### **B21B**

#### **CPC COOPERATIVE PATENT CLASSIFICATION**

#### PERFORMING OPERATIONS; TRANSPORTING B (NOTES omitted)

## SHAPING

#### **B21 MECHANICAL METAL-WORKING WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING METAL** (NOTES omitted)

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

## 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.

### WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00	Metal-rolling methods or mills for making semi- finished products of solid or profiled cross-section	1/0815	• {from flat-rolled products, e.g. by longitudinal shearing}
	$(\underline{B21B 17/00} - \underline{B21B 23/00})$ take precedence; with respect to composition of material to be rolled $\underline{B21B 3/00}$ ; extending closed shapes of metal	1/082	• Piling sections having lateral edges specially adapted for interlocking with each other in order to build a wall
	bands by simultaneous rolling at two or more zones	1/085	Rail sections
	<u>B21B 5/00;</u> metal-rolling stands as units <u>B21B 13/00;</u> continuous casting into moulds having walls	1/0855	• • • {Rerolling or processing worn or discarded rail sections}
	formed by moving rolls <u>B22D 11/06</u> ); Sequence of	1/088	• H- or I-sections
	operations in milling trains; Layout of rolling-mill	1/0883	• • • {using forging or pressing devices}
	plant, e.g. grouping of stands; Succession of passes	1/0886	• • • {using variable-width rolls}
1/02	or of sectional pass alternations	1/09	. L-sections
1/02	• for rolling heavy work, e.g. ingots, slabs, {blooms, or} billets, in which the cross-sectional form is	1/092	T-sections
	unimportant {; Rolling combined with forging or	1/095	. U-or channel sections
	pressing}	1/098	Z-sections
2001/022	• {Blooms or billets}	1/10	• • in a single two-high or universal rolling
1/024	• {Forging or pressing (forging or pressing devices as units <u>B21B 15/0035</u> )}		mill {stand ( <u>B21B 1/085</u> - <u>B21B 1/098</u> take precedence)}
1/026	• • {Rolling}	1/12	• in a continuous process {, i.e. without reversing
2001/028	• • {Slabs}		stands ( <u>B21B 1/085</u> - <u>B21B 1/098</u> take
1/04	• • in a continuous process	1/14	precedence)}
1/06	<ul> <li>in a non-continuous process {, e.g. triplet mill, reversing mill}</li> </ul>	1/14	<ul> <li>in a non-continuous process {, i.e. at least one reversing stand (<u>B21B 1/085</u> - <u>B21B 1/098</u> take precedence)}</li> </ul>
1/08	• for rolling {structural sections, i.e.} work of special cross-section, e.g. angle steel (rolling metal of	1/16	• for rolling {wire rods, bars, merchant bars, rounds} wire or material of like small cross-section
	indefinite length in repetitive shapes specially designed for the manufacture of particular objects <u>B21H 8/00</u> )	1/163	• • {Rolling or cold-forming of concrete reinforcement bars or wire (reinforcement bars
1/0805	• • {Flat bars, i.e. having a substantially rectangular cross-section}	1/166	<ul> <li>per se E04C 5/03); Rolls therefor}</li> <li>. {Rolling wire into sections or flat ribbons}</li> </ul>
2001/081	• • {Roughening or texturing surfaces of structural	1/18	• • in a continuous process
	sections, bars, rounds, wire rods }	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)
2001/221	• • {by cold-rolling}
1/222	• {in a rolling-drawing process; in a multi-pass
1/224	<ul><li>mill}</li><li>• {Edge rolling of flat products}</li></ul>
2001/225	<ul> <li>. {Edge rolling of flat products}</li> <li>. {by hot-rolling}</li> </ul>
1/227	<ul> <li>{by not-round }</li> <li>{Surface roughening or texturing}</li> </ul>
2001/228	<ul> <li>(skin pass rolling or temper rolling)</li> </ul>
1/24	<ul> <li>in a continuous {or semi-continuous} process</li> </ul>
	$\{(\underline{B21B 1/224} \text{ takes precedence})\}$
1/26	• • • by hot-rolling {, e.g. Steckel hot mill}
1/265	• • • { and by compressing or pushing the material in rolling direction }
1/28	• • • by cold-rolling {, e.g. Steckel cold mill}
1/30	• in a non-continuous process {( <u>B21B 1/224</u> takes precedence)}
1/32	• • in reversing {single stand} mills, e.g. with
	intermediate storage reels for accumulating
	work
1/34	• • • by hot-rolling
1/36	• • • by cold-rolling
1/38	• for rolling sheets of limited length, e.g. folded sheets, superimposed sheets, {pack
	rolling}( <u>B21B 1/40</u> takes precedence; folding
	sheets before, or separating layers after, rolling
	<u>B21B 47/00</u> )
2001/383	• • {Cladded or coated products}
2001/386	• • {Plates}
1/40	• for rolling foils which present special problems, e.g.
1/42	because of thinness
1/42	• for step-by-step or planetary rolling (making tubes by pilgrim-step rolling <u>B21B 21/00</u> )
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 <u>B22D 11/06</u> )
1/463	• {in a continuous process, i.e. the cast not being cut before rolling}
1/466	• • {in a non-continuous process, i.e. the cast being
	cut before rolling}
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 <u>C21D</u> ,
2002/001	<u>C22F</u> )
2003/001	• {Aluminium or its alloys}
3/003	<ul> <li>{Rolling non-ferrous metals immediately subsequent to continuous casting, i.e. in-line</li> </ul>
	rolling}
2003/005	• {Copper or its alloys}
2003/006	• {Powder metal alloys}
2003/008	• {Zinc or its alloys}
3/02	• Rolling special iron alloys {, e.g. stainless steel}
5/00	Extending closed shapes of metal bands by rolling
_,	(manufacture of circular shapes, e.g. wheel rims,
	<u>B21H 1/06</u> )

9/00	Measures for carrying out rolling operations under special conditions, e.g. in vacuum or inert atmosphere to prevent oxidation of work; Special measures for removing fumes from rolling mills
11/00	Subsidising the rolling process by subjecting rollers or work to vibrations, {e.g. ultrasonic vibrations}
13/00	Metal-rolling stands, i.e. an assembly composed of a stand frame, rolls, and accessories (B21B 17/00 - B21B 23/00 take precedence)
13/001	• {Convertible or tiltable stands, e.g. from duo to universal stands, from horizontal to vertical stands}
2013/003	• {Inactive rolling stands}
13/005	• {Cantilevered roll stands}
2013/006	• {Multiple strand rolling mills; Mill stands with multiple caliber rolls}
13/008	• {Skew rolling stands, e.g. for rolling rounds}
13/02	• with axes of rolls arranged horizontally
2013/021	•• {Twin mills}
13/023	• • {the axis of the rolls being other than perpendicular to the direction of movement of the product, e.g. cross-rolling}
2013/025	• • {Quarto, four-high stands}
2013/026	• • {Quinto, five high-stands}
2013/028	• • {Sixto, six-high stands}
13/04	• Three-high arrangement
13/06 13/08	<ul> <li>with axes of rolls arranged vertically {, e.g. edgers}</li> <li>with differently-directed roll axes, e.g. for the so-</li> </ul>
15/08	called "universal" rolling process
13/10	all axes being arranged in one plane
13/103	• • {for rolling bars, rods or wire}
2013/106	• • { for sections, e.g. beams, rails }
13/12	• • axes being arranged in different planes
13/14	<ul> <li>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)</li> </ul>
13/142	• • {by axially shifting the rolls, e.g. rolls with tapered ends or with a curved contour for continuously-variable crown CVC}
13/145	• • {Lateral support devices for rolls acting mainly in a direction parallel to the movement of the product}
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}
13/16	<ul> <li>with alternatively operative rolls {, e.g. revolver stands, turret mills}</li> </ul>
13/18	• for step-by-step or planetary rolling; {pendulum mills}(methods <u>B21B 1/42</u> ; making tubes by pilgrim-step rolling <u>B21B 21/00</u> )
13/20	• • for planetary rolling
13/22	<ul> <li>for rolling metal immediately subsequent to continuous casting, {i.e. in-line rolling of steel}(methods therefor <u>B21B 1/46</u>; continuous casting <u>B22D 11/00</u>, e.g. into moulds with rolls <u>B22D 11/06</u>)</li> </ul>
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}
2015/0014	• • {transversely to the rolling direction}
2015/0021	• • {in the rolling direction}
2015/0028	• {Drawing the rolled product}
15/0035	• {Forging or pressing devices as units}
15/0042	• • {Tool changers}
15/005	• • {Lubricating, cooling or heating means}
2015/0057	• {Coiling the rolled product}
2015/0064	• {Uncoiling the rolled product}
2015/0071	• {Levelling the rolled product}
2015/0078	• {Extruding the rolled product}
15/0085	• {Joining ends of material to continuous strip, bar or sheet}
2015/0092	• {Welding in the rolling direction}
15/02	. in which work is subjected to permanent internal
	twisting, e.g. for producing reinforcement bars for
	concrete
Kolling meth	
	ods or mills specially designed for making or bes (control of tube rolling P21P 37/78)
	bes (control of tube rolling <u>B21B 37/78</u> )
	<u>bes (control of tube rolling B21B 37/78)</u> Tube-rolling by rollers of which the axes are
processing tu	<u>bes (control of tube rolling B21B 37/78)</u> Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of
processing tu 17/00	<u>bes (control of tube rolling B21B 37/78)</u> Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling
processing tu	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling</li> <li>with mandrel, {i.e. the mandrel rod contacts the</li> </ul>
processing tu 17/00	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling</li> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes</li> </ul>
processing tu 17/00 17/02	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling</li> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes precedence)</li> </ul>
processing tu 17/00 17/02 17/04	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling</li> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes precedence)</li> <li>in a continuous process</li> </ul>
processing tu 17/00 17/02 17/04 17/06	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling</li> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes precedence)</li> <li>in a continuous process</li> <li>in a discontinuous process</li> </ul>
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processing tu 17/00 17/02 17/04 17/06	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling <ul> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes precedence)</li> <li>in a continuous process</li> <li>in a discontinuous process</li> <li>with mandrel having one or more protrusions {, i.e. only the mandrel plugs contact the rolled tube;</li> </ul> </li> </ul>
processing tu 17/00 17/02 17/04 17/06 17/08	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling <ul> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes precedence)</li> <li>in a continuous process</li> <li>in a discontinuous process</li> <li>with mandrel having one or more protrusions {, i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills}</li> </ul> </li> </ul>
processing tu 17/00 17/02 17/04 17/06 17/08 17/10	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling <ul> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes precedence)</li> <li>in a continuous process</li> <li>in a discontinuous process</li> <li>with mandrel having one or more protrusions {, i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills}</li> <li>in a continuous process</li> </ul> </li> </ul>
processing tu 17/00 17/02 17/04 17/06 17/08	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling <ul> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes precedence)</li> <li>in a continuous process</li> <li>in a discontinuous process</li> <li>with mandrel having one or more protrusions {, i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills}</li> <li>in a discontinuous process</li> <li>in a continuous process</li> <li>in a continuous process</li> </ul> </li> </ul>
processing tu 17/00 17/02 17/04 17/06 17/08 17/10	<ul> <li><u>bes</u> (control of tube rolling <u>B21B 37/78</u>)</li> <li>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling <ul> <li>with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length}(<u>B21B 17/08</u> takes precedence)</li> <li>in a continuous process</li> <li>in a discontinuous process</li> <li>with mandrel having one or more protrusions {, i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills}</li> <li>in a discontinuous process</li> <li>in a continuous process</li> <li>in a continuous process</li> </ul> </li> </ul>

- and having their axes not perpendicular to the axis of the work (straightening by rollers B21D)
   19/02 . the axes of the rollers being arranged essentially diagonally to the axis of the work, e.g. "cross" tube-rolling {; Diescher mills, Stiefel disc piercers or Stiefel rotary piercers}
   19/04 . Rolling basic material of solid, i.e. non-hollow, structure; Piercing {, e.g. rotary piercing mills}
- 19/06 . Rolling hollow basic material, {e.g. Assel mills}(<u>B21B 19/04</u> takes precedence; separating work from mandrel <u>B21C 45/00</u>)
  19/08 . Enlarging tube diameter
  19/10 . Finishing, e.g. smoothing, sizing {, reeling}
  19/12 . the axes of the rollers being arranged essentially parallel to the axis of the work
  19/14 . Rolling tubes by means of additional rollers arranged inside the tubes
- 19/16 Rolling tubes without additional rollers arranged inside the tubes
- 21/00 Pilgrim-step tube-rolling {, i.e. pilger mills}
  21/005 . {with reciprocating stand, e.g. driving the stand}
  21/02 . Rollers therefor
  21/04 . Pilgrim-step feeding mechanisms (B21B 21/06 takes precedence)
  21/045 . {for reciprocating stands}
  21/06 . Devices for revolving work between the steps
- 21/065 • {for reciprocating stands} 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) 2023/005 • {Roughening or texturig surfaces of tubes} 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} 25/02 . Guides, supports, or abutments for mandrels, e.g. carriages {or steadiers}; Adjusting devices for mandrels 25/04. Cooling or lubricating mandrels during operation 25/06 . Interchanging mandrels {, fixing plugs on mandrel rods or cooling during interchanging mandrels (separating tubes from mandrels <u>B21C 45/00</u>)} 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 27/005 • {Rolls with a roughened or textured surface; Methods for making same} 27/02 . Shape or construction of rolls (for rolling metal of indefinite length in repetitive shapes specially designed for the manufacture of particular objects <u>B21H 8/02</u> {; <u>B21B 27/005</u> takes precedence}) 27/021 • • {Rolls for sheets or strips} 2027/022 • • {Rolls having tapered ends} 27/024 • • {Rolls for bars, rods, rounds, tubes, wire or the like} 27/025 • • {Skew rolls} 27/027 • {Vertical rolls} 27/028 • {Variable-width rolls} 27/03 . . Sleeved rolls {(<u>B21B 27/028</u> takes precedence)} 27/032 • • {Rolls for sheets or strips} 27/035 . . {Rolls for bars, rods, rounds, tubes, wire or the like} 27/037 . . . {Skew rolls} 27/05 . . . with deflectable sleeves 27/055 . . . { with sleeves radially deflectable on a stationary beam by means of hydraulic supports (in general F16C 13/00; for papermaking machines D21G 1/00; regulating devices therefor <u>B21B 37/36</u>) 27/06 . Lubricating, cooling or heating rolls 27/08. . internally • • {cooling internally} 2027/083 2027/086 • • {heating internally} 27/10. . externally 2027/103 • • {cooling externally} 27/106 • • • {Heating the rolls} 28/00 Maintaining rolls or rolling equipment in effective condition (lubricating, cooling or heating rolls while in use **B21B** 27/06)
  - 28/02 Maintaining rolls in effective condition, e.g. reconditioning

33/02

• Preventing fracture of rolls

28/04	• • while in use, e.g. polishing {or grinding while the rolls are in their stands}
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 <u>B21B 37/38</u> )}
31/00	Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames
31/02	• Rolling stand frames {or housings}; Roll mountings {; Roll chocks}
2031/021	• • {Integral tandem mill housings}
2031/023	• • {Transverse shifting one housing}
2031/025	• • {Shifting the stand in or against the rolling direction}
2031/026	• • {Transverse shifting the stand}
31/028	• • {Prestressing of rolls or roll mountings in stand frames}
31/04	• • with tie rods {in frameless stands}, e.g. prestressed tie rods
31/06	• Fastening stands or frames to foundation, e.g. to the sole plate (in general $\underline{F16M}$ )
31/07	<ul> <li>Adaptation of roll {neck} bearings (bearings in general <u>F16C</u>)</li> </ul>
2031/072	• • {Bearing materials}
31/074	• • {Oil film bearings, e.g. "Morgoil" bearings}
31/076	• • {Cooling; Lubricating roller bearings}
31/078	• • {Sealing devices (sealings in general <u>F16J 15/00</u> )}
31/08	<ul> <li>Interchanging rolls, roll mountings, or stand frames         {, e.g. using C-hooks; Replacing roll chocks on roll shafts}     </li> </ul>
31/10	<ul> <li>by horizontally displacing {, i.e. horizontal roll changing}</li> </ul>
31/103	• • • {Manipulators or carriages therefor}
31/106	• • {Vertical displacement of rolls or roll chocks during horizontal roll changing}
31/12	• • by vertically displacing
31/14	• • by pivotally displacing
31/16	• Adjusting {or positioning} rolls (control devices <u>B21B 37/00</u> )
31/18	• • by moving rolls axially
31/185	• • • {and by crossing rolls}
31/20	• • by moving rolls perpendicularly to roll axis
31/203	• • • {Balancing rolls}
2031/206	• • • {Horizontal offset of work rolls}
31/22	• • • mechanically {, e.g. by thrust blocks, inserts for removal}
31/24	• • • by screws
31/26	• • • Adjusting eccentrically-mounted roll bearings
31/28	• • • by toggle-lever mechanisms
31/30	• • • • by wedges or their equivalent
31/32	• • • by liquid pressure {, e.g. hydromechanical adjusting}
33/00	Safety devices not otherwise provided for (safety devices in general <u>F16P</u> ); Breaker blocks; Devices for freeing jammed rolls {for handling cobbles; Overload safety devices}
2033/005	• {Cobble-freeing}

35/00	Drives for metal-rolling mills {, e.g. hydraulic
	drives}
2035/005	• {Hydraulic drive motors}
35/02	• for continuously-operating mills ( <u>B21B 35/10</u> , <u>B21B 35/12</u> take precedence)
35/025	• • {for stretch-reducing of tubes}
35/04	• • each stand having its own motor or motors
35/06	• for non-continuously-operating mills or for single stands ( <u>B21B 35/10</u> , <u>B21B 35/12</u> take precedence)
35/08	• • for reversing rolling mills
35/10	• Driving arrangements for rolls which have only a low-power drive; Driving arrangements for rolls which receive power from the shaft of another roll
2035/103	• • {Fluid-driven rolls or rollers}
2035/106	• • {Non-driven or idler rolls or rollers}
35/12	• Toothed-wheel gearings specially adapted for metal- rolling mills; Housings or mountings therefor
35/14	• Couplings, driving spindles, or spindle carriers specially adapted for, or specially arranged in, metal-rolling mills (couplings or shafts in general F16)
35/141	• • {Rigid spindle couplings, e.g. coupling boxes placed on roll necks (rigid couplings in general F16D 1/00)}
35/142	• • {Yielding spindle couplings; Universal joints for spindles (yielding couplings in general F16D 3/00)}
35/143	• • {having slidably-interengaging teeth, e.g. gear-type couplings (universal joints with the coupling parts having slidably-interengaging teeth, in general, <u>F16D 3/18</u> )}
35/144	•••• {Wobbler couplings}
35/145	<ul> <li>. {Hooke's joints or the like with each coupling part pivoted with respect to an intermediate member (Hooke's joints in general <u>F16D 3/26</u>)}</li> </ul>
35/146	• • • {Tongue and slipper joints (tongue and slipper joints in general <u>F16D 3/265</u> )}
35/147	• • {Lubrication of spindle couplings}
35/148	• • {Spindle carriers or balancers}
2035/149	• • {Measuring devices for spindles or couplings}
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 <u>B21B 38/00</u> )
2037/002	• {Mass flow control}
37/005	• {Control of time interval or spacing between workpieces}
37/007	• {Control for preventing or reducing vibration, chatter or chatter marks ( <u>B21B 37/66</u> takes precedence)}
37/16	• Control of thickness, width, diameter or other transverse dimensions ( <u>B21B 37/58</u> takes precedence)
37/165	• • {responsive mainly to the measured thickness of the product}
37/18	Automatic gauge control
37/20	• • • in tandem mills
37/22	• Lateral spread control; Width control, e.g. by edge rolling
37/24	Automatic variation of thickness according to a predetermined programme

B21B
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37/26	• • • for obtaining one strip having successive lengths of different constant thickness	39/00	Arrangements for moving, supporting, or positioning work, or controlling its movement,
37/28	• Control of flatness or profile during rolling of strip,		combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills
27/20	sheets or plates		(guiding, conveying, or accumulating easily-flexible
37/30	• using roll camber control		work in loops or curves <u>B21B 41/00</u> ; specially
37/32	• • by cooling, heating or lubricating the rolls		associated with cooling-beds <u>B21B 43/00</u> ; conveying
37/34	• • • by hydraulic expansion of the rolls		or transporting in general <u>B65G</u> )
37/36	• • • by radial displacement of the roll sleeve on	39/002	• {Piling, unpiling, unscrambling}
	a stationary roll beam by means of hydraulic	39/002	• {Transverse moving}
27/20	supports	39/004	<ul> <li>{Pinch roll sets}</li> </ul>
37/38	• using roll bending ( $\underline{B21B 37/42}$ takes precedence)		
37/40	• using axial shifting of the rolls ( <u>B21B 37/42</u> takes precedence)	39/008	{Rollers for roller conveyors (roller-ways in general <u>B65G 13/00, B21B 39/00</u> )}
37/42	• • using a combination of roll bending and axial shifting of the rolls	39/02	• Feeding or supporting work; Braking or tensioning arrangements {, e.g. threading arrangements}
37/44	• using heating, lubricating or water-spray cooling of the product	39/04	• Lifting or lowering work for conveying purposes, e.g. tilting tables arranged immediately in front of
37/46	• Roll speed or drive motor control ( <u>B21B 37/52</u> , <u>B21B 37/60</u> take precedence)		or behind the pass (turn-over or like manipulating means as such <u>B21B 39/20</u> )
37/48	Tension control; Compression control	39/06	• Pushing or forcing work into pass
37/50	by looper control	39/08	. Braking or tensioning arrangements
37/52	by drive motor control	39/082	• • • {Bridle devices}
37/54	including coiler drive control, e.g. reversing	39/084	{Looper devices}
57754	mills	39/086	{Braking devices}
37/56	Elongation control	39/088	• • • {Bumpers, stopping devices}
37/58	<ul> <li>Roll-force control; Roll-gap control {(<u>B21B 38/105</u>)</li> </ul>	39/10	• Arrangement or installation of feeding rollers in
	takes precedence)}	39/12	rolling stands <ul> <li>Arrangement or installation of roller tables in</li> </ul>
37/60	• • by control of a motor which drives an adjusting screw		relation to a roll stand
37/62	• • by control of a hydraulic adjusting device	39/14	• Guiding, positioning or aligning work ( <u>B21B 43/12</u> takes precedence; guides in which work is subjected
37/64	• Mill spring or roll spring compensation systems, e.g. control of prestressed mill stands	20/16	to permanent internal twisting <u>B21B 15/02</u> )
37/66	Roll eccentricity compensation systems	39/16	• immediately before entering or after leaving the
37/68	. Camber or steering control for strip, sheets or plates,	20/165	pass
	e.g. preventing meandering	39/165	• • {Guides or guide rollers for rods, bars, rounds,
37/70	. Length control ( <u>B21B 37/56</u> takes precedence)		tubes ( <u>B21B 39/28</u> takes precedence); Aligning guides}
37/72	. Rear end control; Front end control	39/18	• • Switches for directing work in metal-rolling mills
37/74	• Temperature control, e.g. by cooling or heating the	39/10	or trains
	rolls or the product ( <u>B21B 37/32</u> , <u>B21B 37/44</u> take	39/20	• Revolving, turning-over, or like manipulation of
	precedence)	39/20	work, {e.g. revolving in trio stands}(guides in
37/76	. Cooling control on the run-out table		which work is subjected to permanent internal
37/78	Control of tube rolling		twisting <u>B21B 15/02</u> )
38/00	Methods or devices for measuring, {detecting or	39/22	• by tipping, e.g. by lifting one side by levers
36/00	monitoring} specially adapted for metal-rolling mills, e.g. position detection, inspection of the	37722	or wedges ( <u>B21B 39/26</u> , <u>B21B 39/28</u> take precedence)
	product {(control devices or methods <u>B21B 37/00</u> )}	39/223	{Side-guard manipulators}
2038/002	• {Measuring axial forces of rolls}	39/226	• • • {Tiltable ingot chairs}
2038/002	• {Measuring scale thickness}	39/24	<ul> <li>by tongs or grippers</li> </ul>
38/006	• {for measuring temperature}	39/26	<ul> <li>by members, e.g. grooved, engaging opposite</li> </ul>
38/000	• {Monitoring or detecting vibration, chatter or	57/20	sides of the work and moved relatively to each
30/000	chatter marks}		other to revolve the work
38/02	• for measuring flatness or profile of strips	39/28	by means of guide members shaped to revolve the
38/04	• for measuring thickness, width, diameter or other		work during its passage
	transverse dimensions of the product	39/30	• by lodging it in a rotating ring manipulator or ring segment manipulator
38/06	• for measuring tension or compression	39/32	
38/08	• for measuring roll-force		Devices specially adapted for turning sheets     Arrangements or constructional combinations
38/10	• for measuring roll-gap, e.g. pass indicators	39/34	• Arrangements or constructional combinations
38/105	• • {Calibrating or presetting roll-gap}		specifically designed to perform functions covered by more than one of groups <u>B21B 39/02</u> ,
38/12	. for measuring roll camber		<u>B21B 39/14, B21B 39/20</u>
		41/00	Guiding, conveying, or accumulating easily- flexible work, e.g. wire, sheet metal bands, in loops or curves: Loop lifters

or curves; Loop lifters

41/02	• Returning work to repeat the pass or passes {within the same stand}	2045/0236	• {Laying heads for overlapping rings on cooling conveyor}
41/04	• • above or underneath the rolling stand or rolls	45/0239	• {Lubricating}
41/06	• in which the direction of movement of the work is	45/0242	• • {Lubricants}
	turned through approximately 180 degrees, {e.g.	45/0245	{Lubricating devices}
	repeaters, i.e. from one stand to another}	45/0248	• • • {using liquid lubricants, e.g. for sections, for
41/08	• without overall change in the general direction of		tubes}
	movement of the work	45/0251	•••• {for strips, sheets, or plates}
41/10	. Loop deflectors {( <u>B21B 39/084</u> takes	2045/0254	•••• {for structural sections, e.g. H-beams}
	precedence)}	45/0257	• • • • {for wire, rods, rounds, bars}
41/12	• Arrangements of interest only with respect to	2045/026	• • • • • {for tubes}
	provision for indicating or controlling operations	45/0263	• • • • {using solid lubricants}
43/00	Cooling beds, whether stationary or moving;	45/0266	• • {Measuring or controlling thickness of liquid
	Means specially associated with cooling beds, e.g.		films}
	for braking work or for transferring it to or from	45/0269	• • {Cleaning}
12/002	the bed (conveying means in general <u>B65G</u> )	45/0272	{Cleaning compositions}
43/003	• {Transfer to bed}	45/0275	{Cleaning devices}
43/006	• {Transfer from bed}	45/0278	• • • {removing liquids}
43/02	• Cooling beds comprising rakes {racks, walking beams} or bars ( <u>B21B 43/10</u> takes precedence)	45/0281	<ul><li> {removing coolants}</li><li> {removing lubricants}</li></ul>
43/04	• Cooling beds comprising rolls or worms	45/0284	
43/04	<ul> <li>Cooling beds comprising rons of worms</li> <li>Cooling beds comprising carriages (<u>B21B 43/08</u>)</li> </ul>	45/0287 45/029	<ul> <li> {removing solid particles, e.g. dust, rust}</li> <li> {Liquid recovering devices}</li> </ul>
45/00	takes precedence)	45/029	{Recovering coolants}
43/08	• Cooling beds comprising revolving drums or	45/0295	{Recovering lubricants}
12/00	recycling chains {or discs}	45/0290	<ul> <li>for de-scaling {, e.g. by brushing (descaling of rod</li> </ul>
43/10	• Cooling beds with other work-shifting elements	45/04	or wire $\underline{B21C} 43/04$ )
	projecting through the bed	45/06	• of strip material ( <u>B21B 45/08</u> takes precedence)
43/12	• Devices for positioning workpieces "flushed", i.e.	45/08	<ul> <li>hydraulically</li> </ul>
	with all their axial ends arranged in line on cooling		
	beds or on co-operating conveyors {, e.g. before cutting}	47/00	Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal (soaking pits <u>C21D 9/70</u> )
45/00	Devices for surface {or other} treatment of	47/02	• for folding sheets before rolling
	work, specially combined with or arranged in,	47/02	<ul> <li>for separating layers after rolling</li> </ul>
	or specially adapted for use in connection with,	-77/0-1	• Tor separating hypers after ronning
	<b>metal-rolling mills</b> (B21B 15/00, {B21B 1/227 and B21B 27/005} take precedence; technical features of scaling-off devices B21C 43/00)	99/00	Subject matter not provided for in other groups o this subclass
45/002	• {Increasing friction between work and working rolls		
45/002	by using friction increasing substance}		
45/004	• {Heating the product}	2201/00	Special rolling modes
2045/006	<ul> <li>{in vacuum or in inert atmosphere}</li> </ul>	2201/02	Austenitic rolling
45/008	• {Heat shields}	2201/04	Ferritic rolling
45/02	<ul> <li>for lubricating, cooling, or cleaning {(in particular)</li> </ul>	2201/06	Thermomechanical rolling
	in combination with forging or pressing devices	2201/08	Batch rolling
	B21B 15/005, control of flatness or profile using	2201/10	• Endless rolling
	lubricating or cooling <u>B21B 37/44</u> )}	2201/12	Isothermic rolling
45/0203	{Cooling}	2201/14	Soft reduction
45/0206	{Coolants}	2201/16	• Two-phase or mixed-phase rolling
45/0209	• • • {Cooling devices, e.g. using gaseous coolants}	2201/18	• Vertical rolling pass lines
2045/0212	• • • • {using gaseous coolants}	<b>F</b>	
45/0215	• • • {using liquid coolants, e.g. for sections, for	<u>Equipment c</u>	<u>coues</u>
	tubes}	2203/00	Auxiliary arrangements, devices or methods in
45/0218	{for strips, sheets, or plates ( $\underline{B21B} 45/023$ , $\underline{B21B} 45/023$ the proceedings)		combination with rolling mills or rolling methods
2045/0221	B21B 45/0233 take precedence)} {for structural sections, e.g. H-beams}	2203/02	Backlash elimination
2045/0221 45/0224	<ul> <li> {for structural sections, e.g. H-beams}</li> <li> {for wire, rods, rounds, bars</li> </ul>	2203/04	• Brakes
43/0224	(B21B 45/023, B21B 45/0233) take	2203/06	• Cassettes
	( <u>B21B 43/025</u> , <u>B21B 43/0255</u> take precedence)}	2203/08	• Clutches
2045/0227	• • • • {for tubes}	2203/10	• Counterweights
45/023	••••• {by immersion in a bath}	2203/12	Covers or shieldings
45/0233	••••••••••••••••••••••••••••••••••••••	2203/14	Dummy bars or slabs
тл(0233	systems}	2203/16	• Eccentrics
	· · · · · · · · · · · · · · · · · · ·	0000/10	

2045/0236	•• {Laying heads for overlapping rings on cooling conveyor}
45/0239	• • {Lubricating}
45/0242	• • • {Lubricants}
45/0245	{Lubricating devices}
45/0248	• • • {using liquid lubricants, e.g. for sections, for tubes}
45/0251	•••• {for strips, sheets, or plates}
2045/0254	• • • • {for structural sections, e.g. H-beams}
45/0257	•••• {for wire, rods, rounds, bars}
2045/026	•••• {for tubes}
45/0263	•••• {using solid lubricants}
45/0266	• • {Measuring or controlling thickness of liquid films}
45/0269	• • {Cleaning}
45/0272	{Cleaning compositions}
45/0275	• • • {Cleaning devices}
45/0278	• • • {removing liquids}
45/0281	• • • • {removing coolants}
45/0284	• • • • {removing lubricants}
45/0287	• • • {removing solid particles, e.g. dust, rust}
45/029	• • • {Liquid recovering devices}
45/0293	{Recovering coolants}
45/0296	• • • • {Recovering lubricants}
45/04	<ul> <li>for de-scaling {, e.g. by brushing (descaling of rod or wire <u>B21C 43/04</u>)}</li> </ul>
45/06	• • of strip material ( <u>B21B 45/08</u> takes precedence)
45/08	• • hydraulically
47/00	Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal (soaking pits <u>C21D 9/70</u> )
47/02	• for folding sheets before rolling
47/04	• for separating layers after rolling
99/00	Subject matter not provided for in other groups of this subclass

2201/00	Special rolling modes
2201/02	Austenitic rolling
2201/04	Ferritic rolling
2201/06	Thermomechanical rolling
2201/08	Batch rolling
2201/10	Endless rolling
2201/12	Isothermic rolling
2201/14	Soft reduction
2201/16	. Two-phase or mixed-phase rolling
2201/18	• Vertical rolling pass lines

## Equipment codes

2203/00	Auxiliary arrangements, devices or methods in combination with rolling mills or rolling methods
2203/02	Backlash elimination
2203/04	• Brakes
2203/06	. Cassettes
2203/08	. Clutches
2203/10	• Counterweights
2203/12	Covers or shieldings
2203/14	Dummy bars or slabs
2203/16	• Eccentrics
2203/18	• Rolls or rollers

## Equipment codes

2203/182	• Fluid driven rolls or rollers	2265/22	• Pass schedule
2203/185	• Reversible rolls for changing grooves	2265/24	• asymmetric rolling
2203/187	• • Tilting rolls		
2203/20	• Flywheels	2267/00	Roll parameters
2203/22	• Hinged chocks	2267/02	• Roll dimensions
2203/24	• Hydrostatic bearings or guides	2267/06	Roll diameter
2203/26	<ul> <li>Motors, drives</li> </ul>	2267/065	Top and bottom roll have different diameters;
2203/28	<ul> <li>Mounting or dismounting bearing and chock as a</li> </ul>		Asymmetrical rolling
2203/20	unit	2267/08	Roll eccentricity
2203/30	• Quick or bayonet couplings	2267/10	Roughness of roll surface
2203/30	<ul> <li>Roll changing stools</li> </ul>	2267/12	. Roll temperature
2203/34	Rotational position or alignment	2267/18	• Roll crown; roll profile
2203/31	Spacers	2267/19	Thermal crown
2203/38	Strain gauges	2267/20	. Ground camber or profile
2203/30	Torsion bars or shafts	2267/22	• • Hydraulic expansion of rolls
2203/40	Turntables	2267/24	• Roll wear
2203/42	Vibration dampers	2267/26	. Hardness of the roll surface
2203/44	• Vibration dampers	2267/28	Elastic moduli of rolls
2205/00	Particular shaped rolled products	2269/00	Roll bending or shifting
2205/02	Tailored blanks	2269/02	<ul> <li>Roll bending; vertical bending of rolls</li> </ul>
2205/04	• Taper- or wedge-shaped profiles	2269/02	. Work roll bending
2261/00	Declaret nonometors	2269/04	Intermediate roll bending
	Product parameters Transverse dimensions	2269/08	-
2261/02 2261/04	This verse dimensions     Thickness, gauge	2269/08	Back-up roll bending     Horizontal bending of rolls
		2269/10	-
2261/043	Blanks with variable thickness in the rolling direction		<ul> <li>Axial shifting the rolls</li> <li>Work rolls</li> </ul>
2261/046	• • • Different thickness in width direction	2269/14	
2261/040	Different constant thicknesses in one rolled	2269/16	Intermediate rolls
2201/05	product	2269/18	• Back-up rolls
2261/06	. Width	2271/00	Mill stand parameters
2261/065	Blanks with variable width	2271/02	• Roll gap, screw-down position, draft position
2261/065	. Diameter	2271/025	• Tapered roll gap
2261/08	Cross-sectional area	2271/04	• Screw-down speed, draft speed
2261/10	. Length	2271/06	• Mill spring
2261/12	Roughness	<b>2252</b> /00	
2261/14	• Weight	2273/00	Path parameters
2261/18	. Temperature	2273/02	• Vertical deviation, e.g. slack, looper height
2261/20	Temperature profile	2273/04	• Lateral deviation, meandering, camber of product
2261/21	Hardness	2273/06	• Threading
2201/22	• Hardness	2273/08	. Threading-in or before threading-in
2263/00	Shape of product	2273/10	• Threading-out or after threading-out
2263/02	• Profile, e.g. of plate, hot strip, sections	2273/12	• End of product
2263/04	. Flatness	2273/14	• Front end or leading end
2263/06	• • Edge waves	2273/16	Tail or rear end
2263/08	• Centre buckles	2273/18	. Presence of product
2263/10	Lateral spread defects	2273/20	• Track of product
2263/12	Dog bone	2273/22	• Aligning on rolling axis, e.g. of roll calibers
2263/16	Alligatoring	2273/24	• Web positioning
2263/20	• End shape; fish tail; tongue	2275/00	Mill drive parameters
2263/30	• Shape in top view	2275/02	• Speed
		2275/02	• Roll speed
2265/00	Forming parameters		
<b>2265/00</b> 2265/02	. Tension	2275/05	Speed difference between top and bottom rolls
<b>2265/00</b> 2265/02 2265/04	<ul><li>Tension</li><li>Front or inlet tension</li></ul>	2275/05 2275/06	<ul><li>Speed difference between top and bottom rolls</li><li>Product speed</li></ul>
<b>2265/00</b> 2265/02 2265/04 2265/06	<ul> <li>Tension</li> <li>Front or inlet tension</li> <li>Interstand tension</li> </ul>	2275/05 2275/06 2275/08	<ul> <li>Speed difference between top and bottom rolls</li> <li>Product speed</li> <li>Coiler speed</li> </ul>
<b>2265/00</b> 2265/02 2265/04 2265/06 2265/08	<ul> <li>Tension</li> <li>Front or inlet tension</li> <li>Interstand tension</li> <li>Back or outlet tension</li> </ul>	2275/05 2275/06 2275/08 2275/10	<ul> <li>Speed difference between top and bottom rolls</li> <li>Product speed</li> <li>Coiler speed</li> <li>Motor power; motor current</li> </ul>
<b>2265/00</b> 2265/02 2265/04 2265/06 2265/08 2265/10	<ul> <li>Tension</li> <li>Front or inlet tension</li> <li>Interstand tension</li> <li>Back or outlet tension</li> <li>Compression, e.g. longitudinal compression</li> </ul>	2275/05 2275/06 2275/08	<ul> <li>Speed difference between top and bottom rolls</li> <li>Product speed</li> <li>Coiler speed</li> </ul>
<b>2265/00</b> 2265/02 2265/04 2265/06 2265/08 2265/10 2265/12	<ul> <li>Tension</li> <li>Front or inlet tension</li> <li>Interstand tension</li> <li>Back or outlet tension</li> <li>Compression, e.g. longitudinal compression</li> <li>Rolling load or rolling pressure; roll force</li> </ul>	2275/05 2275/06 2275/08 2275/10	<ul> <li>Speed difference between top and bottom rolls</li> <li>Product speed</li> <li>Coiler speed</li> <li>Motor power; motor current</li> </ul>
<b>2265/00</b> 2265/02 2265/04 2265/06 2265/08 2265/10 2265/12 2265/14	<ul> <li>Tension</li> <li>Front or inlet tension</li> <li>Interstand tension</li> <li>Back or outlet tension</li> <li>Compression, e.g. longitudinal compression</li> <li>Rolling load or rolling pressure; roll force</li> <li>Reduction rate</li> </ul>	2275/05 2275/06 2275/08 2275/10	<ul> <li>Speed difference between top and bottom rolls</li> <li>Product speed</li> <li>Coiler speed</li> <li>Motor power; motor current</li> </ul>
<b>2265/00</b> 2265/02 2265/04 2265/06 2265/08 2265/10 2265/12	<ul> <li>Tension</li> <li>Front or inlet tension</li> <li>Interstand tension</li> <li>Back or outlet tension</li> <li>Compression, e.g. longitudinal compression</li> <li>Rolling load or rolling pressure; roll force</li> </ul>	2275/05 2275/06 2275/08 2275/10	<ul> <li>Speed difference between top and bottom rolls</li> <li>Product speed</li> <li>Coiler speed</li> <li>Motor power; motor current</li> </ul>
<b>2265/00</b> 2265/02 2265/04 2265/06 2265/08 2265/10 2265/12 2265/14	<ul> <li>Tension</li> <li>Front or inlet tension</li> <li>Interstand tension</li> <li>Back or outlet tension</li> <li>Compression, e.g. longitudinal compression</li> <li>Rolling load or rolling pressure; roll force</li> <li>Reduction rate</li> </ul>	2275/05 2275/06 2275/08 2275/10	<ul> <li>Speed difference between top and bottom rolls</li> <li>Product speed</li> <li>Coiler speed</li> <li>Motor power; motor current</li> </ul>