

## SECTION B — PERFORMING OPERATIONS; TRANSPORTING

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

**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.

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<b>1/00 Metal rolling methods or mills for making semi-finished products of solid or profiled cross-section</b> (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); <b>Sequence of operations in milling trains; Layout of rolling-mill plant, e.g. grouping of stands; Succession of passes or of sectional pass alternations</b>	1/09 • • L-sections <b>[2006.01]</b>
	1/092 • • T-sections <b>[2006.01]</b>
	1/095 • • U- or channel sections <b>[2006.01]</b>
	1/098 • • Z-sections <b>[2006.01]</b>
1/02 • for rolling heavy work, e.g. ingots, slabs, billets, in which the cross-sectional form is unimportant	1/10 • • in a single two-high or universal rolling mill
1/04 • • in a continuous process	1/12 • • in a continuous process
1/06 • • in a non-continuous process	1/14 • • 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) <b>[1, 2006.01]</b>	1/16 • for rolling wire or material of like small cross-section
1/082 • • Piling sections having lateral edges specially adapted for interlocking with each other in order to build a wall <b>[2006.01]</b>	1/18 • • in a continuous process
1/085 • • Rail sections <b>[2006.01]</b>	1/20 • • in a non-continuous process
1/088 • • H- or I-sections <b>[2006.01]</b>	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) <b>[2]</b>

## B21B

1/40	• for rolling foils which present special problems, e.g. because of thinness	17/04	• • in a continuous process
1/42	• for step-by-step or planetary rolling (making tubes by pilgrim-step rolling B21B 21/00)	17/06	• • in a discontinuous process
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]	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
<b>3/00</b>	<b>Rolling materials of special alloys so far as the composition of the alloy requires or permits special rolling methods or sequences</b> (altering special metallurgical properties of alloys, other than structure consolidation or mechanical properties resulting therefrom C21D, C22F)	<b>19/00</b>	<b>Tube-rolling by rollers arranged outside the work and having their axes not perpendicular to the axis of the work</b> (straightening by rollers B21D)
3/02	• Rolling special iron alloys	19/02	• the axes of the rollers being arranged essentially diagonally to the axis of the work, e.g. "cross" tube-rolling
<b>5/00</b>	<b>Extending closed shapes of metal bands by rolling</b> (manufacture of circular shapes, e.g. wheel rims, B21H 1/06)	19/04	• • Rolling basic material of solid, i.e. non-hollow, structure; Piercing
<b>9/00</b>	<b>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</b>	19/06	• • Rolling hollow basic material (B21B 19/04 takes precedence; separating work from mandrel B21C 45/00)
<b>11/00</b>	<b>Subsidising the rolling processes by subjecting rollers or work to vibrations</b>	19/08	• • • Enlarging tube diameter
<b>13/00</b>	<b>Metal-rolling stands, i.e. an assembly composed of a stand frame, rolls, and accessories</b> (B21B 17/00-B21B 23/00 take precedence; details, component parts, accessories, auxiliary means, procedures in connection with metal rolling, <u>see</u> the relevant groups)	19/10	• • • Finishing, e.g. smoothing, sizing
13/02	• with axes of rolls arranged horizontally	19/12	• the axes of the rollers being arranged essentially parallel to the axis of the work
13/04	• • Three-high arrangement	19/14	• • Rolling tubes by means of additional rollers arranged inside the tubes
13/06	• with axes of rolls arranged vertically	19/16	• • Rolling tubes without additional rollers arranged inside the tubes
13/08	• with differently-directed roll axes, e.g. for the so-called "universal" rolling process	<b>21/00</b>	<b>Pilgrim-step tube-rolling</b>
13/10	• • all axes being arranged in one plane	21/02	• Rollers therefor
13/12	• • axes being arranged in different planes	21/04	• Pilgrim-step feeding mechanisms (B21B 21/06 takes precedence)
13/14	• having counter-pressure devices acting on rolls to inhibit deflection of same under load (counter-pressure devices as such B21B 29/00)	21/06	• Devices for revolving work between the steps
13/16	• with alternatively operative rolls	<b>23/00</b>	<b>Tube-rolling not restricted to methods provided for in only one of groups B21B 17/00-B21B 21/00, e.g. combined processes</b> (B21B 25/00 takes precedence)
13/18	• for step-by-step or planetary rolling (methods B21B 1/42; making tubes by pilgrim-step rolling B21B 21/00)	<b>25/00</b>	<b>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</b>
13/20	• • for planetary rolling	25/02	• Guides, supports, or abutments for mandrels, e.g. carriages; Adjusting devices for mandrels
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)	25/04	• Cooling or lubricating mandrels during operation [2]
		25/06	• Interchanging mandrels
<b>15/00</b>	<b>Arrangements for performing additional metal-working operations specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills</b>	<b>27/00</b>	<b>Rolls</b> (shape of working surfaces required by special processes B21B 1/00); <b>Lubricating, cooling or heating rolls while in use</b>
15/02	• in which work is subjected to permanent internal twisting, e.g. for producing reinforcement bars for concrete	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
		<b>28/00</b>	<b>Maintaining rolls or rolling equipment in effective condition</b> (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]
<b><u>Rolling methods or mills specially designed for making or processing tubes</u></b>			
<b>17/00</b>	<b>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling</b>		
17/02	• with mandrel (B21B 17/08 takes precedence) [2]		

29/00	<b>Counter-pressure devices acting on rolls to inhibit deflection of same under load, e.g. backing rolls</b>	37/34	• • • by hydraulic expansion of the rolls [6]
31/00	<b>Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames</b>	37/36	• • • by radial displacement of the roll sleeve on a stationary roll beam by means of hydraulic supports [6]
31/02	• Rolling stand frames; Roll mountings	37/38	• • using roll bending (B21B 37/42 takes precedence) [6]
31/04	• • with tie rods, e.g. prestressed tie rods	37/40	• • using axial shifting of the rolls (B21B 37/42 takes precedence) [6]
31/06	• • Fastening stands or frames to foundation, e.g. to the sole plate (in general F16M)	37/42	• • using a combination of roll bending and axial shifting of the rolls [6]
31/07	• Adaptation of roll bearings (bearings in general F16C) [2]	37/44	• • using heating, lubricating or water-spray cooling of the product [6]
31/08	• Interchanging rolls, roll mountings, or stand frames [2]	37/46	• Roll speed or drive motor control (B21B 37/52, B21B 37/60 take precedence) [6]
31/10	• • by horizontally displacing	37/48	• Tension control; Compression control [6]
31/12	• • by vertically displacing	37/50	• • by loop control [6]
31/14	• • by pivotally displacing	37/52	• • by drive motor control [6]
31/16	• Adjusting rolls (control devices B21B 37/00)	37/54	• • • including coiler drive control, e.g. reversing mills [6]
31/18	• • by moving rolls axially	37/56	• Elongation control [6]
31/20	• • by moving rolls perpendicularly to roll axis	37/58	• Roll-force control; Roll-gap control [6]
31/22	• • • mechanically	37/60	• • by control of a motor which drives an adjusting screw [6]
31/24	• • • • by screws	37/62	• • by control of a hydraulic adjusting device [6]
31/26	• • • • Adjusting eccentrically-mounted roll bearings	37/64	• • Mill spring or roll spring compensation systems, e.g. control of prestressed mill stands [6]
31/28	• • • • by toggle-lever mechanisms	37/66	• • Roll eccentricity compensation systems [6]
31/30	• • • • by wedges or their equivalent	37/68	• Camber or steering control for strip, sheets or plates, e.g. preventing meandering [6]
31/32	• • • by liquid pressure	37/70	• Length control (B21B 37/56 takes precedence) [6]
33/00	<b>Safety devices not otherwise provided for (safety devices in general F16P); Breaker blocks; Devices for freeing jammed rolls [2]</b>	37/72	• Rear end control; Front end control [6]
33/02	• Preventing fracture of rolls [2]	37/74	• Temperature control, e.g. by cooling or heating the rolls or the product (B21B 37/32, B21B 37/44 take precedence) [6]
35/00	<b>Drives for metal-rolling mills</b>	37/76	• • Cooling control on the run-out table [6]
35/02	• for continuously-operating mills (B21B 35/10, B21B 35/12 take precedence)	37/78	• Control of tube rolling [6]
35/04	• • each stand having its own motor or motors	38/00	<b>Methods or devices for measuring specially adapted for metal-rolling mills, e.g. position detection, inspection of the product [6]</b>
35/06	• for non-continuously-operating mills or for single stands (B21B 35/10, B21B 35/12 take precedence)	38/02	• for measuring flatness or profile of strips [6]
35/08	• • for reversing rolling mills	38/04	• for measuring thickness, width, diameter or other transverse dimensions of the product [6]
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]	38/06	• for measuring tension or compression [6]
35/12	• Toothed-wheel gearings specially adapted for metal-rolling mills; Housings or mountings therefor	38/08	• for measuring roll-force [6]
35/14	• Couplings, driving spindles, or spindle carriers specially adapted for or specially arranged in metal-rolling mills (couplings or shafts in general F16)	38/10	• for measuring roll-gap, e.g. pass indicators [6]
37/00	<b>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)</b>	38/12	• for measuring roll camber [6]
37/16	• Control of thickness, width, diameter or other transverse dimensions (B21B 37/58 takes precedence) [6]	39/00	<b>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)</b>
37/18	• • Automatic gauge control [6]	39/02	• Feeding or supporting work; Braking or tensioning arrangements
37/20	• • • in tandem mills [6]	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)
37/22	• • Lateral spread control; Width control, e.g. by edge rolling [6]	39/06	• • Pushing or forcing work into pass
37/24	• • Automatic variation of thickness according to a predetermined programme [6]	39/08	• • Braking or tensioning arrangements
37/26	• • • for obtaining one strip having successive lengths of different constant thickness [6]	39/10	• • Arrangement or installation of feeding rollers in rolling stands
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]		

## B21B

- 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]**