prestressed tie rods
- 31/06 • • Fastening stands or frames to foundation, e.g. to the sole plate (in general F16M)
- 31/07 • Adaptation of roll bearings (bearings in general F16C) [2]
- 31/08 • Interchanging rolls, roll mountings, or stand frames [2]
- 31/10 • • by horizontally displacing
- 31/12 • • by vertically displacing
- 31/14 • • by pivotally displacing
- 31/16 • Adjusting rolls (control devices B21B 37/00)
- 31/18 • • by moving rolls axially
- 31/20 • • by moving rolls perpendicularly to roll axis
- 31/22 • • • mechanically
- 31/24 • • • • by screws
- 31/26 • • • • Adjusting eccentrically-mounted roll bearings
- 31/28 • • • • by toggle-lever mechanisms
- 31/30 • • • • by wedges or their equivalent
- 31/32 • • • by liquid pressure
- 33/00** **Safety devices not otherwise provided for** (safety devices in general F16P); **Breaker blocks; Devices for freeing jammed rolls** [2]
- 33/02 • Preventing fracture of rolls [2]
- 35/00** **Drives for metal-rolling mills**
- 35/02 • for continuously-operating mills (B21B 35/10, B21B 35/12 take precedence)
- 35/04 • • each stand having its own motor or motors
- 35/06 • for non-continuously-operating mills or for single stands (B21B 35/10, B21B 35/12 take precedence)
- 35/08 • • for reversing rolling mills
- 35/10 • Driving arrangements for rolls which have only a low-power drive; Driving arrangements for rolls which receive power from the shaft of another roll [2]
- 35/12 • Toothed-wheel gearings specially adapted for metal-rolling mills; Housings or mountings therefor
- 35/14 • Couplings, driving spindles, or spindle carriers specially adapted for or specially arranged in metal-rolling mills (couplings or shafts in general F16)
- 37/00** **Control devices or methods specially adapted for metal-rolling mills or the work produced thereby** (methods or devices for measuring specially adapted for metal-rolling mills B21B 38/00)
- 37/16 • Control of thickness, width, diameter or other transverse dimensions (B21B 37/58 takes precedence) [6]
- 37/18 • • Automatic gauge control [6]
- 37/20 • • • in tandem mills [6]
- 37/22 • • Lateral spread control; Width control, e.g. by edge rolling [6]
- 37/24 • • Automatic variation of thickness according to a predetermined programme [6]
- 37/26 • • • for obtaining one strip having successive lengths of different constant thickness [6]
- 37/28 • Control of flatness or profile during rolling of strip, sheets or plates [6]
- 37/30 • • using roll camber control [6]
- 37/32 • • • by cooling, heating or lubricating the rolls [6]
- 37/34 • • • by hydraulic expansion of the rolls [6]
- 37/36 • • • by radial displacement of the roll sleeve on a stationary roll beam by means of hydraulic supports [6]
- 37/38 • • using roll bending (B21B 37/42 takes precedence) [6]
- 37/40 • • using axial shifting of the rolls (B21B 37/42 takes precedence) [6]
- 37/42 • • using a combination of roll bending and axial shifting of the rolls [6]
- 37/44 • • using heating, lubricating or water-spray cooling of the product [6]
- 37/46 • Roll speed or drive motor control (B21B 37/52, B21B 37/60 take precedence) [6]
- 37/48 • Tension control; Compression control [6]
- 37/50 • • by looper control [6]
- 37/52 • • by drive motor control [6]
- 37/54 • • • including coiler drive control, e.g. reversing mills [6]
- 37/56 • Elongation control [6]
- 37/58 • Roll-force control; Roll-gap control [6]
- 37/60 • • by control of a motor which drives an adjusting screw [6]
- 37/62 • • by control of a hydraulic adjusting device [6]
- 37/64 • • Mill spring or roll spring compensation systems, e.g. control of prestressed mill stands [6]
- 37/66 • • Roll eccentricity compensation systems [6]
- 37/68 • Camber or steering control for strip, sheets or plates, e.g. preventing meandering [6]
- 37/70 • Length control (B21B 37/56 takes precedence) [6]
- 37/72 • Rear end control; Front end control [6]
- 37/74 • Temperature control, e.g. by cooling or heating the rolls or the product (B21B 37/32, B21B 37/44 take precedence) [6]
- 37/76 • • Cooling control on the run-out table [6]
- 37/78 • Control of tube rolling [6]
- 38/00** **Methods or devices for measuring specially adapted for metal-rolling mills, e.g. position detection, inspection of the product** [6]
- 38/02 • for measuring flatness or profile of strips [6]
- 38/04 • for measuring thickness, width, diameter or other transverse dimensions of the product [6]
- 38/06 • for measuring tension or compression [6]
- 38/08 • for measuring roll-force [6]
- 38/10 • for measuring roll-gap, e.g. pass indicators [6]
- 38/12 • for measuring roll camber [6]

B21B

- 39/00 Arrangements for moving, supporting, or positioning work, or controlling its movement, combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills** (guiding, conveying, or accumulating easily-flexible work in loops or curves B21B 41/00; specially associated with cooling-beds B21B 43/00; conveying or transporting in general B65G)
- 39/02 • Feeding or supporting work; Braking or tensioning arrangements
- 39/04 • • Lifting or lowering work for conveying purposes, e.g. tilting tables arranged immediately in front of or behind the pass (turn-over or like manipulating means as such B21B 39/20)
- 39/06 • • Pushing or forcing work into pass
- 39/08 • • Braking or tensioning arrangements
- 39/10 • • Arrangement or installation of feeding rollers in rolling stands
- 39/12 • • Arrangement or installation of roller tables in relation to a roll stand
- 39/14 • Guiding, positioning or aligning work (B21B 43/12 takes precedence; guides in which work is subjected to permanent internal twisting B21B 15/02)
- 39/16 • • immediately before entering or after leaving the pass
- 39/18 • • Switches for directing work in metal-rolling mills or trains
- 39/20 • Revolving, turning-over, or like manipulation of work (guides in which work is subjected to permanent internal twisting B21B 15/02)
- 39/22 • • by tipping, e.g. by lifting one side by levers or wedges (B21B 39/26, B21B 39/28 take precedence)
- 39/24 • • by tongs or grippers
- 39/26 • • by members, e.g. grooved, engaging opposite sides of the work and moved relatively to each other to revolve the work
- 39/28 • • by means of guide members shaped to revolve the work during its passage
- 39/30 • • by lodging it in a rotating ring manipulator or ring segment manipulator
- 39/32 • • Devices specially adapted for turning sheets
- 39/34 • Arrangements or constructional combinations specifically designed to perform functions covered by more than one of groups B21B 39/02, B21B 39/14, B21B 39/20
- 41/00 Guiding, conveying, or accumulating easily-flexible work, e.g. wire, sheet metal bands, in loops or curves; Loop lifters**
- 41/02 • Returning work to repeat the pass or passes
- 41/04 • • above or underneath the rolling stand or rolls
- 41/06 • in which the direction of movement of the work is turned through approximately 180°
- 41/08 • without overall change in the general direction of movement of the work
- 41/10 • • Loop deflectors
- 41/12 • Arrangements of interest only with respect to provision for indicating or controlling operations
- 43/00 Cooling beds, whether stationary or moving; Means specially associated with cooling beds, e.g. for braking work or for transferring it to or from the bed** (conveying means in general B65G)
- 43/02 • Cooling beds comprising rakes or bars (B21B 43/10 takes precedence) [2]
- 43/04 • Cooling beds comprising rolls or worms
- 43/06 • Cooling beds comprising carriages (B21B 43/08 takes precedence)
- 43/08 • Cooling beds comprising revolving drums or recycling chains
- 43/10 • Cooling beds with other work-shifting elements projecting through the bed
- 43/12 • Devices for positioning workpieces "flushed", i.e. with all their axial ends arranged in line on cooling beds or on co-operating conveyers [2]
- 45/00 Devices for surface treatment of work, specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills** (B21B 15/00 takes precedence; technical features of scaling-off devices B21C 43/00)
- 45/02 • for lubricating, cooling, or cleaning
- 45/04 • for de-scaling
- 45/06 • • of strip material (B21B 45/08 takes precedence)
- 45/08 • • hydraulically
- 47/00 Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal** (soaking pits C21D 9/70) [2]
- 47/02 • for folding sheets before rolling
- 47/04 • for separating layers after rolling
- 99/00 Subject matter not provided for in other groups of this subclass [2006.01]**

B21C MANUFACTURE OF METAL SHEETS, WIRE, RODS, TUBES, PROFILES OR LIKE SEMI-MANUFACTURED PRODUCTS OTHERWISE THAN BY ROLLING; AUXILIARY OPERATIONS USED IN CONNECTION WITH METAL-WORKING WITHOUT ESSENTIALLY REMOVING MATERIAL

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METAL EXTRUDING

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AUXILIARY OPERATIONS USED IN CONNECTION WITH METAL-WORKING WITHOUT
ESSENTIALLY REMOVING MATERIAL

Reeling.....	47/00
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Metal drawing

1/00 Manufacture of metal sheets, wire, rods, tubes or like semi-manufactured products by drawing	3/14	• • • Die holders combined with devices for guiding the drawing material or combined with devices for cooling, heating, or lubricating
1/02 • Drawing metal wire or like flexible metallic material by drawing machines or apparatus in which the drawing action is effected by drums	3/16	• Mandrels (separating mandrels from work B21C 45/00); Mounting or adjusting same
1/04 • • with two or more dies operating in series	3/18	• Making tools by operations not covered by a single other subclass; Repairing
1/06 • • • in which the material slips on the drums	5/00 Pointing or push-pointing drawn work or drawing material	
1/08 • • • in which the material does not slip on the drums	9/00 Cooling, heating or lubricating drawing material (B21C 3/14 takes precedence)	
1/10 • • • • with accumulation of material between consecutively-arranged dies	9/02	• Selection of compositions therefor
1/12 • • Regulating or controlling speed of drawing drums, e.g. to influence tension; Drives; Stop or relief mechanisms (couplings for drums B21C 1/14; design or construction of electrical equipment, <u>see</u> the relevant classes)		
1/14 • • Drums, e.g. capstans (capstans or winches in general B66D); Connection of grippers thereto; Grippers specially adapted for drawing machines or apparatus of the drum type; Couplings specially adapted for these drums	19/00 Devices for straightening wire or like work combined with or specially adapted for use in connection with drawing or winding machines or apparatus	
1/16 • Metal drawing by machines or apparatus in which the drawing action is effected by means other than drums, e.g. by a longitudinally-moved carriage pulling or pushing the work or stock for making metal sheets, rods or tubes	Metal extruding	
1/18 • • from stock of limited length (B21C 1/22 takes precedence)	23/00 Extruding metal; Impact extrusion	
1/20 • • from stock of essentially unlimited length (B21C 1/22 takes precedence)	23/01	• starting from material of particular form or shape, e.g. mechanically pre-treated (B21C 23/22 takes precedence; heat treatment or combinations thereof with mechanical treatments, <u>see</u> appropriate classes)
1/22 • • specially adapted for making tubular articles (bending sheet metal into tubular form by drawing B21D 5/10)	23/02	• Making uncoated products
1/24 • • • by means of mandrels (mandrels B21C 3/16)	23/03	• • by both direct and backward extrusion
1/26 • • • • Push-bench drawing	23/04	• • by direct extrusion
1/27 • • Carriages; Drives	23/06	• • • Making sheets
1/28 • • • Carriages; Connections of grippers thereto; Grippers (for drawing machines of the drum type B21C 1/14)	23/08	• • • Making wire, rods or tubes
1/30 • • • Drives, e.g. carriage-traversing mechanisms; Driving elements, e.g. drawing chains; Controlling the drive	23/10	• • • • Making finned tubes
1/32 • • Feeding or discharging the material or mandrels	23/12	• • • • Extruding bent tubes or rods
1/34 • • Guiding or supporting the material or mandrels	23/14	• • • • Making other products
3/00 Profiling tools for metal drawing; Combinations of dies and mandrels for metal drawing	23/16	• • • • Making turbo blades or propellers
3/02 • Dies; Selection of material therefor; Cleaning thereof	23/18	• • by impact extrusion [2]
3/04 • • with non-adjustable section (B21C 3/08 takes precedence)	23/20	• • by backward extrusion
3/06 • • with adjustable section (B21C 3/08 takes precedence)	23/21	• Presses specially adapted for extruding metal (extrusion presses in general B30B 11/22)
3/08 • • with section defined by rollers, balls, or the like	23/22	• Making metal-coated products; Making products from two or more metals
3/10 • • with hydraulic forces acting immediately on work	23/24	• • Covering indefinite lengths of metal or non-metal material with a metal coating
3/12 • • Die holders; Rotating dies	23/26	• • • Applying metal coats to cables, e.g. to insulated electric cables
	23/28	• • • • on intermittently-operating extrusion presses
	23/30	• • • • on continuously-operating extrusion presses
	23/32	• Lubrication of metal being extruded or of dies, or the like, e.g. physical state of lubricant, location where lubricant is applied (chemical composition, <u>see</u> appropriate classes)
	25/00 Profiling tools for metal extruding	
	25/02	• Dies
	25/04	• Mandrels

B21C

- 25/06 • Press heads, dies, or mandrels for coating work
 - 25/08 • Dies or mandrels with section variable during extruding, e. g for making tapered work; Controlling variation
 - 25/10 • Making tools by operations not covered by a single other subclass
 - 26/00 Rams or plungers for metal extruding; Discs therefor [2]**
 - 27/00 Containers for metal to be extruded** (B21C 29/02 takes precedence)
 - 27/02 • for making coated work
 - 27/04 • Venting metal-container chamber
 - 29/00 Cooling or heating extruded work or parts of the extrusion press**
 - 29/02 • of containers for metal to be extruded
 - 29/04 • of press heads, dies, or mandrels
 - 31/00 Control devices for metal extruding, e.g. for regulating the pressing speed or temperature of metal** (B21C 25/08 takes precedence); **Measuring devices, e.g. for temperature of metal, combined with or specially adapted for use in connection with extrusion presses** (measuring devices of more general interest within subclass B21C, see group B21C 51/00)
 - 33/00 Feeding extrusion presses with metal to be extruded**
 - 33/02 • the metal being in liquid form
 - 35/00 Removing work or waste from extruding presses; Drawing-off extruded work** (in connection with the extruding of bent tubes or rods B21C 23/12); **Cleaning dies, ducts, containers, or mandrels for metal extruding [2]**
 - 35/02 • Removing or drawing-off work
 - 35/03 • • Straightening the work (metal straightening in general B21D)
 - 35/04 • Cutting-off or removing waste
 - 35/06 • Cleaning dies, ducts, containers or mandrels [2]

 - 37/00 Manufacture of metal sheets, rods, wire, tubes, profiles or like semi-manufactured products, not otherwise provided for** (by rolling B21B; by working or processing semi-finished sheet metal, profiles, tubes, or wire B21D, B21F; by casting B22; by material-removing machine tools B23; by welding, e.g. cladding or plating, B23K; by grinding or polishing B24; by electroforming C25D 1/00); **Manufacture of tubes of special shape [2]**
 - 37/02 • of sheets
 - 37/04 • of rods or wire
 - 37/06 • of tubes or metal hoses; Combined procedures for making tubes, e.g. for making multi-wall tubes (bending sheets for making tubes B21D 5/00; seaming by folding B21D 39/02)
 - 37/08 • • Making tubes with welded or soldered seams (involving only a soldering or welding operation B23K)
 - 37/083 • • • Supply, or operations combined with supply, of strip material
 - 37/087 • • • using rods or strips of soldering material
 - 37/09 • • • of coated strip material
 - 37/10 • • Making tubes with riveted seams
 - 37/12 • • Making tubes or metal hoses with helically arranged seams
 - 37/14 • • Making tubes from doubled flat material
 - 37/15 • • Making tubes of special shape; Making the fittings
 - 37/16 • • • Making tubes with varying diameter in longitudinal direction
 - 37/18 • • • • conical tubes
 - 37/20 • • • Making helical or similar guides in or on tubes without removing material, e.g. by drawing same over mandrels, by pushing same through dies
 - 37/22 • • • Making finned or ribbed tubes by fixing strip or like material to tubes (making heat exchangers B21D 53/02)
 - 37/24 • • • • annularly-ribbed tubes
 - 37/26 • • • • helically-ribbed tubes
 - 37/28 • • • Making tube fittings for connecting pipes, e.g. U-pieces
 - 37/29 • • • • Making branched pieces, e.g. T-pieces
 - 37/30 • • Finishing tubes, e.g. sizing, burnishing
 - 43/00 Devices for cleaning metal products combined with or specially adapted for use with machines or apparatus provided for in this subclass**
 - 43/02 • combined with or specially adapted for use in connection with drawing or winding machines or apparatus
 - 43/04 • • Devices for de-scaling wire or like flexible work
- Auxiliary operations used in connection with metal working without essentially removing material**
- 45/00 Separating mandrels from work or vice versa**
 - 47/00 Winding-up, coiling or winding-off metal wire, metal band or other flexible metal material characterised by features relevant to metal processing only** (coiling wire into particular forms B21F 3/00; hot coilers in connection with heat-treatment apparatus C21D 9/68)
 - 47/02 • Winding-up or coiling
 - 47/04 • • on or in reels or drums, without using a moving guide (reels or drums B21C 47/28)
 - 47/06 • • • with loaded rollers, bolts, or equivalent means holding the material on the reel or drum
 - 47/08 • • without making use of a reel or drum, the first turn being formed by a stationary guide
 - 47/10 • • by means of a moving guide
 - 47/12 • • • the guide moving parallel to the axis of the coil (B21C 47/14 takes precedence)
 - 47/14 • • • by means of a rotating guide, e.g. laying the material around a stationary reel or drum
 - 47/16 • Unwinding or uncoiling
 - 47/18 • • from reels or drums
 - 47/20 • • • the unreeled material moving transversely to the tangent line of the drum, e.g. axially, radially
 - 47/22 • • Unwinding coils without reels or drums
 - 47/24 • Transferring coils to or from winding apparatus or to or from operative position therein; Preventing uncoiling during transfer
 - 47/26 • Special arrangements with regard to simultaneous or subsequent treatment of the material
 - 47/28 • Drums or other coil-holders (gripping means B21C 47/32)
 - 47/30 • • expandible or contractible
 - 47/32 • Tongs or gripping means specially adapted for reeling operations

47/34	• Feeding or guiding devices not specially adapted to a particular type of apparatus		
49/00	Devices for temporarily accumulating material	99/00	Subject matter not provided for in other groups of this subclass [2009.01]
51/00	Measuring, gauging, indicating, counting, or marking devices specially adapted for use in the production or manipulation of material in accordance with subclasses B21B-B21F		
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(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

Straightening.....	1/00, 3/00, 25/00
Bending.....	11/00
of sheets.....	5/00, 13/00
of rods.....	7/00, 13/00
of tubes.....	9/00, 15/00
Twisting.....	11/00
Corrugating or grooving or bending into waves.....	13/00, 15/00, 17/00
Punching, stamping, deep- drawing, spinning, high-energy forming.....	22/00-28/00
EDGE TREATMENT; CONNECTION OF PARTS.....	19/00, 41/00, 39/00
OTHER METHODS.....	25/00, 31/00, 41/00
COMBINED PROCESSES.....	21/00, 35/00
HANDLING.....	43/00, 45/00
OTHER AUXILIARY OPERATIONS.....	33/00
TOOLS.....	37/00
SAFETY.....	55/00
SPECIAL TREATMENT FOR THE MANUFACTURE OF SPECIFIED ARTICLES.....	47/00-53/00

Straightening; Restoring form; Bending; Corrugating; Flanging

- 1/00** **Straightening, restoring form or removing local distortions of sheet metal or specific articles made therefrom** (B21D 3/00 takes precedence); **Stretching sheet metal combined with rolling** (working sheet metal of limited length by stretching B21D 25/00; by localised hammering B21D 31/06) [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** (straightening of well casings in situ E21B)

- 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 (by twisting only B21D 11/14)
- 3/14 • Recontouring
- 3/16 • of specific articles made from metal rods, tubes, or profiles, e.g. crankshafts, by specially-adapted methods or means
- 5/00** **Bending sheet metal along straight lines, e.g. to form simple curves** (B21D 11/06-B21D 11/18 take precedence; corrugating sheet metal B21D 13/00; as edge treatment B21D 19/00)
- 5/01 • between rams and anvils or abutments
- 5/02 • on press brakes without making use of clamping means

B21D

- 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
 - 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 (filling of tubes with such material B21D 9/16) [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** (corrugating or bending into wave form B21D 13/00, B21D 15/00; flanging B21D 19/00); **Twisting** [2]
 - 11/02 • Bending by stretching or pulling over a die (working sheet metal of limited length by stretching B21D 25/00)
 - 11/06 • Bending into helical or spiral form; Forming a succession of return bends, e.g. serpentine form (making helically seamed tubing B21C 37/12)
 - 11/07 • • Making serpentine-shaped articles by bending essentially in one plane
 - 11/08 • Bending by altering the thickness of part of the cross-section of the work (B21D 11/06 takes precedence)
 - 11/10 • 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 • Jogging
 - 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** (tubes B21D 15/00)
 - 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** (wrinkle-bending using mandrels or the like B21D 9/14) [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 (grooving or notching of bolts, studs, or the like B21K 1/54)
 - 17/04 • by rolling
 - 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)
 - 19/02 • by continuously-acting tools moving along the edge (edge-curling B21D 19/12)
 - 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. armouring same
 - 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; shaping over a die without external former B21D 11/02)
- 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
- 22/28 • • of cylindrical articles using consecutive dies
- 22/30 • • to finish articles formed by deep-drawing
- 24/00 Special deep-drawing arrangements in, or in connection with, presses**
- 24/02 • Die-cushions
- 24/04 • Blank holders; Mounting means therefor
- 24/06 • • Mechanically spring-loaded blank holders
- 24/08 • • Pneumatically or hydraulically loaded blank holders
- 24/10 • Devices controlling or operating blank holders independently, or in conjunction with dies
- 24/12 • • mechanically
- 24/14 • • pneumatically or hydraulically
- 24/16 • Additional equipment in association with the tools, e.g. for shearing, for trimming
- 25/00 Working sheet metal of limited length by stretching, e.g. for straightening [2]**
- 25/02 • by pulling over a die [2]
- 25/04 • Clamping arrangements [2]
- 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)**
- 26/02 • by applying fluid pressure [2, 2011.01]
- 26/021 • • Deforming sheet bodies [2011.01]
- 26/023 • • • including an additional treatment performed by fluid pressure, e.g. perforating [2011.01]
- 26/025 • • • Means for controlling the clamping or opening of the moulds [2011.01]
- 26/027 • • • Means for controlling fluid parameters, e.g. pressure or temperature [2011.01]
- 26/029 • • • Closing or sealing means [2011.01]
- 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]
- 26/035 • • • including an additional treatment performed by fluid pressure, e.g. perforating [2011.01]
- 26/037 • • • Forming branched tubes [2011.01]
- 26/039 • • • Means for controlling the clamping or opening of the moulds [2011.01]
- 26/041 • • • Means for controlling fluid parameters, e.g. pressure or temperature [2011.01]
- 26/043 • • • Means for controlling the axial pusher [2011.01]
- 26/045 • • • Closing or sealing means [2011.01]
- 26/047 • • • Mould construction (B21D 26/037-B21D 26/045 take precedence) [2011.01]
- 26/049 • • • Deforming bodies having a closed end [2011.01]
- 26/051 • • • Deforming double-walled bodies [2011.01]
- 26/053 • • characterised by the material of the blanks [2011.01]
- 26/055 • • • Blanks having super-plastic properties [2011.01]
- 26/057 • • • Tailored blanks [2011.01]
- 26/059 • • • Layered blanks [2011.01]
- 26/06 • • by shock waves
- 26/08 • • • generated by explosives, e.g. chemical explosives
- 26/10 • • • generated by evaporation, e.g. of wire, of liquids
- 26/12 • • • initiated by spark discharge [2]
- 26/14 • applying magnetic forces
- 28/00 Shaping by press-cutting; Perforating**
- 28/02 • Punching blanks or articles with or without obtaining scrap (cutting nails or pins from strips or sheet material B21G 3/26); Notching
- 28/04 • • Centering the work; Positioning the tools
- 28/06 • • Making more than one part out of the same blank; Scrapless working
- 28/08 • • • Zig-zag sequence working
- 28/10 • • Incompletely punching in such a manner that the parts are still coherent with the work
- 28/12 • • Punching using rotatable carriers
- 28/14 • • Dies (ejecting or stripping-off devices arranged in punching machines or tools B21D 45/00)
- 28/16 • • Shoulder or burr prevention
- 28/18 • • Yieldable, e.g. rubber, punching pads
- 28/20 • • Applications of drives
- 28/22 • • Notching the peripheries of circular blanks, e.g. laminations for dynamo-electric machines
- 28/24 • Perforating, i.e. punching holes
- 28/26 • • in sheets or flat parts
- 28/28 • • in tubes or other hollow bodies
- 28/30 • • in annular parts, e.g. rims
- 28/32 • • in other articles of special shape
- 28/34 • • Perforating tools; Die holders
- 28/36 • • using rotatable work or tool holders
-
- 31/00 Other methods for working sheet metal, metal tubes, metal profiles (deforming one surface of tubes helically by rolling B21H 3/00; upsetting B21J 5/08; working metal by removing material therefrom B23; embossing B44B)**
- 31/02 • Stabbing or piercing, e.g. for making sieves (dimpling B21D 22/04; perforating by punching B21D 28/24)
- 31/04 • Expanding other than provided for in groups B21D 1/00-B21D 28/00, e.g. for making expanded metal (B21D 47/00 takes precedence; enlarging tube ends B21D 41/02) [2]

B21D

- 31/06 • Deforming sheet metal, tubes or profiles by sequential impacts, e.g. hammering, beating, peen forming (forging hammers B21J 7/00)
- 33/00 Special measures in connection with working metal foils, e.g. gold foils** (cutting or perforating of metal foil analogous to paper B26)
- 35/00 Combined processes according to methods covered by groups B21D 1/00-B21D 31/00** (B21D 21/00 takes precedence)
- 37/00 Tools as parts of machines covered by this subclass** (forms or constructions of tools uniquely adapted for particular operations, see in the relevant groups for the operations)
 - 37/01 • Selection of materials [2]
 - 37/02 • Die constructions enabling assembly of the die parts in different ways (B21D 37/06 takes precedence)
 - 37/04 • Movable or exchangeable mountings for tools
 - 37/06 • • Pivotaly-arranged tools, e.g. disengageable (die sets with dies pivoted to one another B21D 37/12)
 - 37/08 • Dies with different parts for several steps in a process
 - 37/10 • Die sets; Pillar guides
 - 37/12 • • Particular guiding equipment; Special arrangements for interconnection or cooperation of dies
 - 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; welding B23K; press-fitting, force-fitting, or shrinking in general B23P 11/00, B23P 19/00; by adhesives F16B 11/00); **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 (in general B65G)
 - 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** (by winding wire or tape thereon B65H 54/00, B65H 81/00; specially adapted for manufacturing conductors or cables H01B 13/26)
 - 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; Re-forming same (making tubes from doubled flat material B21C 37/14)

- 51/16 • characterised by the use of the objects (making heat exchangers B21D 53/02)
- 51/18 • • vessels, e.g. tubs, vats, tanks, sinks, or the like
- 51/20 • • • barrels
- 51/22 • • • pots, e.g. for cooking
- 51/24 • • high-pressure containers, e.g. boilers, bottles
- 51/26 • • cans or tins; Closing same in a permanent manner (making outlet arrangements B21D 51/38; welding or soldering B23K) [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 same 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 wire fabrics B21F; 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]
- 53/04 • • of sheet metal
- 53/06 • • of metal tubes
- 53/08 • • of both metal tubes and sheet metal (connecting tubes in openings B21D 39/06)
- 53/10 • parts of bearings; sleeves; valve seats or the like
- 53/12 • • cages for bearings
- 53/14 • belts, e.g. machine-gun belts
- 53/16 • rings, e.g. barrel hoops
- 53/18 • • of hollow or C-shaped cross-section, e.g. for curtains, for eyelets
- 53/20 • • washers, e.g. for sealing
- 53/22 • • • with means for preventing rotation
- 53/24 • nuts or like thread-engaging members
- 53/26 • wheels or the like
- 53/28 • • gear wheels
- 53/30 • • wheel rims
- 53/32 • • wheel covers
- 53/34 • • brake drums
- 53/36 • clips, clamps, or like fastening or attaching devices, e.g. for electric installation
- 53/38 • locksmith's goods, e.g. handles
- 53/40 • • hinges, e.g. door hinge plates
- 53/42 • • keys
- 53/44 • fancy goods, e.g. jewellery products
- 53/46 • haberdashery, e.g. buckles, combs; pronged fasteners, e.g. staples
- 53/48 • • buttons, e.g. press-buttons, snap fasteners
- 53/50 • • metal slide-fastener parts
- 53/52 • • • fastener elements; Attaching such elements so far as this procedure is combined with the process for making the elements
- 53/54 • • • slides
- 53/56 • • • stops
- 53/58 • end-pieces for laces or ropes
- 53/60 • cutlery wares; garden tools or the like
- 53/62 • • spoons; table forks
- 53/64 • • knives; scissors; cutting blades (B21D 53/72 takes precedence; handle portions B21D 53/70)
- 53/66 • • spades; shovels (handle portions B21D 53/70)
- 53/68 • • rakes, garden forks, or the like (handle portions B21D 53/70)
- 53/70 • • handle portions (B21D 53/72 takes precedence)
- 53/72 • • sickles; scythes
- 53/74 • frames for openings, e.g. for windows, doors, handbags
- 53/76 • writing or drawing instruments, e.g. writing pens, erasing pens
- 53/78 • propeller blades; turbine blades
- 53/80 • dustproof covers; safety covers
- 53/82 • perforated music sheets; pattern sheets, e.g. for control purposes, stencils
- 53/84 • other parts for engines, e.g. connecting-rods
- 53/86 • other parts for bicycles or motorcycles
- 53/88 • other parts for vehicles, e.g. cowlings, mudguards
- 53/90 • • axle-housings
- 53/92 • other parts for aircraft
-
- 55/00 Safety devices protecting the machine or the operator, specially adapted for apparatus or machines dealt with in this subclass** (for presses in general B30B; safety devices in general F16P)

B21F WORKING OR PROCESSING OF WIRE (rolling of metal B21B; by drawing, auxiliary operations used in connection with metal-working without essentially removing material B21C; bundling articles B65B 13/00)

Subclass index

WIRE WORKING CHARACTERISED BY OPERATIONS PERFORMED

Bending, straightening; coiling; twisting.....	1/00, 3/00, 7/00
Upsetting, straining.....	5/00, 9/00
Cutting, splitting, connecting.....	11/00, 13/00, 15/00
Articles jacketed or reinforced with wire.....	17/00
Coating of wire.....	19/00
Other treatments.....	99/00
Feeding wire into apparatus.....	23/00

B21F**WIRE WORKING CHARACTERISED BY THE PARTICULAR ARTICLES PRODUCED**

Barbed wire;network, fencing, wire fabrics.....	25/00, 27/00-33/00
Springs, rings.....	35/00, 37/00
other articles.....	39/00-45/00

Wire working characterised by operations performed**1/00 Bending wire other than coiling; Straightening wire**

- 1/02 • Straightening
- 1/04 • Undulating
- 1/06 • Bending wire-eyes

3/00 Coiling wire into particular forms

- 3/02 • helically
- 3/027 • • with extended ends formed in a special shape, e.g. for clothes-pegs
- 3/04 • • externally on a mandrel or the like
- 3/06 • • internally on a hollow form
- 3/08 • to flat spiral
- 3/10 • to spirals other than flat, e.g. conical
- 3/12 • of interconnected helical springs

5/00 Upsetting wire (in the manufacture of nails or pins B21G 3/12)**7/00 Twisting wire; Twisting wire together (for connections of limited size B21F 15/04)****9/00 Straining wire (straining prestressing wires for concrete E04G 21/12; connections or attachments adapted for straining F16G 11/00)**

- 9/02 • by tools adapted also for making connections

11/00 Cutting wire (hand-held metal-shearing or metal-cutting devices B23D 29/00; hand cutting tools with two jaws which come into abutting contact B26B 17/00)**13/00 Splitting wire****15/00 Connecting wire to wire or other metallic material or objects; Connecting parts by means of wire (tools for both straining and connecting B21F 9/00; jacketing or reinforcing B21F 17/00; manufacture of wire network B21F 27/00; in making bands B21F 43/00)**

- 15/02 • wire with wire
- 15/04 • • without additional connecting elements or material, e.g. by twisting
- 15/06 • • with additional connecting elements or material
- 15/08 • • • making use of soldering or welding
- 15/10 • wire with sheet metal

17/00 Jacketing or reinforcing articles with wire (by winding B65H 54/00, B65H 81/00; by braiding D04C)**19/00 Metallic coating of wire (by extruding B21C 23/24; by soldering or welding, e.g. cladding or plating, B23K; by other non-mechanical means C23; electroplating C25D)****23/00 Feeding wire in wire-working machines or apparatus (applicable also to feeding rods or strips B21D 43/00)****Wire working characterised by the particular articles produced****25/00 Making barbed wire****27/00 Making wire network, i.e. wire nets (meshed-ring network B21F 31/00; in making bands B21F 43/00; using looms D03D)**

- 27/02 • without additional connecting elements or material at crossings, e.g. connected by knitting
- 27/04 • • Manufacturing on machines with rotating blades or formers
- 27/06 • • Manufacturing on twister-gear machines
- 27/08 • with additional connecting elements or material at crossings
- 27/10 • • with soldered or welded crossings
- 27/12 • Making special types or portions of network by methods or means specially adapted therefor
- 27/14 • • Specially bending or deforming free wire ends
- 27/16 • • for spring mattresses
- 27/18 • • of meshed work for filters or sieves
- 27/20 • • of plaster-carrying network
- 27/22 • • of network for wire-reinforced glass or the like

29/00 Making fencing or like material made partly of wire (B21F 25/00, B21F 27/00 take precedence) [2]

- 29/02 • comprising bars or the like connected by wires

31/00 Making meshed-ring network from wire**33/00 Tools or devices specially designed for handling or processing wire fabrics or the like**

- 33/02 • Mounting of wire network on frames
- 33/04 • Connecting ends of helical springs for mattresses

35/00 Making springs from wire (by coiling wire B21F 3/00; making resilient rings B21F 37/02)

- 35/02 • Bending or deforming ends of coil springs to special shape
- 35/04 • Making flat springs, e.g. sinus springs

37/00 Manufacture of rings from wire (in chain making B21L; producing bead-rings or bead-cores for tyres B29D 30/48)

- 37/02 • or resilient rings, e.g. key-rings
- 37/04 • of washers (B21F 37/02 takes precedence)

39/00 Making wheel spokes from wire**41/00 Making umbrella frames or members from wire****43/00 Making bands, e.g. bracelets, or wire (making chains B21L; using looms D03D)****45/00 Wire-working in the manufacture of other particular articles (of pins, needles, nails, hairpins B21G; of chains B21L)**

- 45/02 • of clothes hangers
- 45/04 • of elements, e.g. levers or links, for bottle stoppers
- 45/06 • of flexible shafts or hollow conduits, e.g. for Bowden mechanisms
- 45/08 • of loom heddles
- 45/10 • of cards for fabric-napping machines
- 45/12 • of fishing hooks
- 45/14 • of end-pieces for laces or ropes

- 45/16 • of devices for fastening or securing purposes
- 45/18 • • of slide fastener elements
- 45/20 • • of spring hooks; of spring safety hooks
- 45/22 • • of paper fasteners or clips (staples B21F 45/24)
- 45/24 • • of staples; of belt-fastening elements
- 45/26 • • of buttons

- 45/28 • • • of "patent-fastener" or press-button type

99/00 Subject matter not provided for in other groups of this subclass [2009.01]

B21G MAKING NEEDLES, PINS, OR NAILS

1/00 Making needles used for performing operations
(forming heads on pin-like needles B21G 3/12; making U-shaped hairpins B21G 7/04)

Note(s)

Group B21G 1/12 takes precedence over groups B21G 1/02-B21G 1/10.

- 1/02 • of needles with eyes, e.g. sewing-needles, sewing-awls
- 1/04 • • of needles specially adapted for use in machines or tools
- 1/06 • of needles with hook or barb, e.g. crochet hooks
- 1/08 • of hollow needles or needles with hollow end, e.g. hypodermic needles, larding-needles (B21G 1/10 takes precedence)
- 1/10 • equipped with locking means for the material to be drawn through, e.g. for repairing tubeless tyres
- 1/12 • Securing, cleaning-off burrs, reconditioning, polishing, grinding
- 3/00 Making pins, nails, or the like** (of pins with individual caps B21G 5/00; of U-like shape B21G 7/00; of split-pins B21G 7/08) [2]
- 3/02 • of pins of the kind used in the tailoring trade or the household
- 3/04 • • with locking or shielding device for the pin point, e.g. safety-pins
- 3/06 • of nails with shoulders
- 3/08 • of nails with head and two or more shanks or split shanks

- 3/10 • of undulated nails or pins
- 3/12 • Upsetting; Forming heads
- 3/14 • Reducing diameter of parts otherwise than by rolling
- 3/16 • Pointing, with or without cutting
- 3/18 • by operations not restricted to one of the groups B21G 3/12-B21G 3/16 (B21G 3/06-B21G 3/10 take precedence)
- 3/20 • • from wire of indefinite length (by rolling B21G 3/30)
- 3/22 • • • in pairs arranged head to head
- 3/24 • • • by simultaneously forming the head of one nail and the adjacent point of another
- 3/26 • • by cutting from strip or sheet material
- 3/28 • • by forging or pressing
- 3/30 • • by rolling
- 3/32 • Feeding material to be worked to nail or pin making machines

5/00 Making pins or nails with attached caps or with coated heads

- 5/02 • of drawing-pins or pins of drawing-pin type

7/00 Making pins of U-like shape or split-pins (of paper fasteners or staples B21D 53/46, B21F 45/16)

- 7/02 • of U-like shape
- 7/04 • • of hairpins
- 7/06 • • • of undulated hairpins
- 7/08 • of split-pins, e.g. cotter-pins

B21H MAKING PARTICULAR METAL OBJECTS BY ROLLING, e.g. SCREWS, WHEELS, RINGS, BARRELS, BALLS (essentially from sheet metal B21D)

Note(s)

This subclass covers only rolling operations which are specially adapted for use in the manufacture of particular objects and which are not essentially combined with any different metal-working operation unless the latter is a subsidiary operation performed in the same machine.

1/00 Making articles shaped as bodies of revolution
(rolling tubes B21B 17/00-B21B 25/00)

- 1/02 • discs; disc wheels
- 1/04 • • with rim, e.g. railway wheels
- 1/06 • rings of restricted axial length (extending closed shapes of metal bands by simultaneous rolling at two or more zones B21B 5/00)
- 1/08 • • railway wheel rims
- 1/10 • • rims for pneumatic tyres
- 1/12 • • rings for ball or roller bearings
- 1/14 • balls, rollers, cone rollers, or like bodies
- 1/16 • • for bearings
- 1/18 • cylinders, e.g. rolled transversely
- 1/20 • • rolled longitudinally

- 1/22 • characterised by use of rolls having circumferentially varying profile [2]

3/00 Making helical bodies or bodies having parts of helical shape (helical gears B21H 5/00; bending strip or the like helically B21D 11/06; forming tubes or tube walls into helical shape B21D 15/04)

- 3/02 • external screw-threads
- 3/04 • • Making by means of profiled rolls
- 3/06 • • Making by means of profiled members other than rolls, e.g. jaws, moved longitudinally or curvilinearly with respect to each other
- 3/08 • internal screw-threads
- 3/10 • twist-drills; screw-taps
- 3/12 • articles with helicoidal surface

B21H

5/00	Making gear wheels	7/14	• knurled articles
5/02	• with cylindrical outline	7/16	• turbine blades; compressor blades; propeller blades
5/04	• bevel gears	7/18	• grooved pins; Rolling grooves, e.g. oil grooves, in articles
7/00	Making articles not provided for in groups B21H 1/00-B21H 5/00, e.g. agricultural tools, dinner forks, knives, spoons (nails, pins B21G 3/30)	8/00	Rolling metal of indefinite length in repetitive shapes specially designed for the manufacture of particular objects
7/02	• spades; shovels	8/02	• Rolls of special shape
7/04	• hoes	9/00	Feeding arrangements for rolling machines or apparatus manufacturing articles dealt with in this subclass
7/06	• ploughshares; axes	9/02	• for screw-rolling machines
7/08	• forks; rakes		
7/10	• knives; sickles; scythes		
7/12	• horse-shoes; articles of like shape, e.g. wear-resisting attachments for shoes		

B21J FORGING; HAMMERING; PRESSING; RIVETING; FORGE FURNACES (rolling of metal B21B; making particular products by forging or pressing B21K; cladding or plating B23K; finishing surfaces by hammering B23P 9/04; compacting surfaces by blasting with particulate material B24C 1/10; general features of presses, presses for consolidating scrap B30B; furnaces in general F27)

Subclass index

PREPARING METAL STOCK.....	1/00
FORGING; HAMMERING; PRESSING	
General methods, equipment therefor.....	5/00
Machines, presses, hammers.....	7/00-13/00
Lubrication.....	3/00
Furnaces.....	17/00
RIVETING.....	15/00
OTHER BLACKSMITHS' REQUISITES.....	19/00

1/00	Preparing metal stock	7/08	• • • with rigidly-guided hammer
1/02	• Preliminary treatment of metal stock without particular shaping, e.g. salvaging segregated zones, forging or pressing in the rough (modifying the physical properties by deformation C21D 7/00, C22F 1/00)	7/10	• • with both drive and hammer connected to a fulcrumed lever, e.g. tail hammers
1/04	• Shaping in the rough solely by forging or pressing	7/12	• • • the lever being a spring, i.e. spring hammers
1/06	• Heating or cooling methods or arrangements specially adapted for performing forging or pressing operations	7/14	• • Forging machines working with several hammers
3/00	Lubricating during forging or pressing (lubricating in general F16N)	7/16	• • • in rotary arrangements
5/00	Methods for forging, hammering, or pressing (for working sheet metal or metal tubes, rods, or profiles B21D; for working wire B21F); Special equipment or accessories therefor	7/18	• • Forging machines working with die jaws, e.g. pivoted, movable laterally of the forging or pressing direction, e.g. for swaging
5/02	• Die forging; Trimming by making use of special dies	7/20	• Drives for hammers; Transmission means therefor
5/04	• by directly applied fluid pressure or explosive action	7/22	• • for power hammers
5/06	• for performing particular operations	7/24	• • • operated by steam, air, or other gaseous pressure
5/08	• • Upsetting	7/26	• • • operated by internal combustion
5/10	• • Piercing billets (in combination with extrusion B21C 23/00)	7/28	• • • operated by hydraulic or liquid pressure
5/12	• • Forming profiles on internal or external surfaces (making screw-thread by forging, pressing, or hammering B21K)	7/30	• • • operated by electro-magnets
7/00	Hammers; Forging machines with hammers or die jaws acting by impact (hand hammers B25D; electrical features section H)	7/32	• • • operated by rotary drive, e.g. electric motor
7/02	• Special design or construction	7/34	• • • operating both the hammer and the anvil, so-called counter-tup
7/04	• • Power hammers	7/36	• • for drop hammers
7/06	• • Drop hammers	7/38	• • • driven by steam, air, or other gaseous pressure
		7/40	• • • driven by hydraulic or liquid pressure
		7/42	• • • operated by rotary drive, e.g. electric motors
		7/44	• • • • equipped with belts, ropes, cables, chains
		7/46	• • Control devices specially adapted to forging hammers, not restricted to one of the preceding subgroups
		9/00	Forging presses
		9/02	• Special design or construction
		9/04	• • Piercing presses
		9/06	• • Swaging presses; Upsetting presses

9/08	• • • equipped with devices for heating the workpiece (electric heating elements H05B)	15/16	• • Drives for riveting machines; Transmission means therefor
9/10	• Drives for forging presses	15/18	• • • operated by air pressure or other gas pressure, e.g. explosion pressure
9/12	• • operated by hydraulic or liquid pressure	15/20	• • • operated by hydraulic or liquid pressure
9/14	• • • in conjunction with electric power	15/22	• • • operated by both hydraulic or liquid pressure and gas pressure
9/16	• • • in conjunction with steam or gas power	15/24	• • • operated by electro-magnets
9/18	• • operated by making use of gearing mechanisms, e.g. levers, spindles, crankshafts, eccentrics, toggle-levers, rack bars	15/26	• • • operated by rotary drive, e.g. by electric motor
9/20	• • Control devices specially adapted to forging presses not restricted to one of the preceding subgroups	15/28	• • Control devices specially adapted to riveting machines not restricted to one of the preceding subgroups
11/00	Forging hammers combined with forging presses; Forging machines with provision for hammering and pressing	15/30	• • Particular elements, e.g. supports; Suspension equipment specially adapted for portable riveters
13/00	Details of machines for forging, pressing, or hammering	15/32	• • • Devices for inserting or holding rivets in position with or without feeding arrangements
13/02	• Dies or mountings therefor [2]	15/34	• • • • for installing tubular rivets
13/03	• • Die mountings [2]	15/36	• • Rivet sets, i.e. tools for forming heads; Mandrels for expanding parts of hollow rivets
13/04	• Frames; Guides	15/38	• Accessories for use in connection with riveting, e.g. pliers for upsetting; Hand tools for riveting
13/06	• Hammer tups; Anvils; Anvil blocks	15/40	• • for forming rivet heads
13/08	• Accessories for handling work or tools	15/42	• • Special clamping devices for workpieces to be riveted together, e.g. operating through the rivet holes
13/10	• • Manipulators (in general B25J)	15/44	• • Rivet hole positioners
13/12	• • • Turning means	15/46	• • Positioners for rivets for making tube joints
13/14	• • Ejecting devices	15/48	• • Devices for caulking rivets
15/00	Riveting	15/50	• • Removing or cutting devices for rivets
15/02	• Riveting procedures	17/00	Forge furnaces (furnaces for heat treatment C21D 9/00; furnaces in general F27)
15/04	• • Riveting hollow rivets mechanically	17/02	• electrically heated (electric heating elements H05B)
15/06	• • Riveting hollow rivets by means of hydraulic, liquid, or gas pressure	19/00	Blacksmiths' requisites not otherwise provided for
15/08	• • Riveting by applying heat to the end parts of the rivets to enable heads to be formed	19/02	• Hearths; Air supply arrangements specially adapted therefor
15/10	• Riveting machines (electric heating elements H05B)	19/04	• Anvils; Associated items
15/12	• • with tools or tool parts having a movement additional to the feed movement, e.g. spin		
15/14	• • specially adapted for riveting specific articles, e.g. brake lining machines		
B21K	MAKING FORGED OR PRESSED PRODUCTS, e.g. HORSE-SHOES, RIVETS, BOLTS, WHEELS (making particular articles by working sheet metal without essentially removing material B21D; processing wire B21F; making pins, needles or nails B21G; making particular articles by rolling B21H; forging machines, pressing machines, hammering machines, in general B21J; making chains B21L; plating B23K)		

Note(s)

This subclass covers only forging, pressing, or hammering operations which are specially adapted for use in the manufacture of particular objects and which are not essentially combined with any different metal-working operation unless the latter is a subsidiary operation performed in the same machine.

Subclass index

MAKING MACHINE ELEMENTS OR TOOLS.....	1/00, 3/00, 5/00, 19/00
MAKING RAILS.....	7/00, 9/00
MAKING LOCKSMITHS' OR BLACKSMITHS' GOODS.....	13/00, 15/00
MAKING OTHER ARTICLES.....	7/00, 11/00, 17/00, 21/00, 23/00
UNITING OF COMPONENTS.....	25/00
ACCESSORIES, AUXILIARY DEVICES.....	27/00, 29/00, 31/00

**Making particular articles by forging, pressing, or hammering;
Equipment therefor**

1/00 Making machine elements

- 1/02 • balls, rolls, or rollers, e.g. for bearings
- 1/04 • ball-races
- 1/05 • cages for bearings [2]
- 1/06 • axles or shafts
- 1/08 • • crankshafts
- 1/10 • • of cylindrical form
- 1/12 • • of specially-shaped cross-section
- 1/14 • fittings
- 1/16 • • parts of pipe or hose couplings
- 1/18 • pistons or plungers
- 1/20 • valve parts
- 1/22 • • poppet valves, e.g. for internal-combustion engines
- 1/24 • • valve bodies; valve seats
- 1/26 • housings or supporting parts, e.g. axle housings, engine mountings
- 1/28 • wheels; discs
- 1/30 • • with gear-teeth
- 1/32 • • discs, e.g. disc wheels
- 1/34 • • wheels with spokes
- 1/36 • • with blades
- 1/38 • • rims; tyres
- 1/40 • • hubs
- 1/42 • • pulleys, e.g. cable pulleys
- 1/44 • bolts, studs, or the like (making screw-thread B21K 1/56; making U-bolts B21K 1/74)
- 1/46 • • with heads
- 1/48 • • • Machines working with hammers, e.g. beating in a radial direction, for forming heads
- 1/50 • • • Trimming or shearing formed heads, e.g. working with dies
- 1/52 • • double-ended, e.g. with heads on both ends (forming heads B21K 1/46)
- 1/54 • • with grooves or notches
- 1/56 • screw-threaded elements [2]
- 1/58 • rivets
- 1/60 • • hollow or semi-hollow rivets
- 1/62 • • special rivets, e.g. with electrical contacts
- 1/64 • nuts (making screw-thread B21K 1/56)
- 1/66 • • from strip bars
- 1/68 • • from round or profiled bars
- 1/70 • • of special shape, e.g. self-locking nuts, wing nuts
- 1/72 • hooks, e.g. crane hooks, railway track spikes (making nails in general B21G)
- 1/74 • forked members or members with two or more limbs, e.g. U-bolts, anchors
- 1/76 • elements not mentioned in one of the preceding groups

3/00 Making engine or like machine parts not covered by B21K 1/00; Making propellers or the like

- 3/02 • cylinder heads
- 3/04 • blades, e.g. for turbines; Upsetting of blade roots

5/00 Making tools or tool parts, e.g. pliers

- 5/02 • drilling-tools or other tools for making or working on holes
- 5/04 • • twisting-tools, e.g. drills, reamers
- 5/06 • • Dressing, e.g. sharpening rock drills
- 5/08 • • drifting tools
- 5/10 • • Forming drill-bit shanks

- 5/12 • other cutting tools (cutlery wares B21K 11/00)
- 5/14 • hand hammers
- 5/16 • tools for turning nuts
- 5/18 • handles or parts therefor
- 5/20 • Making working faces of dies, either recessed or outstanding

7/00 Making railway appurtenances; Making vehicle parts

- 7/02 • parts for permanent way (spikes B21K 1/72)
- 7/04 • • switch tongues
- 7/06 • • sleepers
- 7/08 • • base plates for rails, e.g. chairs
- 7/10 • • rail joints
- 7/12 • parts for locomotives or vehicles, e.g. frames, underframes
- 7/14 • • brake rigging or brake parts [2]

9/00 Reconditioning railroad accessories, e.g. rails

11/00 Making cutlery wares; Making garden tools or the like

- 11/02 • knives
- 11/04 • spoons; table forks
- 11/06 • scissors
- 11/08 • sickles; scythes
- 11/10 • axes; picks
- 11/12 • spades; shovels
- 11/14 • rakes; garden forks

13/00 Making locksmiths' goods, e.g. handles for cases

- 13/02 • hinges

15/00 Making blacksmiths' goods

- 15/02 • horse-shoes; accessories therefor
- 15/04 • • caulks
- 15/06 • metal attachments for footwear, e.g. wear-resisting plates

17/00 Making sport articles, e.g. skates

19/00 Making articles for agricultural machinery

- 19/02 • plough blades; ploughshares

21/00 Making hollow articles not covered by any single one of groups B21K 1/00-B21K 19/00 (essentially from sheet-metal or uniform thin-walled tubes B21D, e.g. B21D 41/00, B21D 51/00)

- 21/02 • Producing blanks in the shape of discs or cups as semi-finished articles for making hollow articles, e.g. to be deep-drawn or extruded
- 21/04 • Shaping thin-walled hollow articles, e.g. cartridges
- 21/06 • Shaping thick-walled hollow articles, e.g. projectiles
- 21/08 • Shaping hollow articles with different cross-section in longitudinal direction, e.g. nozzles, spark-plugs
- 21/10 • • cone-shaped or bell-shaped articles, e.g. insulator caps
- 21/12 • Shaping end portions of hollow articles
- 21/14 • • closed or substantially-closed ends, e.g. cartridge bottoms
- 21/16 • Remodelling hollow bodies with respect to the shape of the cross-section (remodelling end portions only B21K 21/12)

23/00 Making other articles

- 23/02 • members of endless tracks, e.g. track guides, shoes (making from sheet-metal B21D)

- 23/04 • flanged articles (B21K 1/28 takes precedence; flanging tubes B21D)
- 25/00 **Uniting components to form integral members, e.g. turbine wheels and shafts, caulks with inserts, with or without shaping of the components** (uniting by interference- or press-fitting B23P 11/02, B23P 19/02)

Accessories; Auxiliary devices

- 27/00 **Handling devices, e.g. for feeding, aligning, discharging; Cutting-off means; Arrangement thereof**

B21L MAKING CHAINS (making chains or chain links by casting B22D 25/02; chains in general F16G)

Subclass index

GENERAL METHODS OF WORKING

Chains made from individual links.....	1/00, 3/00, 7/00, 9/00
Chains with integral links.....	5/00
METHODS FOR MAKING SPECIAL CHAINS OR PARTS THEREOF.....	11/00, 13/00
TOOLS FOR MANUFACTURE OR REPAIR.....	19/00, 21/00
FINISHING.....	15/00
OTHER MANUFACTURE.....	99/00

- | | |
|--|--|
| 1/00 Making chains or chain links by bending workpieces of rod, wire, or strip to form links of oval or other simple shape (B21L 3/00, B21L 7/00 take precedence) | 11/00 Making chains or chain links of special shape |
| 1/02 • by bending the ends of the workpieces to abut | 11/02 • each link being formed of a single member of which both ends are bent or shaped to engage the middle portion of the next link |
| 1/04 • by bending and interconnecting the ends of the workpieces with or without separate jointing members | 11/04 • • the ends being pierced or punched to form eyes |
| 3/00 Making chains or chain links by bending the chain links or link parts and subsequently welding or soldering the abutting ends (B21L 7/00 takes precedence) | 11/06 • • • the workpiece being of thin strip metal |
| 3/02 • Machines or devices for welding chain links | 11/08 • • the ends being interengaged with other parts of the same link |
| 3/04 • • by making use of forge or pressure welding | 11/10 • the chain links having opposed correspondingly shaped cylindrical and hook-like parts of which one part forms a hinge-like support for the adjacent link (B21L 11/02 takes precedence) |
| 5/00 Making chains or chain links by working the starting material in such a way that integral, i.e. jointless, chain links are formed | 11/12 • Forming bead chains |
| 5/02 • in such a way that interconnected links are formed | 11/14 • Making chain links with inserted or integrally-formed studs |
| 7/00 Making chains or chain links by cutting single loops or loop-parts from coils, assembling the cut parts and subsequently subjecting same to twisting with or without welding | 13/00 Making terminal or intermediate chain links of special shape; Making couplings for chains, e.g. swivels, shackles |
| 9/00 Making chains or chain links, the links being composed of two or more different parts, e.g. drive chains (B21L 1/04, B21L 7/00, B21L 11/14, B21L 13/00 take precedence) | 15/00 Finishing or dressing chains or chain links, e.g. removing burr material, calibrating (B21L 9/06 takes precedence) |
| 9/02 • of roller-chain or other plate-link type | 15/02 • Twisting already closed links |
| 9/04 • • Punching or bending the different parts of the chain links | 19/00 Appurtenances for chain-making not restricted to any particular process |
| 9/06 • • Sorting, feeding, assembling, riveting, or finishing parts of chains | 21/00 Tools or implements for repairing chains using metal-working operations, e.g. for detaching deformed chain links |
| 9/08 • • Combining the chain links with auxiliary parts, e.g. welding-on wear-resistant parts | 99/00 Subject matter not provided for in other groups of this subclass [2009.01] |