

CPC**COOPERATIVE PATENT CLASSIFICATION****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

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.

B21B 1/00

Metal-rolling methods or mills for making semi-finished products of solid or profiled cross-section ([B21B 17/00](#) to [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**

- B21B 1/02 . for rolling heavy work, e.g. ingots, slabs, { blooms }billets, in which the cross-sectional form is unimportant { Rolling combined with forging or pressing }
- B21B 1/024 .. { Forging or pressing (forging or pressing devices as units [B21B 15/0035](#))}
- B21B 1/026 .. { Rolling }
- B21B 1/04 .. in a continuous process
- B21B 1/06 .. in a non-continuous process, { e.g. triplet mill, reversing mill }
- B21B 1/08 . for rolling { structural sections, i.e. }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](#))
- B21B 1/0805 .. { Flat bars, i.e. having a substantially rectangular cross-section }
- B21B 1/0815 .. { from flat-rolled products, e.g. by longitudinal shearing }
- B21B 1/082 .. Piling sections having lateral edges specially adapted for interlocking with each other in order to build a wall
- B21B 1/085 .. Rail sections
- B21B 1/0855 ... { Rerolling or processing worn or discarded rail sections }
- B21B 1/088 .. H- or I-sections
- B21B 1/0883 ... { using forging or pressing devices }
- B21B 1/0886 ... { using variable-width rolls }
- B21B 1/09 .. L-sections
- B21B 1/092 .. T-sections
- B21B 1/095 .. U-or channel sections
- B21B 1/098 .. Z-sections

WARNING

Groups [B21B 1/098](#) is not complete. See also other subgroups of [B21B 1/08](#)

- B21B 1/10 .. in a single two-high or universal rolling mill { stand ([B21B 1/085](#) to [B21B 1/098](#) take precedence) }
- B21B 1/12 .. in a continuous process, { i.e. without reversing stands ([B21B 1/085](#) to [B21B 1/098](#) take precedence) }
- B21B 1/14 .. in a non-continuous process, { i.e. at least one reversing stand ([B21B 1/085](#) to [B21B 1/098](#) take precedence) }
- B21B 1/16 . for rolling { wire rods, bars, merchant bars, rounds } wire or material of like small cross-section
- B21B 1/163 .. { Rolling or cold-forming of concrete reinforcement bars or wire (reinforcement bars per se [E04C 5/03](#)); Rolls therefor }
- B21B 1/166 .. { Rolling wire into sections or flat ribbons }
- B21B 1/18 .. in a continuous process
- B21B 1/20 .. in a non-continuous process, (e.g. skew rolling, i.e. planetary cross rolling)
- B21B 1/22 . for rolling { plates, strips, } bands or sheets of indefinite length ([B21B 1/42](#) takes precedence)
- B21B 1/222 .. { in a rolling-drawing process; in a multi-pass mill }
- B21B 1/224 .. { Edge rolling of flat products }
- B21B 1/227 .. { Surface roughening or texturing }
- B21B 1/24 .. in a continuous { or semi-continuous } process {([B21B 1/224](#) takes precedence) }
- B21B 1/26 ... by hot-rolling, { e.g. Steckel hot mill }
- B21B 1/265 { and by compressing or pushing the material in rolling direction }
- B21B 1/28 ... by cold-rolling, { e.g. Steckel cold mill }
- B21B 1/30 .. in a non-continuous process {([B21B 1/224](#) takes precedence) }
- B21B 1/32 ... in reversing { single stand } mills, e.g. with intermediate storage reels for accumulating work
- B21B 1/34 by hot-rolling
- B21B 1/36 by cold-rolling
- B21B 1/38 . for rolling sheets of limited length, e.g. folded sheets, superimposed sheets, { pack rolling } ([B21B 1/40](#) takes precedence; folding sheets before, or separating layers after, rolling [B21B 47/00](#))
- B21B 1/40 . for rolling foils which present special problems, e.g. because of thinness
- B21B 1/42 . for step-by-step or planetary rolling (making tubes by pilgrim-step rolling [B21B 21/00](#))
- B21B 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](#))
- B21B 1/463 .. { in a continuous process, i.e. the cast not being cut before rolling }
- B21B 1/466 .. { in a non-continuous process, i.e. the cast being cut before rolling }
- B21B 3/00 Rolling materials of special alloys so far as the composition of the alloy requires or**

permits special rolling methods or sequences { Rolling of aluminium, copper, zinc or other non-ferrous metals } (altering special metallurgical properties of alloys, other than structure consolidation or mechanical properties resulting therefrom [C21D](#) , [C22F](#))

- B21B 3/003 . { Rolling non-ferrous metals immediately subsequent to continuous casting, i.e. in-line rolling }
- B21B 3/02 . Rolling special iron alloys, { e.g. stainless steel }
- B21B 5/00** **Extending closed shapes of metal bands by rolling** (manufacture of circular shapes, e.g. wheel rims, [B21H 1/06](#))
- B21B 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**
- B21B 11/00** **Subsidising the rolling process by subjecting rollers or work to vibrations, { e.g. ultrasonic vibrations }**
- B21B 13/00** **Metal-rolling stands, i.e. an assembly composed of a stand frame, rolls, and accessories** ([B21B 17/00](#) to [B21B 23/00](#) take precedence; details, component parts, accessories, auxiliary means, procedures in connection with metal rolling, see the relevant groups)
- B21B 13/001 . { Convertible or tiltable stands, e.g. from duo to universal stands, from horizontal to vertical stands }
- B21B 13/005 . { Cantilevered roll stands }
- B21B 13/008 . { Skew rolling stands, e.g. for rolling rounds }
- B21B 13/02 . with axes of rolls arranged horizontally
- B21B 13/023 . . { the axis of the rolls being other than perpendicular to the direction of movement of the product, e.g. cross-rolling }
- B21B 13/04 . . Three-high arrangement
- B21B 13/06 . with axes of rolls arranged vertically, { e.g. edgers }
- B21B 13/08 . with differently-directed roll axes, e.g. for the so-called "universal" rolling process
- B21B 13/10 . . all axes being arranged in one plane
- B21B 13/103 . . . { for rolling bars, rods or wire }
- B21B 13/12 . . axes being arranged in different planes
- B21B 13/14 . having counter-pressure devices acting on rolls to inhibit deflection of same under load; { Back-up rolls } (counter-pressure devices as such [B21B 29/00](#))
- B21B 13/142 . . { by axially shifting the rolls, e.g. rolls with tapered ends or with a curved contour for continuously-variable crown CVC }
- B21B 13/145 . . { Lateral support devices for rolls acting mainly in a direction parallel to the

- movement of the product }
- B21B 13/147 . . { Cluster mills, e.g. Sendzimir mills , Rohn mills, i.e. each work roll being supported by two rolls only arranged symmetrically with respect to the plane passing through the working rolls }
- B21B 13/16 . with alternatively operative rolls, { e.g. revolver stands, turret mills }
- B21B 13/18 . for step-by-step or planetary rolling; { pendulum mills } (methods [B21B 1/42](#) ; making tubes by pilgrim-step rolling [B21B 21/00](#))
- B21B 13/20 . . for planetary rolling
- B21B 13/22 . for rolling metal immediately subsequent to continuous casting, { i.e. in-line rolling of steel } (methods therefor [B21B 1/46](#) ; continuous casting [B22D 11/00](#) , e.g. into moulds with rolls [B22D 11/06](#))

B21B 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

- B21B 15/0007 . { Cutting or shearing the product }
- B21B 15/0035 . { Forging or pressing devices as units }
- B21B 15/0042 . . { Tool changers }
- B21B 15/005 . . { Lubricating, cooling or heating means }
- B21B 15/0085 . { Joining ends of material to continuous strip, bar or sheet }
- B21B 15/02 . in which work is subjected to permanent internal twisting, e.g. for producing reinforcement bars for concrete

Guidance heading: Rolling methods or mills specially designed for making or processing tubes (control of tube rolling [B21B 37/78](#))

B21B 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

- B21B 17/02 . with mandrel, { i.e. the mandrel rod contacts the rolled tube over the rod length } ([B21B 17/08](#) takes precedence)
- B21B 17/04 . . in a continuous process
- B21B 17/06 . . in a discontinuous process
- B21B 17/08 . with mandrel having one or more protrusions, { i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills }
- B21B 17/10 . . in a continuous process
- B21B 17/12 . . in a discontinuous process, { e.g. plug-rolling mills }
- B21B 17/14 . without mandrel, { e.g. stretch-reducing mills }

B21B 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](#))

- B21B 19/02 . the axes of the rollers being arranged essentially diagonally to the axis of the work, e.g. "cross" tube-rolling { **Diescher mills, Stiefel disc piercers, Stiefel rotary piercers** }
- B21B 19/04 . . Rolling basic material of solid, i.e. non-hollow, structure; Piercing, { e.g. **rotary piercing mills** }
- B21B 19/06 . . Rolling hollow basic material, { e.g. **Assel mills** } ([B21B 19/04](#) takes precedence; separating work from mandrel [B21C 45/00](#))
- B21B 19/08 . . . Enlarging tube diameter
- B21B 19/10 . . . Finishing, e.g. smoothing, sizing, { **reeling** }
- B21B 19/12 . the axes of the rollers being arranged essentially parallel to the axis of the work
- B21B 19/14 . . Rolling tubes by means of additional rollers arranged inside the tubes
- B21B 19/16 . . Rolling tubes without additional rollers arranged inside the tubes
- B21B 21/00** **Pilgrim-step tube-rolling, { i.e. pilger mills }**
- B21B 21/005 . { with reciprocating stand, e.g. driving the stand }
- B21B 21/02 . Rollers therefor
- B21B 21/04 . Pilgrim-step feeding mechanisms ([B21B 21/06](#) takes precedence)
- B21B 21/045 . . { for reciprocating stands }
- B21B 21/06 . Devices for revolving work between the steps
- B21B 21/065 . . { for reciprocating stands }
- B21B 23/00** **Tube-rolling not restricted to methods provided for in only one of groups [B21B 17/00](#) , [B21B 19/00](#) , [B21B 21/00](#) , e.g. combined processes { planetary tube rolling, auxiliary arrangements, e.g. lubricating, special tube blanks, continuous casting combined with tube rolling } ([B21B 25/00](#) takes precedence)**
- B21B 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; { Construction of, or alloys for, mandrels or plugs }**
- B21B 25/02 . Guides, supports, or abutments for mandrels, e.g. carriages { or **steadiers** }; Adjusting devices for mandrels
- B21B 25/04 . Cooling or lubricating mandrels during operation
- B21B 25/06 . Interchanging mandrels, { fixing plugs on mandrel rods or cooling during interchanging mandrels (separating tubes from mandrels [B21C 45/00](#)) }
- B21B 27/00** **Rolls, { roll alloys or roll fabrication } (shape of working surfaces required by special processes [B21B 1/00](#)); Lubricating, cooling or heating rolls while in use**
- B21B 27/005 . { Rolls with a roughened or textured surface; Methods for making same }
- B21B 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](#)) {(

- [27/005](#) takes precedence)}
- B21B 27/021 . . { Rolls for sheets or strips }
 - B21B 27/024 . . { Rolls for bars, rods, rounds, tubes, wire or the like }
 - B21B 27/025 . . . { Skew rolls }
 - B21B 27/027 . . { Vertical rolls }
 - B21B 27/028 . . { Variable-width rolls }
 - B21B 27/03 . . Sleeved rolls {([B21B 27/028](#) takes precedence)}
 - B21B 27/032 . . . { Rolls for sheets or strips }
 - B21B 27/035 . . . { Rolls for bars, rods, rounds, tubes, wire or the like }
 - B21B 27/037 { Skew rolls }
 - B21B 27/05 . . . with deflectable sleeves
 - B21B 27/055 . . . { with sleeves radially deflectable on a stationary beam by means of hydraulic supports (in general [F16C 13/00](#) ; for paper-making machines [D21G 1/00](#) ; regulating devices therefor [B21B 37/36](#)) }
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- B21B 27/06 . Lubricating, cooling or heating rolls
 - B21B 27/08 . . internally
 - B21B 27/10 . . externally
 - B21B 27/106 . . . { Heating the rolls }
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- B21B 28/00** **Maintaining rolls or rolling equipment in effective condition** (lubricating, cooling or heating rolls while in use [B21B 27/06](#))
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- B21B 28/02 . Maintaining rolls in effective condition, e.g. reconditioning
 - B21B 28/04 . . while in use, e.g. polishing { or grinding while the rolls are in their stands }
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- B21B 29/00** **Counter-pressure devices acting on rolls to inhibit deflection of same under load, e.g. backing rolls;** { Roll bending devices, e.g. hydraulic actuators acting on roll shaft ends (control devices responsive to roll bending [B21B 37/38](#)) }
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- B21B 31/00** **Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames**
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- B21B 31/02 . Rolling stand frames { or housings }; Roll mountings; { Roll chocks }
 - B21B 31/028 . . { Prestressing of rolls or roll mountings in stand frames }
 - B21B 31/04 . . with tie rods { in frameless stands }, e.g. prestressed tie rods
 - B21B 31/06 . . Fastening stands or frames to foundation, e.g. to the sole plate (in general [F16M](#))
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- B21B 31/07 . Adaptation of roll { neck }bearings (bearings in general [F16C](#))
 - B21B 31/074 . . { Oil film bearings, e.g. "Morgoil" bearings }
 - B21B 31/076 . . { Cooling; Lubricating roller bearings }
 - B21B 31/078 . . { Sealing devices (Sealings in general [F16J 15/00](#)) }
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- B21B 31/08 . Interchanging rolls, roll mountings, or stand frames, { e.g. using C-hooks; Replacing roll chocks on roll shafts }

- B21B 31/10 . . . by horizontally displacing, { i.e. horizontal roll changing }
- B21B 31/103 . . . { Manipulators or carriages therefor }
- B21B 31/106 . . . { Vertical displacement of rolls or roll chocks during horizontal roll changing }
- B21B 31/12 . . . by vertically displacing
- B21B 31/14 . . . by pivotally displacing

- B21B 31/16 . . . Adjusting { or positioning } rolls (control devices [B21B 37/00](#))
- B21B 31/18 . . . by moving rolls axially
- B21B 31/185 . . . { and by crossing rolls }
- B21B 31/20 . . . by moving rolls perpendicularly to roll axis
- B21B 31/203 . . . { Balancing rolls }
- B21B 31/22 . . . mechanically, { e.g. by thrust blocks, inserts for removal }
- B21B 31/24 by screws
- B21B 31/26 Adjusting eccentrically-mounted roll bearings
- B21B 31/28 by toggle-lever mechanisms
- B21B 31/30 by wedges or their equivalent
- B21B 31/32 . . . by liquid pressure, { e.g. hydromechanical adjusting }

- B21B 33/00** **Safety devices not otherwise provided for (safety devices in general [F16P](#)); Breaker blocks; Devices for freeing jammed rolls { for handling cobbles; Overload safety devices }**

- B21B 33/02 . . . Preventing fracture of rolls

- B21B 35/00** **Drives for metal-rolling mills, { e.g. hydraulic drives }**

- B21B 35/02 . . . for continuously-operating mills ([B21B 35/10](#) , [B21B 35/12](#) take precedence)
- B21B 35/025 . . . { for stretch-reducing of tubes }
- B21B 35/04 . . . each stand having its own motor or motors

- B21B 35/06 . . . for non-continuously-operating mills or for single stands ([B21B 35/10](#) , [B21B 35/12](#) take precedence)
- B21B 35/08 . . . for reversing rolling mills

- B21B 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

- B21B 35/12 . . . Toothed-wheel gearings specially adapted for metal-rolling mills; Housings or mountings therefor

- B21B 35/14 . . . Couplings, driving spindles, or spindle carriers specially adapted for, or specially arranged in, metal-rolling mills (couplings or shafts in general [F16](#))
- B21B 35/141 . . . { Rigid spindle couplings, e.g. coupling boxes placed on roll necks (rigid couplings in general [F16D 1/00](#)) }
- B21B 35/142 . . . { Yielding spindle couplings; Universal joints for spindles (yielding couplings in general [F16D 3/00](#)) }
- B21B 35/143 . . . { having slidably-interengaging teeth, e.g. gear-type couplings (universal joints

- with the coupling parts having slidably-interengaging teeth, in general, [F16D 3/18](#))}
- B21B 35/144 { Wobbler couplings }
- B21B 35/145 . . . { Hooke`s joints or the like with each coupling part pivoted with respect to an intermediate member (Hooke`s joints in general [F16D 3/26](#)) }
- B21B 35/146 { Tongue and slipper joints (tongue and slipper joints in general [F16D 3/265](#)) }
- B21B 35/147 . . { Lubrication of spindle couplings }
- B21B 35/148 . . { Spindle carriers or balancers }

- B21B 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](#))**

- B21B 37/005 . { Control of time interval or spacing between workpieces }
- B21B 37/007 . { Control for preventing or reducing vibration, chatter or chatter marks ([B21B 37/66](#) takes precedence) }
- B21B 37/16 . Control of thickness, width, diameter or other transverse dimensions ([B21B 37/58](#) takes precedence)
- B21B 37/165 . . { responsive mainly to the measured thickness of the product }
- B21B 37/18 . . Automatic gauge control
- B21B 37/20 . . . in tandem mills
- B21B 37/22 . . Lateral spread control; Width control, e.g. by edge rolling
- B21B 37/24 . . Automatic variation of thickness according to a predetermined programme
- B21B 37/26 . . . for obtaining one strip having successive lengths of different constant thickness

- B21B 37/28 . Control of flatness or profile during rolling of strip, sheets or plates
- B21B 37/30 . . using roll camber control
- B21B 37/32 . . . by cooling, heating or lubricating the rolls
- B21B 37/34 . . . by hydraulic expansion of the rolls
- B21B 37/36 . . . by radial displacement of the roll sleeve on a stationary roll beam by means of hydraulic supports
- B21B 37/38 . . using roll bending ([B21B 37/42](#) takes precedence)
- B21B 37/40 . . using axial shifting of the rolls ([B21B 37/42](#) takes precedence)
- B21B 37/42 . . using a combination of roll bending and axial shifting of the rolls
- B21B 37/44 . . using heating, lubricating or water-spray cooling of the product

- B21B 37/46 . Roll speed or drive motor control ([B21B 37/52](#) , [B21B 37/60](#) take precedence)

- B21B 37/48 . Tension control; Compression control
- B21B 37/50 . . by looper control
- B21B 37/52 . . by drive motor control
- B21B 37/54 . . . including coiler drive control, e.g. reversing mills

- B21B 37/56 . Elongation control

- B21B 37/58 . Roll-force control; Roll-gap control {([B21B 38/105 takes precedence](#))}
- B21B 37/60 . . by control of a motor which drives an adjusting screw
- B21B 37/62 . . by control of a hydraulic adjusting device
- B21B 37/64 . . Mill spring or roll spring compensation systems, e.g. control of prestressed mill stands
- B21B 37/66 . . Roll eccentricity compensation systems
- B21B 37/68 . Camber or steering control for strip, sheets or plates, e.g. preventing meandering
- B21B 37/70 . Length control ([B21B 37/56 takes precedence](#))
- B21B 37/72 . Rear end control; Front end control
- B21B 37/74 . Temperature control, e.g. by cooling or heating the rolls or the product ([B21B 37/32](#) , [B21B 37/44 take precedence](#))
- B21B 37/76 . . Cooling control on the run-out table
- B21B 37/78 . Control of tube rolling
- B21B 38/00** **Methods or devices for measuring, { detecting or monitoring } specially adapted for metal-rolling mills, e.g. position detection, inspection of the product {(Control devices or methods [B21B 37/00](#))}**
- B21B 38/006 . { for measuring temperature }
- B21B 38/008 . { Monitoring or detecting vibration, chatter or chatter marks }
- B21B 38/02 . for measuring flatness or profile of strips
- B21B 38/04 . for measuring thickness, width, diameter or other transverse dimensions of the product
- B21B 38/06 . for measuring tension or compression
- B21B 38/08 . for measuring roll-force
- B21B 38/10 . for measuring roll-gap, e.g. pass indicators
- B21B 38/105 . . { Calibrating or presetting roll-gap }
- B21B 38/12 . for measuring roll camber
- 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](#))**
- B21B 39/002 . { Piling, unpling, unscrambling }
- B21B 39/004 . { Transverse moving }

- B21B 39/006 . { Pinch roll sets }
- B21B 39/008 . { Rollers for roller conveyers (roller-ways in general [B65G 13/00](#) , [B21B 39/00](#))}
- B21B 39/02 . Feeding or supporting work; Braking or tensioning arrangements, { e.g. threading arrangements }
- B21B 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](#))
- B21B 39/06 . . Pushing or forcing work into pass
- B21B 39/08 . . Braking or tensioning arrangements
- B21B 39/082 . . . { Bridle devices }
- B21B 39/084 . . . { Looper devices }
- B21B 39/086 . . . { Braking devices }
- B21B 39/088 . . . { Bumpers, stopping devices }
- B21B 39/10 . . Arrangement or installation of feeding rollers in rolling stands
- B21B 39/12 . . Arrangement or installation of roller tables in relation to a roll stand
- B21B 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](#))
- B21B 39/16 . . immediately before entering or after leaving the pass
- B21B 39/165 . . . { Guides or guide rollers for rods, bars, rounds, tubes ([B21B 39/28](#) takes precedence) }; Aligning guides }
- B21B 39/18 . . Switches for directing work in metal-rolling mills or trains
- B21B 39/20 . Revolving, turning-over, or like manipulation of work, { e.g. revolving in trio stands } (guides in which work is subjected to permanent internal twisting [B21B 15/02](#))
- B21B 39/22 . . by tipping, e.g. by lifting one side by levers or wedges ([B21B 39/26](#) , [B21B 39/28](#) take precedence)
- B21B 39/223 . . . { Side-guard manipulators }
- B21B 39/226 . . . { Tilttable ingot chairs }
- B21B 39/24 . . by tongs or grippers
- B21B 39/26 . . by members, e.g. grooved, engaging opposite sides of the work and moved relatively to each other to revolve the work
- B21B 39/28 . . by means of guide members shaped to revolve the work during its passage
- B21B 39/30 . . by lodging it in a rotating ring manipulator or ring segment manipulator
- B21B 39/32 . . Devices specially adapted for turning sheets
- B21B 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](#)
- B21B 41/00 Guiding, conveying, or accumulating easily-flexible work, e.g. wire, sheet metal bands, in loops or curves; Loop lifters**
- B21B 41/02 . Returning work to repeat the pass or passes { within the same stand }
- B21B 41/04 . . above or underneath the rolling stand or rolls
- B21B 41/06 . in which the direction of movement of the work is turned through approximately 180

degrees, { e.g. repeaters, i.e. from one stand to another }

- B21B 41/08 . without overall change in the general direction of movement of the work
- B21B 41/10 . . Loop deflectors { ([B21B 39/084](#) takes precedence) }
- B21B 41/12 . Arrangements of interest only with respect to provision for indicating or controlling operations

- B21B 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](#))**
- B21B 43/003 . { Transfer to bed }
- B21B 43/006 . { Transfer from bed }
- B21B 43/02 . Cooling beds comprising rakes { racks, walking beams } or bars ([B21B 43/10](#) takes precedence)
- B21B 43/04 . Cooling beds comprising rolls or worms
- B21B 43/06 . Cooling beds comprising carriages ([B21B 43/08](#) takes precedence)
- B21B 43/08 . Cooling beds comprising revolving drums or recycling chains { or discs }
- B21B 43/10 . Cooling beds with other work-shifting elements projecting through the bed
- B21B 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, { e.g. before cutting }

- B21B 45/00** **Devices for surface { or other } treatment of work, specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills ([B21B 15/00](#) , { [B21B 1/227](#) and [B21B 27/005](#) } take precedence; technical features of scaling-off devices [B21C 43/00](#))**
- B21B 45/002 . { Increasing friction between work and working rolls by using friction increasing substance }
- B21B 45/004 . { Heating the product }
- B21B 45/008 . { Heat shields }
- B21B 45/02 . for lubricating, cooling, or cleaning { (in particular in combination with forging or pressing devices [B21B 15/005](#) , control of flatness or profile using lubricating or cooling [B21B 37/44](#)) }
- B21B 45/0203 . . { Cooling }
- B21B 45/0206 . . . { Coolants }
- B21B 45/0209 . . . { Cooling devices, e.g. using gaseous coolants }
- B21B 45/0215 { using liquid coolants, e.g. for sections, for tubes }
- B21B 45/0218 { for strips, sheets, or plates ([B21B 45/023](#) , [B21B 45/0233](#) take

| | | |
|--------------|-------|--|
| | | precedence)} |
| B21B 45/0224 | ..... | { for wire, rods, rounds, bars (B21B 45/023 , B21B 45/0233 take precedence)} |
| B21B 45/023 | ..... | { by immersion in a bath } |
| B21B 45/0233 | ..... | { Spray nozzles, Nozzle headers; Spray systems } |
| B21B 45/0239 | .. | { Lubricating } |
| B21B 45/0242 | ... | { Lubricants } |
| B21B 45/0245 | ... | { Lubricating devices } |
| B21B 45/0248 | .... | { using liquid lubricants, e.g. for sections, for tubes } |
| B21B 45/0251 | ..... | { for strips, sheets, or plates } |
| B21B 45/0257 | ..... | { for wire, rods, rounds, bars } |
| B21B 45/0263 | .... | { using solid lubricants } |
| B21B 45/0266 | .. | { Measuring or controlling thickness of liquid films } |
| B21B 45/0269 | .. | { Cleaning } |
| B21B 45/0272 | ... | { Cleaning compositions } |
| B21B 45/0275 | ... | { Cleaning devices } |
| B21B 45/0278 | .... | { removing liquids } |
| B21B 45/0281 | ..... | { removing coolants } |
| B21B 45/0284 | ..... | { removing lubricants } |
| B21B 45/0287 | .... | { removing solid particles, e.g. dust, rust } |
| B21B 45/029 | ... | { Liquid recovering devices } |
| B21B 45/0293 | .... | { Recovering coolants } |
| B21B 45/0296 | .... | { Recovering lubricants } |
| B21B 45/04 | . | for de-scaling, { e.g. by brushing (descaling of rod or wire B21C 43/04)} |
| B21B 45/06 | .. | of strip material (B21B 45/08 takes precedence) |
| B21B 45/08 | .. | hydraulically |

B21B 47/00 **Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal ([soaking pits C21D 9/70](#))**

| | | |
|------------|---|-------------------------------------|
| B21B 47/02 | . | for folding sheets before rolling |
| B21B 47/04 | . | for separating layers after rolling |

B21B 99/00 **Subject matter not provided for in other groups of this subclass**

B21B 2001/00 **Metal-rolling methods or mills for making semi-finished products of solid or profiled cross-section ([B21B 17/00](#) to [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**

| | | |
|--------------|---|---|
| B21B 2001/02 | . | for rolling heavy work, e.g. ingots, slabs, { blooms }billets, in which the cross-sectional |
|--------------|---|---|

- form is unimportant { [Rolling combined with forging or pressing](#) }
- [B21B 2001/022](#) . . Blooms or billets
- [B21B 2001/028](#) . . Slabs
- [B21B 2001/08](#) . for rolling { [structural sections, i.e.](#) }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 \[B21H 8/00\]\(#\)](#))
- [B21B 2001/081](#) . . Roughening or texturing surfaces of structural sections, bars, rounds, wire rods
- [B21B 2001/22](#) . for rolling { [plates, strips,](#) }bands or sheets of indefinite length ([B21B 1/42 takes precedence](#))
- [B21B 2001/221](#) . . by cold-rolling
- [B21B 2001/225](#) . . by hot-rolling
- [B21B 2001/228](#) . . skin pass rolling or temper rolling
- [B21B 2001/38](#) . for rolling sheets of limited length, e.g. folded sheets, superimposed sheets, { [pack rolling](#) } ([B21B 1/40 takes precedence; folding sheets before, or separating layers after, rolling \[B21B 47/00\]\(#\)](#))
- [B21B 2001/383](#) . . Cladded or coated products
- [B21B 2001/386](#) . . Plates
- [B21B 2003/00](#)** **Rolling materials of special alloys so far as the composition of the alloy requires or permits special rolling methods or sequences** { [Rolling of aluminium, copper, zinc or other non-ferrous metals](#) } ([altering special metallurgical properties of alloys, other than structure consolidation or mechanical properties resulting therefrom \[C21D\]\(#\) , \[C22F\]\(#\)](#))
- [B21B 2003/001](#) . Aluminium or its alloys
- [B21B 2003/005](#) . Copper or its alloys
- [B21B 2003/006](#) . Powder metal alloys
- [B21B 2003/008](#) . Zinc or its alloys
- [B21B 2013/00](#)** **Metal-rolling stands, i.e. an assembly composed of a stand frame, rolls, and accessories** ([B21B 17/00 to B21B 23/00 take precedence; details, component parts, accessories, auxiliary means, procedures in connection with metal rolling, see the relevant groups](#))
- [B21B 2013/003](#) . Inactive rolling stands
- [B21B 2013/006](#) . Multiple strand rolling mills; Mill stands with multiple caliber rolls
- [B21B 2013/02](#) . with axes of rolls arranged horizontally
- [B21B 2013/021](#) . . Twin mills
- [B21B 2013/025](#) . . Quarto, four-high stands
- [B21B 2013/026](#) . . Quinto, five high-stands
- [B21B 2013/028](#) . . Sixto, six-high stands

| | |
|---------------------|--|
| B21B 2013/08 | . with differently-directed roll axes, e.g. for the so-called "universal" rolling process |
| B21B 2013/10 | .. all axes being arranged in one plane |
| B21B 2013/106 | ... for sections, e.g. beams, rails |
| B21B 2015/00 | Arrangements for performing additional metal-working operations specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills |
| B21B 2015/0007 | . { Cutting or shearing the product } |
| B21B 2015/0014 | .. transversely to the rolling direction |
| B21B 2015/0021 | .. in the rolling direction |
| B21B 2015/0028 | . Drawing the rolled product |
| B21B 2015/0057 | . Coiling the rolled product |
| B21B 2015/0064 | . Uncoiling the rolled product |
| B21B 2015/0071 | . Levelling the rolled product |
| B21B 2015/0078 | . Extruding the rolled product |
| B21B 2015/0092 | . Welding in the rolling direction |
| B21B 2023/00 | Tube-rolling not restricted to methods provided for in only one of groups B21B 17/00 , B21B 19/00 , B21B 21/00 , e.g. combined processes { planetary tube rolling, auxiliary arrangements, e.g. lubricating, special tube blanks, continuous casting combined with tube rolling } (B21B 25/00 takes precedence) |
| B21B 2023/005 | . Roughening or texturing surfaces of tubes |
| B21B 2027/00 | Rolls, { roll alloys or roll fabrication } (shape of working surfaces required by special processes B21B 1/00); Lubricating, cooling or heating rolls while in use |
| B21B 2027/02 | . 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) {(B21B 27/005 takes precedence)} |
| B21B 2027/021 | .. { Rolls for sheets or strips } |
| B21B 2027/022 | ... Rolls having tapered ends |
| B21B 2027/06 | . Lubricating, cooling or heating rolls |
| B21B 2027/08 | .. internally |
| B21B 2027/083 | ... cooling internally |
| B21B 2027/086 | ... heating internally |
| B21B 2027/10 | .. externally |
| B21B 2027/103 | ... cooling externally |
| B21B 2031/00 | Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll |

mountings, or stand frames

- B21B 2031/02 . Rolling stand frames { or housings }; Roll mountings; { Roll chocks }
- B21B 2031/021 .. Integral tandem mill housings
- B21B 2031/023 .. Transverse shifting one housing
- B21B 2031/025 .. Shifting the stand in or against the rolling direction
- B21B 2031/026 .. Transverse shifting the stand

- B21B 2031/07 . Adaptation of roll { neck }bearings (bearings in general [F16C](#))
- B21B 2031/072 .. Bearing materials

- B21B 2031/16 . Adjusting { or positioning }rolls (control devices [B21B 37/00](#))
- B21B 2031/20 .. by moving rolls perpendicularly to roll axis
- B21B 2031/206 ... Horizontal offset of work rolls

- B21B 2033/00** **Safety devices not otherwise provided for (safety devices in general [F16P](#)); Breaker blocks; Devices for freeing jammed rolls { for handling cobbles; Overload safety devices }**

- B21B 2033/005 . Cobble-freeing

- B21B 2035/00** **Drives for metal-rolling mills, { e.g. hydraulic drives }**

- B21B 2035/005 . Hydraulic drive motors

- B21B 2035/10 . Driving arrangements for rolls which have only a low-power drive; Driving arrangements for rolls which receive power from the shaft of another roll
- B21B 2035/103 .. Fluid-driven rolls or rollers
- B21B 2035/106 .. Non-driven or idler rolls or rollers

- B21B 2035/14 . Couplings, driving spindles, or spindle carriers specially adapted for, or specially arranged in, metal-rolling mills (couplings or shafts in general [F16](#))
- B21B 2035/149 .. Measuring devices for spindles or couplings

- B21B 2037/00** **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](#))**

- B21B 2037/002 . Mass flow control

- B21B 2038/00** **Methods or devices for measuring, { detecting or monitoring }specially adapted for metal-rolling mills, e.g. position detection, inspection of the product {(Control devices or methods [B21B 37/00](#))}**

- B21B 2038/002 . Measuring axial forces of rolls

- B21B 2038/004 . Measuring scale thickness

B21B 2045/00 **Devices for surface { or other } treatment of work, specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills (B21B 15/00 , { B21B 1/227 and B21B 27/005 } take precedence; technical features of scaling-off devices B21C 43/00)**

B21B 2045/004 . { Heating the product }

B21B 2045/006 .. in vacuum or in inert atmosphere

B21B 2045/02 . for lubricating, cooling, or cleaning {(in particular in combination with forging or pressing devices B21B 15/005 , control of flatness or profile using lubricating or cooling B21B 37/44)}

B21B 2045/0203 .. { Cooling }

B21B 2045/0209 ... { Cooling devices, e.g. using gaseous coolants }

B21B 2045/0212 using gaseous coolants

B21B 2045/0215 { using liquid coolants, e.g. for sections, for tubes }

B21B 2045/0221 for structural sections, e.g. H-beams

B21B 2045/0227 for tubes

B21B 2045/0236 .. Laying heads for overlapping rings on cooling conveyer

B21B 2045/0239 .. { Lubricating }

B21B 2045/0245 ... { Lubricating devices }

B21B 2045/0248 { using liquid lubricants, e.g. for sections, for tubes }

B21B 2045/0254 for structural sections, e.g. H-beams

B21B 2045/026 for tubes

B21B 2201/00 **Special rolling modes**

B21B 2201/02 . Austenitic rolling

B21B 2201/04 . Ferritic rolling

B21B 2201/06 . Thermomechanical rolling

B21B 2201/08 . Batch rolling

B21B 2201/10 . Endless rolling

B21B 2201/12 . Isothermic rolling

B21B 2201/14 . Soft reduction

B21B 2201/16 . Two-phase or mixed-phase rolling

B21B 2201/18 . Vertical rolling pass lines

Guidance heading: **Equipment codes**

B21B 2203/00 **Auxiliary arrangements, devices or methods in combination with rolling mills or**

rolling methods

- B21B 2203/02 . Backlash elimination
- B21B 2203/04 . Brakes
- B21B 2203/06 . Cassettes
- B21B 2203/08 . Clutches
- B21B 2203/10 . Counterweights
- B21B 2203/12 . Covers or shieldings
- B21B 2203/14 . Dummy bars or slabs
- B21B 2203/16 . Eccentrics
- B21B 2203/18 . Rolls or rollers
- B21B 2203/182 . . Fluid driven rolls or rollers
- B21B 2203/185 . . Reversible rolls for changing grooves
- B21B 2203/187 . . Tilting rolls
- B21B 2203/20 . Flywheels
- B21B 2203/22 . Hinged chocks
- B21B 2203/24 . Hydrostatic bearings or guides
- B21B 2203/26 . Motors, drives
- B21B 2203/28 . Mounting or dismounting bearing and chock as a unit
- B21B 2203/30 . Quick or bayonet couplings
- B21B 2203/32 . Roll changing stools
- B21B 2203/34 . Rotational position or alignment
- B21B 2203/36 . Spacers
- B21B 2203/38 . Strain gauges
- B21B 2203/40 . Torsion bars or shafts
- B21B 2203/42 . Turntables
- B21B 2203/44 . Vibration dampers

B21B 2205/00 Particular shaped rolled products

- B21B 2205/02 . Tailored blanks
- B21B 2205/04 . Taper- or wedge-shaped profiles

B21B 2261/00 Product parameters

- B21B 2261/02 . Transverse dimensions
- B21B 2261/04 . . Thickness, gauge
- B21B 2261/043 . . . Blanks with variable thickness in the rolling direction
- B21B 2261/046 . . . Different thickness in width direction
- B21B 2261/05 . . . Different constant thicknesses in one rolled product
- B21B 2261/06 . . Width
- B21B 2261/065 . . . Blanks with variable width
- B21B 2261/08 . . Diameter
- B21B 2261/10 . . Cross-sectional area
- B21B 2261/12 . Length
- B21B 2261/14 . Roughness
- B21B 2261/18 . Weight
- B21B 2261/20 . Temperature
- B21B 2261/21 . . Temperature profile
- B21B 2261/22 . Hardness

B21B 2263/00 Shape of product

- B21B 2263/02 . Profile, e.g. of plate, hot strip, sections
- B21B 2263/04 . Flatness
- B21B 2263/06 . . Edge waves
- B21B 2263/08 . . Centre buckles
- B21B 2263/10 . Lateral spread defects
- B21B 2263/12 . . Dog bone
- B21B 2263/16 . Alligatoring
- B21B 2263/20 . End shape; fish tail; tongue
- B21B 2263/30 . Shape in top view

B21B 2265/00 Forming parameters

- B21B 2265/02 . Tension

| | |
|---------------------|--|
| B21B 2265/04 | . . Front or inlet tension |
| B21B 2265/06 | . . Interstand tension |
| B21B 2265/08 | . . Back or outlet tension |
| B21B 2265/10 | . Compression, e.g. longitudinal compression |
| B21B 2265/12 | . Rolling load or rolling pressure; roll force |
| B21B 2265/14 | . Reduction rate |
| B21B 2265/16 | . . Extension |
| B21B 2265/18 | . Elongation |
| B21B 2265/20 | . Slip |
| B21B 2265/22 | . Pass schedule |
| B21B 2265/24 | . asymmetric rolling |
| B21B 2267/00 | Roll parameters |
| B21B 2267/02 | . Roll dimensions |
| B21B 2267/06 | . . Roll diameter |
| B21B 2267/065 | . . . Top and bottom roll have different diameters; Asymmetrical rolling |
| B21B 2267/08 | . . Roll eccentricity |
| B21B 2267/10 | . Roughness of roll surface |
| B21B 2267/12 | . Roll temperature |
| B21B 2267/18 | . Roll crown; roll profile |
| B21B 2267/19 | . . Thermal crown |
| B21B 2267/20 | . . Ground camber or profile |
| B21B 2267/22 | . . Hydraulic expansion of rolls |
| B21B 2267/24 | . Roll wear |
| B21B 2267/26 | . Hardness of the roll surface |
| B21B 2267/28 | . Elastic moduli of rolls |
| B21B 2269/00 | Roll bending or shifting |
| B21B 2269/02 | . Roll bending; vertical bending of rolls |
| B21B 2269/04 | . . Work roll bending |
| B21B 2269/06 | . . Intermediate roll bending |
| B21B 2269/08 | . . Back-up roll bending |

B21B 2269/10 . Horizontal bending of rolls

B21B 2269/12 . Axial shifting the rolls

B21B 2269/14 . . Work rolls

B21B 2269/16 . . Intermediate rolls

B21B 2269/18 . . Back-up rolls

B21B 2271/00 Mill stand parameters

B21B 2271/02 . Roll gap, screw-down position, draft position

B21B 2271/025 . . Tapered roll gap

B21B 2271/04 . . Screw-down speed, draft speed

B21B 2271/06 . Mill spring

B21B 2273/00 Path parameters

B21B 2273/02 . Vertical deviation, e.g. slack, looper height

B21B 2273/04 . Lateral deviation, meandering, camber of product

B21B 2273/06 . Threading

B21B 2273/08 . . Threading-in or before threading-in

B21B 2273/10 . . Threading-out or after threading-out

B21B 2273/12 . End of product

B21B 2273/14 . . Front end or leading end

B21B 2273/16 . . Tail or rear end

B21B 2273/18 . Presence of product

B21B 2273/20 . Track of product

B21B 2273/22 . Aligning on rolling axis, e.g. of roll calibers

B21B 2273/24 . Web positioning

B21B 2275/00 Mill drive parameters

B21B 2275/02 . Speed

B21B 2275/04 . . Roll speed

B21B 2275/05 . . . Speed difference between top and bottom rolls

B21B 2275/06 . . Product speed

B21B 2275/08 . . Coiler speed

B21B 2275/10 . Motor power; motor current

B21B 2275/12 . . Roll torque