

**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 2001/022](#) .. Blooms or billets
- [B21B 1/024](#) .. { Forging or pressing ( forging or pressing devices as units [B21B 15/0035](#) ) }
- [B21B 1/026](#) .. { Rolling }
- [B21B 2001/028](#) .. Slabs
- [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 2001/081](#) .. Roughening or texturing surfaces of structural sections, bars, rounds, wire rods
- [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 2001/221 .. by cold-rolling
- B21B 1/222 .. { in a rolling-drawing process; in a multi-pass mill }
- B21B 1/224 .. { Edge rolling of flat products }
- B21B 2001/225 .. by hot-rolling
- B21B 1/227 .. { Surface roughening or texturing }
- B21B 2001/228 .. skin pass rolling or temper rolling
- 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 2001/383 .. Cladded or coated products
- B21B 2001/386 .. Plates
- 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](#) , [C22E](#) )
  
- B21B 2003/001 . Aluminium or its alloys
- B21B 3/003 . { [Rolling non-ferrous metals immediately subsequent to continuous casting, i.e. in-line rolling](#) }
- B21B 2003/005 . Copper or its alloys
- B21B 2003/006 . Powder metal alloys
- B21B 2003/008 . Zinc or its alloys
- 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 2013/003 . Inactive rolling stands
- B21B 13/005 . { [Cantilevered roll stands](#) }
- B21B 2013/006 . Multiple strand rolling mills ; Mill stands with multiple caliber rolls
- B21B 13/008 . { [Skew rolling stands, e.g. for rolling rounds](#) }

- B21B 13/02 . with axes of rolls arranged horizontally
- B21B 2013/021 . . Twin mills
- 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 2013/025 . . Quarto, four-high stands
- B21B 2013/026 . . Quinto, five high-stands
- B21B 2013/028 . . Sixto, six-high stands
- 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 2013/106 . . . for sections, e.g. beams, rails
- 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 2015/0014 . . transversely to the rolling direction
- B21B 2015/0021 . . in the rolling direction
  
- B21B 2015/0028 . Drawing the rolled product
  
- B21B 15/0035 . { Forging or pressing devices as units }

- B21B 15/0042 . . { Tool changers }
- B21B 15/005 . . { Lubricating, cooling or heating means }
- 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 15/0085 . { Joining ends of material to continuous strip, bar or sheet }
- B21B 2015/0092 . Welding in the rolling direction
- 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 2023/005 . Roughening or texturing surfaces of tubes
  
- 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](#) ) { ( [B21B 27/005](#) takes precedence ) }
- B21B 27/021 . . { Rolls for sheets or strips }
- B21B 2027/022 . . . Rolls having tapered ends
- 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](#) ) }
  
- B21B 27/06 . Lubricating, cooling or heating rolls
- B21B 27/08 . . internally
- B21B 2027/083 . . . cooling internally
- B21B 2027/086 . . . heating internally
- B21B 27/10 . . externally
- B21B 2027/103 . . . cooling externally
- B21B 27/106 . . . { Heating the rolls }
  
- B21B 28/00** **Maintaining rolls or rolling equipment in effective condition ( lubricating, cooling or heating rolls while in use [B21B 27/06](#) )**
  
- 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 }
  
- 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](#) ) }**
  
- B21B 31/00** **Rolling stand structures ; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames**
  
- B21B 31/02 . 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 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](#) )
  
- B21B 31/07 . Adaptation of roll { neck } bearings ( bearings in general [F16C](#) )
- B21B 2031/072 . . Bearing materials
- 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](#) ) }
  
- 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 2031/206 . . . Horizontal offset of work 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 2033/005 . Cobble-freeing
- B21B 33/02 . Preventing fracture of rolls
  
- B21B 35/00** **Drives for metal-rolling mills, { e.g. hydraulic drives }**
  
- B21B 2035/005 . Hydraulic drive motors
  
- 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 2035/103 . . Fluid-driven rolls or rollers
- B21B 2035/106 . . Non-driven or idler rolls or rollers
  
- 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 2035/149 .. Measuring devices for spindles or couplings

**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 2037/002 . Mass flow control
- 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 2038/002 . Measuring axial forces of rolls
- B21B 2038/004 . Measuring scale thickness
- 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 . . . { [Tiltable 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 2045/006 .. in vacuum or in inert atmosphere
- 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 2045/0212 .... 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 2045/0221 ..... for structural sections, e.g. H-beams
- B21B 45/0224 ..... { for wire, rods, rounds, bars ( [B21B 45/023](#) , [B21B 45/0233](#) take precedence ) }
- B21B 2045/0227 ..... for tubes
- B21B 45/023 ..... { by immersion in a bath }
- B21B 45/0233 ..... { Spray nozzles, Nozzle headers; Spray systems }
- B21B 2045/0236 .. Laying heads for overlapping rings on cooling conveyer
- 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 2045/0254 ..... for structural sections, e.g. H-beams
- B21B 45/0257 ..... { for wire, rods, rounds, bars }
- B21B 2045/026 ..... for tubes
- 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 <a href="#">B21C 43/04</a> ) }
B21B 45/06	. . of strip material ( <a href="#">B21B 45/08</a> takes precedence )
B21B 45/08	. . hydraulically
<b>B21B 47/00</b>	<b>Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal ( soaking pits <a href="#">C21D 9/70</a> )</b>
B21B 47/02	. for folding sheets before rolling
B21B 47/04	. for separating layers after rolling
<b>B21B 99/00</b>	<b>Subject matter not provided for in other groups of this subclass</b>
<b>B21B 2201/00</b>	<b>Special rolling modes</b>
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
<b>Guidance heading:</b>	<b>Equipment codes</b>
<b>B21B 2203/00</b>	<b>Auxiliary arrangements, devices or methods in combination with rolling mills or rolling methods</b>
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
<b>B21B 2205/00</b>	<b>Particular shaped rolled products</b>
B21B 2205/02	. Tailored blanks
B21B 2205/04	. Taper- or wedge-shaped profiles
<b>B21B 2261/00</b>	<b>Product parameters</b>
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
<b>B21B 2267/00</b>	<b>Roll parameters</b>
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
<b>B21B 2269/00</b>	<b>Roll bending or shifting</b>
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
<b>B21B 2271/00</b>	<b>Mill stand parameters</b>

- 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