

**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](#) , [C22F](#))
  
- 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

**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](#)}

<b>B21B 29/00</b>	<b>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 <a href="#">B21B 37/38</a>)}</b>
<b>B21B 31/00</b>	<b>Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames</b>
<a href="#">B21B 31/02</a>	. Rolling stand frames {or housings}; Roll mountings;{Roll chocks}
<a href="#">B21B 2031/021</a>	.. {Integral tandem mill housings}
<a href="#">B21B 2031/023</a>	.. {Transverse shifting one housing}
<a href="#">B21B 2031/025</a>	.. {Shifting the stand in or against the rolling direction}
<a href="#">B21B 2031/026</a>	.. {Transverse shifting the stand}
<a href="#">B21B 31/028</a>	.. {Prestressing of rolls or roll mountings in stand frames}
<a href="#">B21B 31/04</a>	.. with tie rods {in frameless stands}, e.g. prestressed tie rods
<a href="#">B21B 31/06</a>	.. Fastening stands or frames to foundation, e.g. to the sole plate ( <a href="#">in general F16M</a> )
<a href="#">B21B 31/07</a>	. Adaptation of roll {neck}bearings ( <a href="#">bearings in general F16C</a> )
<a href="#">B21B 2031/072</a>	.. {Bearing materials}
<a href="#">B21B 31/074</a>	.. {Oil film bearings, e.g. "Morgoil" bearings}
<a href="#">B21B 31/076</a>	.. {Cooling; Lubricating roller bearings}
<a href="#">B21B 31/078</a>	.. {Sealing devices ( <a href="#">Sealings in general F16J 15/00</a> )}
<a href="#">B21B 31/08</a>	. Interchanging rolls, roll mountings, or stand frames,{e.g. using C-hooks; Replacing roll chocks on roll shafts}
<a href="#">B21B 31/10</a>	.. by horizontally displacing,{i.e. horizontal roll changing}
<a href="#">B21B 31/103</a>	... {Manipulators or carriages therefor}
<a href="#">B21B 31/106</a>	... {Vertical displacement of rolls or roll chocks during horizontal roll changing}
<a href="#">B21B 31/12</a>	.. by vertically displacing
<a href="#">B21B 31/14</a>	.. by pivotally displacing
<a href="#">B21B 31/16</a>	. Adjusting {or positioning}rolls ( <a href="#">control devices B21B 37/00</a> )
<a href="#">B21B 31/18</a>	.. by moving rolls axially
<a href="#">B21B 31/185</a>	... {and by crossing rolls}
<a href="#">B21B 31/20</a>	.. by moving rolls perpendicularly to roll axis
<a href="#">B21B 31/203</a>	... {Balancing rolls}
<a href="#">B21B 2031/206</a>	... {Horizontal offset of work rolls}
<a href="#">B21B 31/22</a>	... mechanically,{e.g. by thrust blocks, inserts for removal}
<a href="#">B21B 31/24</a>	.... by screws
<a href="#">B21B 31/26</a>	.... Adjusting eccentrically-mounted roll bearings
<a href="#">B21B 31/28</a>	.... by toggle-lever mechanisms
<a href="#">B21B 31/30</a>	.... by wedges or their equivalent
<a href="#">B21B 31/32</a>	... by liquid pressure,{e.g. hydromechanical adjusting}
<b>B21B 33/00</b>	<b>Safety devices not otherwise provided for (<a href="#">safety devices in general F16P</a>); Breaker blocks; Devices for freeing jammed rolls {for handling cobbles; Overload safety devices}</b>



- 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 ( <a href="#">B21B 37/42 takes precedence</a> )
B21B 37/40	.. using axial shifting of the rolls ( <a href="#">B21B 37/42 takes precedence</a> )
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 ( <a href="#">B21B 37/52</a> , <a href="#">B21B 37/60 take precedence</a> )
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 {( <a href="#">B21B 38/105 takes precedence</a> )}
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 ( <a href="#">B21B 37/56 takes precedence</a> )
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 ( <a href="#">B21B 37/32</a> , <a href="#">B21B 37/44 take precedence</a> )
B21B 37/76	.. Cooling control on the run-out table
B21B 37/78	. Control of tube rolling
<b>B21B 38/00</b>	<b>Methods or devices for measuring,{<a href="#">detecting or monitoring</a>}specially adapted for metal-rolling mills, e.g. position detection, inspection of the product {(Control devices or methods <a href="#">B21B 37/00</a>)}</b>
B21B 2038/002	. { <a href="#">Measuring axial forces of rolls</a> }
B21B 2038/004	. { <a href="#">Measuring scale thickness</a> }
B21B 38/006	. { <a href="#">for measuring temperature</a> }
B21B 38/008	. { <a href="#">Monitoring or detecting vibration, chatter or chatter marks</a> }

- 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 ( <a href="#">B21B 45/023</a> , <a href="#">B21B 45/0233</a> take precedence)}
B21B 2045/0221	.....	{for structural sections, e.g. H-beams}
B21B 45/0224	.....	{for wire, rods, rounds, bars ( <a href="#">B21B 45/023</a> , <a href="#">B21B 45/0233</a> 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 ( <a href="#">descaling of rod or wire 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 (<a href="#">soaking pits C21D 9/70</a>)</b>
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**

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**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

**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**

B21B 2273/02

B21B 2273/04

B21B 2273/06

B21B 2273/08

B21B 2273/10

B21B 2273/12

B21B 2273/14

B21B 2273/16

B21B 2273/18

B21B 2273/20

B21B 2273/22

B21B 2273/24

**Path parameters**

- . Vertical deviation, e.g. slack, looper height
- . Lateral deviation, meandering, camber of product
- . Threading
  - .. Threading-in or before threading-in
  - .. Threading-out or after threading-out
- . End of product
  - .. Front end or leading end
  - .. Tail or rear end
- . Presence of product
- . Track of product
- . Aligning on rolling axis, e.g. of roll calibers
- . Web positioning

**B21B 2275/00**

B21B 2275/02

B21B 2275/04

B21B 2275/05

B21B 2275/06

B21B 2275/08

B21B 2275/10

B21B 2275/12

**Mill drive parameters**

- . Speed
  - .. Roll speed
    - ... Speed difference between top and bottom rolls
  - .. Product speed
  - .. Coiler speed
- . Motor power; motor current
  - .. Roll torque