

CPC COOPERATIVE PATENT CLASSIFICATION

B PERFORMING OPERATIONS; TRANSPORTING

(NOTES omitted)

SHAPING

B21 MECHANICAL METAL-WORKING WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING METAL (casting, powder metallurgy [B22](#); shearing [B23D](#); working of metal by the action of a high concentration of electric current [B23H](#); soldering, welding, flame-cutting [B23K](#); other working of metal [B23P](#); punching sheet material in general [B26F](#); processes for changing of physical properties of metals [C21D](#), [C22F](#); electroforming [C25D 1/00](#))

(NOTES omitted)

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.

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 (B21B 17/00 - B21B 23/00 take precedence; with respect to composition of material to be rolled B21B 3/00 ; extending closed shapes of metal bands by simultaneous rolling at two or more zones B21B 5/00 ; metal-rolling stands as units B21B 13/00 ; continuous casting into moulds having walls formed by moving rolls B22D 11/06); Sequence of operations in milling trains; Layout of rolling-mill plant, e.g. grouping of stands; Succession of passes or of sectional pass alternations	1/0805	• • {Flat bars, i.e. having a substantially rectangular cross-section}
		2001/081	• • {Roughening or texturing surfaces of structural sections, bars, rounds, wire rods}
		1/0815	• • {from flat-rolled products, e.g. by longitudinal shearing}
		1/082	• • Piling sections having lateral edges specially adapted for interlocking with each other in order to build a wall
		1/085	• • Rail sections
		1/0855	• • • {Rerolling or processing worn or discarded rail sections}
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}	1/088	• • H- or I-sections
		1/0883	• • • {using forging or pressing devices}
		1/0886	• • • {using variable-width rolls}
2001/022	• • {Blooms or billets}	1/09	• • L-sections
1/024	• • {Forging or pressing (forging or pressing devices as units B21B 15/0035)}	1/092	• • T-sections
1/026	• • {Rolling}	1/095	• • U- or channel sections
2001/028	• • {Slabs}	1/098	• • Z-sections
1/04	• • in a continuous process	1/10	• • in a single two-high or universal rolling mill {stand (B21B 1/085 - B21B 1/098 take precedence)}
1/06	• • in a non-continuous process {, e.g. triplet mill, reversing mill}	1/12	• • in a continuous process {, i.e. without reversing stands (B21B 1/085 - B21B 1/098 take precedence)}
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)	1/14	• • in a non-continuous process {, i.e. at least one reversing stand (B21B 1/085 - B21B 1/098 take precedence)}

1/16	• for rolling {wire rods, bars, merchant bars, rounds} wire or material of like small cross-section	2003/008	• {Zinc or its alloys}
1/163	• • {Rolling or cold-forming of concrete reinforcement bars or wire (reinforcement bars per se E04C 5/03); Rolls therefor}	3/02	• Rolling special iron alloys {, e.g. stainless steel}
1/166	• • {Rolling wire into sections or flat ribbons}	5/00	Extending closed shapes of metal bands by rolling (manufacture of circular shapes, e.g. wheel rims, B21H 1/06)
1/18	• • in a continuous process	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
1/20	• • in a non-continuous process, (e.g. skew rolling, i.e. planetary cross rolling)	11/00	Subsidising the rolling process by subjecting rollers or work to vibrations, {e.g. ultrasonic vibrations}
1/22	• for rolling {plates, strips,} bands or sheets of indefinite length (B21B 1/42 takes precedence)	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; details, component parts, accessories, auxiliary means, procedures in connection with metal rolling, see the relevant groups)
2001/221	• • {by cold-rolling}	13/001	• {Convertible or tiltable stands, e.g. from duo to universal stands, from horizontal to vertical stands}
1/222	• • {in a rolling-drawing process; in a multi-pass mill}	2013/003	• {Inactive rolling stands}
1/224	• • {Edge rolling of flat products}	13/005	• {Cantilevered roll stands}
2001/225	• • {by hot-rolling}	2013/006	• {Multiple strand rolling mills; Mill stands with multiple caliber rolls}
1/227	• • {Surface roughening or texturing}	13/008	• {Skew rolling stands, e.g. for rolling rounds}
2001/228	• • {skin pass rolling or temper rolling}	13/02	• with axes of rolls arranged horizontally
1/24	• • in a continuous {or semi-continuous} process { (B21B 1/224 takes precedence)}	2013/021	• • {Twin mills}
1/26	• • • by hot-rolling {, e.g. Steckel hot mill}	13/023	• • {the axis of the rolls being other than perpendicular to the direction of movement of the product, e.g. cross-rolling}
1/265	• • • • {and by compressing or pushing the material in rolling direction}	2013/025	• • {Quarto, four-high stands}
1/28	• • • by cold-rolling {, e.g. Steckel cold mill}	2013/026	• • {Quinto, five high-stands}
1/30	• • in a non-continuous process { (B21B 1/224 takes precedence)}	2013/028	• • {Sixto, six-high stands}
1/32	• • • in reversing {single stand} mills, e.g. with intermediate storage reels for accumulating work	13/04	• • Three-high arrangement
1/34	• • • • by hot-rolling	13/06	• with axes of rolls arranged vertically {, e.g. edgers}
1/36	• • • • by cold-rolling	13/08	• with differently-directed roll axes, e.g. for the so-called "universal" rolling process
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)	13/10	• • all axes being arranged in one plane
2001/383	• • {Cladded or coated products}	13/103	• • • {for rolling bars, rods or wire}
2001/386	• • {Plates}	2013/106	• • • {for sections, e.g. beams, rails}
1/40	• for rolling foils which present special problems, e.g. because of thinness	13/12	• • axes being arranged in different planes
1/42	• for step-by-step or planetary rolling (making tubes by pilgrim-step rolling B21B 21/00)	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)
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)	13/142	• • {by axially shifting the rolls, e.g. rolls with tapered ends or with a curved contour for continuously-variable crown CVC}
1/463	• • {in a continuous process, i.e. the cast not being cut before rolling}	13/145	• • {Lateral support devices for rolls acting mainly in a direction parallel to the movement of the product}
1/466	• • {in a non-continuous process, i.e. the cast being cut before rolling}	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}
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)	13/16	• with alternatively operative rolls {, e.g. revolver stands, turret mills}
2003/001	• {Aluminium or its alloys}	13/18	• for step-by-step or planetary rolling; {pendulum mills} (methods B21B 1/42; making tubes by pilgrim-step rolling B21B 21/00)
3/003	• {Rolling non-ferrous metals immediately subsequent to continuous casting, i.e. in-line rolling}	13/20	• • for planetary rolling
2003/005	• {Copper or its alloys}		
2003/006	• {Powder metal alloys}		

13/22	<ul style="list-style-type: none"> 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) 	19/16	<ul style="list-style-type: none"> Rolling tubes without additional rollers arranged inside the tubes
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	21/00	Pilgrim-step tube-rolling {, i.e. pilger mills}
15/0007	<ul style="list-style-type: none"> {Cutting or shearing the product} 	21/005	<ul style="list-style-type: none"> {with reciprocating stand, e.g. driving the stand}
2015/0014	<ul style="list-style-type: none"> {transversely to the rolling direction} 	21/02	<ul style="list-style-type: none"> Rollers therefor
2015/0021	<ul style="list-style-type: none"> {in the rolling direction} 	21/04	<ul style="list-style-type: none"> Pilgrim-step feeding mechanisms (B21B 21/06 takes precedence)
2015/0028	<ul style="list-style-type: none"> {Drawing the rolled product} 	21/045	<ul style="list-style-type: none"> {for reciprocating stands}
15/0035	<ul style="list-style-type: none"> {Forging or pressing devices as units} 	21/06	<ul style="list-style-type: none"> Devices for revolving work between the steps
15/0042	<ul style="list-style-type: none"> {Tool changers} 	21/065	<ul style="list-style-type: none"> {for reciprocating stands}
15/005	<ul style="list-style-type: none"> {Lubricating, cooling or heating means} 	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)
2015/0057	<ul style="list-style-type: none"> {Coiling the rolled product} 	2023/005	<ul style="list-style-type: none"> {Roughening or texturing surfaces of tubes}
2015/0064	<ul style="list-style-type: none"> {Uncoiling the rolled product} 	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}
2015/0071	<ul style="list-style-type: none"> {Levelling the rolled product} 	25/02	<ul style="list-style-type: none"> Guides, supports, or abutments for mandrels, e.g. carriages {or steadiers}; Adjusting devices for mandrels
2015/0078	<ul style="list-style-type: none"> {Extruding the rolled product} 	25/04	<ul style="list-style-type: none"> Cooling or lubricating mandrels during operation
15/0085	<ul style="list-style-type: none"> {Joining ends of material to continuous strip, bar or sheet} 	25/06	<ul style="list-style-type: none"> Interchanging mandrels {, fixing plugs on mandrel rods or cooling during interchanging mandrels (separating tubes from mandrels B21C 45/00)}
2015/0092	<ul style="list-style-type: none"> {Welding in the rolling direction} 	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
15/02	<ul style="list-style-type: none"> in which work is subjected to permanent internal twisting, e.g. for producing reinforcement bars for concrete 	27/005	<ul style="list-style-type: none"> {Rolls with a roughened or textured surface; Methods for making same}
<u>Rolling methods or mills specially designed for making or processing tubes (control of tube rolling B21B 37/78)</u>		27/02	<ul style="list-style-type: none"> 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})
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	27/021	<ul style="list-style-type: none"> {Rolls for sheets or strips}
17/02	<ul style="list-style-type: none"> with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length} (B21B 17/08 takes precedence) 	2027/022	<ul style="list-style-type: none"> {Rolls having tapered ends}
17/04	<ul style="list-style-type: none"> in a continuous process 	27/024	<ul style="list-style-type: none"> {Rolls for bars, rods, rounds, tubes, wire or the like}
17/06	<ul style="list-style-type: none"> in a discontinuous process 	27/025	<ul style="list-style-type: none"> {Skew rolls}
17/08	<ul style="list-style-type: none"> with mandrel having one or more protrusions {, i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills} 	27/027	<ul style="list-style-type: none"> {Vertical rolls}
17/10	<ul style="list-style-type: none"> in a continuous process 	27/028	<ul style="list-style-type: none"> {Variable-width rolls}
17/12	<ul style="list-style-type: none"> in a discontinuous process {, e.g. plug-rolling mills} 	27/03	<ul style="list-style-type: none"> Sleeved rolls {(B21B 27/028 takes precedence)}
17/14	<ul style="list-style-type: none"> without mandrel {, e.g. stretch-reducing mills} 	27/032	<ul style="list-style-type: none"> {Rolls for sheets or strips}
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)	27/035	<ul style="list-style-type: none"> {Rolls for bars, rods, rounds, tubes, wire or the like}
19/02	<ul style="list-style-type: none"> 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} 	27/037	<ul style="list-style-type: none"> {Skew rolls}
19/04	<ul style="list-style-type: none"> Rolling basic material of solid, i.e. non-hollow, structure; Piercing {, e.g. rotary piercing mills} 	27/05	<ul style="list-style-type: none"> with deflectable sleeves
19/06	<ul style="list-style-type: none"> Rolling hollow basic material, {e.g. Assel mills} (B21B 19/04 takes precedence; separating work from mandrel B21C 45/00) 	27/055	<ul style="list-style-type: none"> {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)}
19/08	<ul style="list-style-type: none"> Enlarging tube diameter 	27/06	<ul style="list-style-type: none"> Lubricating, cooling or heating rolls
19/10	<ul style="list-style-type: none"> Finishing, e.g. smoothing, sizing {, reeling} 	27/08	<ul style="list-style-type: none"> internally
19/12	<ul style="list-style-type: none"> the axes of the rollers being arranged essentially parallel to the axis of the work 	2027/083	<ul style="list-style-type: none"> {cooling internally}
19/14	<ul style="list-style-type: none"> Rolling tubes by means of additional rollers arranged inside the tubes 	2027/086	<ul style="list-style-type: none"> {heating internally}

27/10	. . externally	31/32	. . . by liquid pressure {, e.g. hydromechanical adjusting}
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)	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}
28/02	. Maintaining rolls in effective condition, e.g. reconditioning	2033/005	. {Cobble-freeing}
28/04	. . while in use, e.g. polishing {or grinding while the rolls are in their stands}	33/02	. Preventing fracture of rolls
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)}	35/00	Drives for metal-rolling mills {, e.g. hydraulic drives}
31/00	Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames	2035/005	. {Hydraulic drive motors}
31/02	. Rolling stand frames {or housings}; Roll mountings {; Roll chocks}	35/02	. for continuously-operating mills (B21B 35/10 , B21B 35/12 take precedence)
2031/021	. . {Integral tandem mill housings}	35/025	. . {for stretch-reducing of tubes}
2031/023	. . {Transverse shifting one housing}	35/04	. . each stand having its own motor or motors
2031/025	. . {Shifting the stand in or against the rolling direction}	35/06	. for non-continuously-operating mills or for single stands (B21B 35/10 , B21B 35/12 take precedence)
2031/026	. . {Transverse shifting the stand}	35/08	. . for reversing rolling mills
31/028	. . {Prestressing of rolls or roll mountings in stand frames}	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
31/04	. . with tie rods {in frameless stands}, e.g. prestressed tie rods	2035/103	. . {Fluid-driven rolls or rollers}
31/06	. . Fastening stands or frames to foundation, e.g. to the sole plate (in general F16M)	2035/106	. . {Non-driven or idler rolls or rollers}
31/07	. Adaptation of roll {neck} bearings (bearings in general F16C)	35/12	. Toothed-wheel gearings specially adapted for metal-rolling mills; Housings or mountings therefor
2031/072	. . {Bearing materials}	35/14	. Couplings, driving spindles, or spindle carriers specially adapted for, or specially arranged in, metal-rolling mills (couplings or shafts in general F16)
31/074	. . {Oil film bearings, e.g. "Morgoil" bearings}	35/141	. . {Rigid spindle couplings, e.g. coupling boxes placed on roll necks (rigid couplings in general F16D 1/00)}
31/076	. . {Cooling; Lubricating roller bearings}	35/142	. . {Yielding spindle couplings; Universal joints for spindles (yielding couplings in general F16D 3/00)}
31/078	. . {Sealing devices (sealings in general F16J 15/00)}	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)}
31/08	. Interchanging rolls, roll mountings, or stand frames {, e.g. using C-hooks; Replacing roll chocks on roll shafts}	35/144 {Wobbler couplings}
31/10	. . by horizontally displacing {, i.e. horizontal roll changing}	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)}
31/103	. . . {Manipulators or carriages therefor}	35/146 {Tongue and slipper joints (tongue and slipper joints in general F16D 3/265)}
31/106	. . . {Vertical displacement of rolls or roll chocks during horizontal roll changing}	35/147	. . {Lubrication of spindle couplings}
31/12	. . by vertically displacing	35/148	. . {Spindle carriers or balancers}
31/14	. . by pivotally displacing	2035/149	. . {Measuring devices for spindles or couplings}
31/16	. Adjusting {or positioning} rolls (control devices B21B 37/00)	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)
31/18	. . by moving rolls axially		
31/185	. . . {and by crossing rolls}	2037/002	. {Mass flow control}
31/20	. . by moving rolls perpendicularly to roll axis	37/005	. {Control of time interval or spacing between workpieces}
31/203	. . . {Balancing rolls}	37/007	. {Control for preventing or reducing vibration, chatter or chatter marks (B21B 37/66 takes precedence)}
2031/206	. . . {Horizontal offset of work rolls}	37/16	. Control of thickness, width, diameter or other transverse dimensions (B21B 37/58 takes precedence)
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		

37/165	. . {responsive mainly to the measured thickness of the product}	38/08	. for measuring roll-force
37/18	. . Automatic gauge control	38/10	. for measuring roll-gap, e.g. pass indicators
37/20	. . . in tandem mills	38/105	. . {Calibrating or presetting roll-gap}
37/22	. . Lateral spread control; Width control, e.g. by edge rolling	38/12	. for measuring roll camber
37/24	. . Automatic variation of thickness according to a predetermined programme	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)
37/26	. . . for obtaining one strip having successive lengths of different constant thickness		
37/28	. Control of flatness or profile during rolling of strip, sheets or plates		
37/30	. . using roll camber control	39/002	. {Piling, unpling, unscrambling}
37/32	. . . by cooling, heating or lubricating the rolls	39/004	. {Transverse moving}
37/34	. . . by hydraulic expansion of the rolls	39/006	. {Pinch roll sets}
37/36	. . . by radial displacement of the roll sleeve on a stationary roll beam by means of hydraulic supports	39/008	. {Rollers for roller conveyors (roller-ways in general B65G 13/00 , B21B 39/00)}
37/38	. . using roll bending (B21B 37/42 takes precedence)	39/02	. Feeding or supporting work; Braking or tensioning arrangements {, e.g. threading arrangements }
37/40	. . using axial shifting of the rolls (B21B 37/42 takes precedence)	39/04	. . Lifting or lowering work for conveying purposes, e.g. tilting tables arranged immediately in front of or behind the pass (turn-over or like manipulating means as such B21B 39/20)
37/42	. . using a combination of roll bending and axial shifting of the rolls		
37/44	. . using heating, lubricating or water-spray cooling of the product	39/06	. . Pushing or forcing work into pass
37/46	. Roll speed or drive motor control (B21B 37/52 , B21B 37/60 take precedence)	39/08	. . Braking or tensioning arrangements
37/48	. Tension control; Compression control	39/082	. . . {Bridle devices}
37/50	. . by looper control	39/084	. . . {Looper devices}
37/52	. . by drive motor control	39/086	. . . {Braking devices}
37/54	. . . including coiler drive control, e.g. reversing mills	39/088	. . . {Bumpers, stopping devices}
37/56	. Elongation control	39/10	. . Arrangement or installation of feeding rollers in rolling stands
37/58	. Roll-force control; Roll-gap control {(B21B 38/105 takes precedence)}	39/12	. . Arrangement or installation of roller tables in relation to a roll stand
37/60	. . by control of a motor which drives an adjusting screw	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)
37/62	. . by control of a hydraulic adjusting device	39/16	. . immediately before entering or after leaving the pass
37/64	. . Mill spring or roll spring compensation systems, e.g. control of prestressed mill stands	39/165	. . . {Guides or guide rollers for rods, bars, rounds, tubes (B21B 39/28 takes precedence); Aligning guides}
37/66	. . Roll eccentricity compensation systems		
37/68	. Camber or steering control for strip, sheets or plates, e.g. preventing meandering	39/18	. . Switches for directing work in metal-rolling mills or trains
37/70	. Length control (B21B 37/56 takes precedence)	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)
37/72	. Rear end control; Front end control		
37/74	. Temperature control, e.g. by cooling or heating the rolls or the product (B21B 37/32 , B21B 37/44 take precedence)	39/22	. . by tipping, e.g. by lifting one side by levers or wedges (B21B 39/26 , B21B 39/28 take precedence)
37/76	. . Cooling control on the run-out table		
37/78	. Control of tube rolling	39/223	. . . {Side-guard manipulators}
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)}	39/226	. . . {Tilttable ingot chairs}
2038/002	. {Measuring axial forces of rolls}	39/24	. . by tongs or grippers
2038/004	. {Measuring scale thickness}	39/26	. . by members, e.g. grooved, engaging opposite sides of the work and moved relatively to each other to revolve the work
38/006	. {for measuring temperature}		
38/008	. {Monitoring or detecting vibration, chatter or chatter marks}	39/28	. . by means of guide members shaped to revolve the work during its passage
38/02	. for measuring flatness or profile of strips	39/30	. . by lodging it in a rotating ring manipulator or ring segment manipulator
38/04	. for measuring thickness, width, diameter or other transverse dimensions of the product	39/32	. . Devices specially adapted for turning sheets
38/06	. for measuring tension or compression		

39/34	<ul style="list-style-type: none"> 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 	45/0224	<ul style="list-style-type: none"> ... {for wire, rods, rounds, bars (B21B 45/023, B21B 45/0233 take precedence)}
41/00	Guiding, conveying, or accumulating easily-flexible work, e.g. wire, sheet metal bands, in loops or curves; Loop lifters	2045/0227	<ul style="list-style-type: none"> ... {for tubes}
41/02	<ul style="list-style-type: none"> Returning work to repeat the pass or passes {within the same stand} 	45/023	<ul style="list-style-type: none"> ... {by immersion in a bath}
41/04	<ul style="list-style-type: none"> ... above or underneath the rolling stand or rolls 	45/0233	<ul style="list-style-type: none"> ... {Spray nozzles, Nozzle headers; Spray systems}
41/06	<ul style="list-style-type: none"> 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} 	2045/0236	<ul style="list-style-type: none"> ... {Laying heads for overlapping rings on cooling conveyor}
41/08	<ul style="list-style-type: none"> without overall change in the general direction of movement of the work 	45/0239	<ul style="list-style-type: none"> ... {Lubricating}
41/10	<ul style="list-style-type: none"> ... Loop deflectors {(B21B 39/084 takes precedence)} 	45/0242	<ul style="list-style-type: none"> ... {Lubricants}
41/12	<ul style="list-style-type: none"> Arrangements of interest only with respect to provision for indicating or controlling operations 	45/0245	<ul style="list-style-type: none"> ... {Lubricating devices}
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)	45/0248	<ul style="list-style-type: none"> ... {using liquid lubricants, e.g. for sections, for tubes}
43/003	<ul style="list-style-type: none"> {Transfer to bed} 	45/0251	<ul style="list-style-type: none"> ... {for strips, sheets, or plates}
43/006	<ul style="list-style-type: none"> {Transfer from bed} 	2045/0254	<ul style="list-style-type: none"> ... {for structural sections, e.g. H-beams}
43/02	<ul style="list-style-type: none"> Cooling beds comprising rakes {racks, walking beams} or bars (B21B 43/10 takes precedence) 	45/0257	<ul style="list-style-type: none"> ... {for wire, rods, rounds, bars}
43/04	<ul style="list-style-type: none"> Cooling beds comprising rolls or worms 	2045/026	<ul style="list-style-type: none"> ... {for tubes}
43/06	<ul style="list-style-type: none"> Cooling beds comprising carriages (B21B 43/08 takes precedence) 	45/0263	<ul style="list-style-type: none"> ... {using solid lubricants}
43/08	<ul style="list-style-type: none"> Cooling beds comprising revolving drums or recycling chains {or discs} 	45/0266	<ul style="list-style-type: none"> ... {Measuring or controlling thickness of liquid films}
43/10	<ul style="list-style-type: none"> Cooling beds with other work-shifting elements projecting through the bed 	45/0269	<ul style="list-style-type: none"> ... {Cleaning}
43/12	<ul style="list-style-type: none"> Devices for positioning workpieces "flushed", i.e. with all their axial ends arranged in line on cooling beds or on co-operating conveyors {, e.g. before cutting} 	45/0272	<ul style="list-style-type: none"> ... {Cleaning compositions}
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)	45/0275	<ul style="list-style-type: none"> ... {Cleaning devices}
45/002	<ul style="list-style-type: none"> {Increasing friction between work and working rolls by using friction increasing substance} 	45/0278	<ul style="list-style-type: none"> ... {removing liquids}
45/004	<ul style="list-style-type: none"> {Heating the product} 	45/0281	<ul style="list-style-type: none"> ... {removing coolants}
2045/006	<ul style="list-style-type: none"> ... {in vacuum or in inert atmosphere} 	45/0284	<ul style="list-style-type: none"> ... {removing lubricants}
45/008	<ul style="list-style-type: none"> {Heat shields} 	45/0287	<ul style="list-style-type: none"> ... {removing solid particles, e.g. dust, rust}
45/02	<ul style="list-style-type: none"> 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)} 	45/029	<ul style="list-style-type: none"> ... {Liquid recovering devices}
45/0203	<ul style="list-style-type: none"> ... {Cooling} 	45/0293	<ul style="list-style-type: none"> ... {Recovering coolants}
45/0206	<ul style="list-style-type: none"> ... {Coolants} 	45/0296	<ul style="list-style-type: none"> ... {Recovering lubricants}
45/0209	<ul style="list-style-type: none"> ... {Cooling devices, e.g. using gaseous coolants} 	45/04	<ul style="list-style-type: none"> for de-scaling {, e.g. by brushing (descaling of rod or wire B21C 43/04)}
2045/0212	<ul style="list-style-type: none"> ... {using gaseous coolants} 	45/06	<ul style="list-style-type: none"> ... of strip material (B21B 45/08 takes precedence)
45/0215	<ul style="list-style-type: none"> ... {using liquid coolants, e.g. for sections, for tubes} 	45/08	<ul style="list-style-type: none"> ... hydraulically
45/0218	<ul style="list-style-type: none"> ... {for strips, sheets, or plates (B21B 45/023, B21B 45/0233 take precedence)} 	47/00	Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal (soaking pits C21D 9/70)
2045/0221	<ul style="list-style-type: none"> ... {for structural sections, e.g. H-beams} 	47/02	<ul style="list-style-type: none"> for folding sheets before rolling
		47/04	<ul style="list-style-type: none"> for separating layers after rolling
		99/00	Subject matter not provided for in other groups of this subclass
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2201/00	Special rolling modes		
2201/02	<ul style="list-style-type: none"> Austenitic rolling 		
2201/04	<ul style="list-style-type: none"> Ferritic rolling 		
2201/06	<ul style="list-style-type: none"> Thermomechanical rolling 		
2201/08	<ul style="list-style-type: none"> Batch rolling 		
2201/10	<ul style="list-style-type: none"> Endless rolling 		
2201/12	<ul style="list-style-type: none"> Isothermic rolling 		
2201/14	<ul style="list-style-type: none"> Soft reduction 		
2201/16	<ul style="list-style-type: none"> Two-phase or mixed-phase rolling 		
2201/18	<ul style="list-style-type: none"> Vertical rolling pass lines 		
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Equipment codes			
2203/00	Auxiliary arrangements, devices or methods in combination with rolling mills or rolling methods		
2203/02	<ul style="list-style-type: none"> Backlash elimination 		
2203/04	<ul style="list-style-type: none"> Brakes 		

2203/06	. Cassettes	2265/08	. . Back or outlet tension
2203/08	. Clutches	2265/10	. Compression, e.g. longitudinal compression
2203/10	. Counterweights	2265/12	. Rolling load or rolling pressure; roll force
2203/12	. Covers or shieldings	2265/14	. Reduction rate
2203/14	. Dummy bars or slabs	2265/16	. . Extension
2203/16	. Eccentrics	2265/18	. Elongation
2203/18	. Rolls or rollers	2265/20	. Slip
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	. Motors, drives	2267/065	. . . Top and bottom roll have different diameters; Asymmetrical rolling
2203/28	. Mounting or dismounting bearing and chock as a unit	2267/08	. . Roll eccentricity
2203/30	. Quick or bayonet couplings	2267/10	. Roughness of roll surface
2203/32	. Roll changing stools	2267/12	. Roll temperature
2203/34	. Rotational position or alignment	2267/18	. Roll crown; roll profile
2203/36	. Spacers	2267/19	. . Thermal crown
2203/38	. Strain gauges	2267/20	. . Ground camber or profile
2203/40	. Torsion bars or shafts	2267/22	. . Hydraulic expansion of rolls
2203/42	. Turntables	2267/24	. Roll wear
2203/44	. Vibration dampers	2267/26	. Hardness of the roll surface
		2267/28	. Elastic moduli of rolls
2205/00	Particular shaped rolled products		
2205/02	. Tailored blanks	2269/00	Roll bending or shifting
2205/04	. Taper- or wedge-shaped profiles	2269/02	. Roll bending; vertical bending of rolls
		2269/04	. . Work roll bending
2261/00	Product parameters	2269/06	. . Intermediate roll bending
2261/02	. Transverse dimensions	2269/08	. . Back-up roll bending
2261/04	. . Thickness, gauge	2269/10	. Horizontal bending of rolls
2261/043	. . . Blanks with variable thickness in the rolling direction	2269/12	. Axial shifting the rolls
2261/046	. . . Different thickness in width direction	2269/14	. . Work rolls
2261/05	. . . Different constant thicknesses in one rolled product	2269/16	. . Intermediate rolls
2261/06	. . Width	2269/18	. . Back-up rolls
2261/065	. . . Blanks with variable width		
2261/08	. . Diameter	2271/00	Mill stand parameters
2261/10	. . Cross-sectional area	2271/02	. Roll gap, screw-down position, draft position
2261/12	. Length	2271/025	. . Tapered roll gap
2261/14	. Roughness	2271/04	. . Screw-down speed, draft speed
2261/18	. Weight	2271/06	. Mill spring
2261/20	. Temperature		
2261/21	. . Temperature profile	2273/00	Path parameters
2261/22	. Hardness	2273/02	. Vertical deviation, e.g. slack, looper height
		2273/04	. Lateral deviation, meandering, camber of product
2263/00	Shape of product	2273/06	. Threading
2263/02	. Profile, e.g. of plate, hot strip, sections	2273/08	. . Threading-in or before threading-in
2263/04	. Flatness	2273/10	. . Threading-out or after threading-out
2263/06	. . Edge waves	2273/12	. End of product
2263/08	. . Centre buckles	2273/14	. . Front end or leading end
2263/10	. Lateral spread defects	2273/16	. . Tail or rear end
2263/12	. . Dog bone	2273/18	. Presence of product
2263/16	. Alligating	2273/20	. Track of product
2263/20	. End shape; fish tail; tongue	2273/22	. Aligning on rolling axis, e.g. of roll calibers
2263/30	. Shape in top view	2273/24	. Web positioning
2265/00	Forming parameters	2275/00	Mill drive parameters
2265/02	. Tension	2275/02	. Speed
2265/04	. . Front or inlet tension	2275/04	. . Roll speed
2265/06	. . Interstand tension	2275/05	. . . Speed difference between top and bottom rolls
		2275/06	. . Product speed
		2275/08	. . Coiler speed
		2275/10	. Motor power; motor current

2275/12 . . Roll torque