

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.

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	1/0815	. . {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}
		1/088	. . H- or I-sections
		1/0883	. . . {using forging or pressing devices}
		1/0886	. . . {using variable-width rolls}
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}	1/09	. . L-sections
		1/092	. . T-sections
		1/095	. . U-or channel sections
		1/098	. . Z-sections
2001/022	. . {Blooms or billets}	1/10	. . in a single two-high or universal rolling mill {stand (B21B 1/085 - B21B 1/098 take precedence)}
1/024	. . {Forging or pressing (forging or pressing devices as units B21B 15/0035)}		
1/026	. . {Rolling}	1/12	. . in a continuous process {, i.e. without reversing stands (B21B 1/085 - B21B 1/098 take precedence)}
2001/028	. . {Slabs}		
1/04	. . in a continuous process	1/14	. . in a non-continuous process {, i.e. at least one reversing stand (B21B 1/085 - B21B 1/098 take precedence)}
1/06	. . in a non-continuous process {, e.g. triplet mill, reversing mill}		
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)	1/16	. for rolling {wire rods, bars, merchant bars, rounds} wire or material of like small cross-section
1/0805	. . {Flat bars, i.e. having a substantially rectangular cross-section}	1/163	. . {Rolling or cold-forming of concrete reinforcement bars or wire (reinforcement bars per se E04C 5/03); Rolls therefor}
2001/081	. . {Roughening or texturing surfaces of structural sections, bars, rounds, wire rods}	1/166	. . {Rolling wire into sections or flat ribbons}
		1/18	. . in a continuous process

B21B

- 1/20 . . in a non-continuous process,(e.g. skew rolling, i.e. planetary cross rolling)
- 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 mill}
- 1/224 . . {Edge rolling of flat products}
- 2001/225 . . {by hot-rolling}
- 1/227 . . {Surface roughening or texturing}
- 2001/228 . . {skin pass rolling or temper rolling}
- 1/24 . . in a continuous {or semi-continuous} process {([B21B 1/224 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 {([B21B 1/224 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} ([B21B 1/40 takes precedence](#); [folding sheets before, or separating layers after, rolling B21B 47/00](#))
- 2001/383 . . {Cladded or coated products}
- 2001/386 . . {Plates}
- 1/40 . for rolling foils which present special problems, e.g. because of thinness
- 1/42 . for step-by-step or planetary rolling ([making tubes by pilgrim-step rolling B21B 21/00](#))
- 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](#))
- 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 [C21D](#), [C22F](#))**
- 2003/001 . {Aluminium or its alloys}
- 3/003 . {Rolling non-ferrous metals immediately subsequent to continuous casting, i.e. in-line 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, [B21H 1/06](#))**
- 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](#); details, component parts, accessories, auxiliary means, procedures in connection with metal rolling, [see the relevant groups](#))**
- 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 . . {Sexto, six-high stands}
- 13/04 . . Three-high arrangement
- 13/06 . with axes of rolls arranged vertically {, e.g. edgers}
- 13/08 . with differently-directed roll axes, e.g. for the so-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 . 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](#))
- 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 . with alternatively operative rolls {, e.g. revolver stands, turret mills}
- 13/18 . for step-by-step or planetary rolling; {pendulum mills} ([methods B21B 1/42](#); [making tubes by pilgrim-step rolling B21B 21/00](#))
- 13/20 . . for planetary rolling
- 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](#))

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	21/04	• Pilgrim-step feeding mechanisms (B21B 21/06 takes precedence)
15/0007	• {Cutting or shearing the product}	21/045	• • {for reciprocating stands}
2015/0014	• • {transversely to the rolling direction}	21/06	• Devices for revolving work between the steps
2015/0021	• • {in the rolling direction}	21/065	• • {for reciprocating stands}
2015/0028	• {Drawing the rolled product}	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)
15/0035	• {Forging or pressing devices as units}	2023/005	• {Roughening or texturing surfaces of tubes}
15/0042	• • {Tool changers}	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}
15/005	• • {Lubricating, cooling or heating means}	25/02	• Guides, supports, or abutments for mandrels, e.g. carriages {or steadiers}; Adjusting devices for mandrels
2015/0057	• {Coiling the rolled product}	25/04	• Cooling or lubricating mandrels during operation
2015/0064	• {Uncoiling the rolled product}	25/06	• Interchanging mandrels {, fixing plugs on mandrel rods or cooling during interchanging mandrels (separating tubes from mandrels B21C 45/00)}
2015/0071	• {Levelling the rolled product}	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
2015/0078	• {Extruding the rolled product}	27/005	• {Rolls with a roughened or textured surface; Methods for making same}
15/0085	• {Joining ends of material to continuous strip, bar or sheet}	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})
2015/0092	• {Welding in the rolling direction}	27/021	• • {Rolls for sheets or strips}
15/02	• in which work is subjected to permanent internal twisting, e.g. for producing reinforcement bars for concrete	2027/022	• • • {Rolls having tapered ends}
<u>Rolling methods or mills specially designed for making or processing tubes (control of tube rolling B21B 37/78)</u>		27/024	• • {Rolls for bars, rods, rounds, tubes, wire or the like}
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	27/025	• • • {Skew rolls}
17/02	• with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length} (B21B 17/08 takes precedence)	27/027	• • {Vertical rolls}
17/04	• • in a continuous process	27/028	• • {Variable-width rolls}
17/06	• • in a discontinuous process	27/03	• • Sleeved rolls {(B21B 27/028 takes precedence)}
17/08	• with mandrel having one or more protrusions {, i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills}	27/032	• • • {Rolls for sheets or strips}
17/10	• • in a continuous process	27/035	• • • {Rolls for bars, rods, rounds, tubes, wire or the like}
17/12	• • in a discontinuous process {, e.g. plug-rolling mills}	27/037	• • • • {Skew rolls}
17/14	• without mandrel {, e.g. stretch-reducing mills}	27/05	• • • with deflectable sleeves
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)	27/055	• • • • {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)}
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}	27/06	• Lubricating, cooling or heating rolls
19/04	• • Rolling basic material of solid, i.e. non-hollow, structure; Piercing {, e.g. rotary piercing mills}	27/08	• • internally
19/06	• • Rolling hollow basic material, {e.g. Assel mills} (B21B 19/04 takes precedence; separating work from mandrel B21C 45/00)	2027/083	• • • {cooling internally}
19/08	• • • Enlarging tube diameter	2027/086	• • • {heating internally}
19/10	• • • Finishing, e.g. smoothing, sizing {, reeling}	27/10	• • externally
19/12	• the axes of the rollers being arranged essentially parallel to the axis of the work	2027/103	• • • {cooling externally}
19/14	• • Rolling tubes by means of additional rollers arranged inside the tubes	27/106	• • • {Heating the rolls}
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		

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	2037/002	. {Mass flow control}
31/185	. . . {and by crossing rolls}	37/005	. {Control of time interval or spacing between workpieces}
31/20	. . by moving rolls perpendicularly to roll axis	37/007	. {Control for preventing or reducing vibration, chatter or chatter marks (B21B 37/66 takes precedence)}
31/203	. . . {Balancing rolls}	37/16	. Control of thickness, width, diameter or other transverse dimensions (B21B 37/58 takes precedence)
2031/206	. . . {Horizontal offset of work rolls}	37/165	. . {responsive mainly to the measured thickness of the product}
31/22	. . . mechanically {, e.g. by thrust blocks, inserts for removal}	37/18	. . Automatic gauge control
31/24	. . . . by screws	37/20	. . . in tandem mills
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}		

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
37/26	. . . for obtaining one strip having successive lengths of different constant thickness		(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)
37/28	. Control of flatness or profile during rolling of strip, sheets or plates		
37/30	. . using roll camber control		
37/32	. . . by cooling, heating or lubricating the rolls	39/002	. {Piling, unpiling, unscrambling}
37/34	. . . by hydraulic expansion of the rolls	39/004	. {Transverse moving}
37/36	. . . by radial displacement of the roll sleeve on a stationary roll beam by means of hydraulic supports	39/006	. {Pinch roll sets}
		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	39/18	. . Switches for directing work in metal-rolling mills or trains
37/68	. Camber or steering control for strip, sheets or plates, e.g. preventing meandering	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)
37/70	. Length control (B21B 37/56 takes precedence)	39/22	. . by tipping, e.g. by lifting one side by levers or wedges (B21B 39/26 , B21B 39/28 take precedence)
37/72	. Rear end control; Front end control	39/223	. . . {Side-guard manipulators}
37/74	. Temperature control, e.g. by cooling or heating the rolls or the product (B21B 37/32 , B21B 37/44 take precedence)	39/226	. . . {Tiltable ingot chairs}
37/76	. . Cooling control on the run-out table	39/24	. . by tongs or grippers
37/78	. Control of tube rolling	39/26	. . by members, e.g. grooved, engaging opposite sides of the work and moved relatively to each other to revolve the work
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)}	39/28	. . by means of guide members shaped to revolve the work during its passage
2038/002	. {Measuring axial forces of rolls}	39/30	. . by lodging it in a rotating ring manipulator or ring segment manipulator
2038/004	. {Measuring scale thickness}	39/32	. . Devices specially adapted for turning sheets
38/006	. {for measuring temperature}	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
38/008	. {Monitoring or detecting vibration, chatter or chatter marks}		
38/02	. for measuring flatness or profile of strips		
38/04	. for measuring thickness, width, diameter or other transverse dimensions of the product		
38/06	. for measuring tension or compression		
38/08	. for measuring roll-force		
38/10	. for measuring roll-gap, e.g. pass indicators		
38/105	. . {Calibrating or presetting roll-gap}		

41/00	Guiding, conveying, or accumulating easily-flexible work, e.g. wire, sheet metal bands, in loops or curves; Loop lifters	45/0233	. . . . . {Spray nozzles, Nozzle headers; Spray systems}
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 turned through approximately 180 degrees, {e.g. repeaters, i.e. from one stand to another}	45/0242	. . . {Lubricants}
41/08	. without overall change in the general direction of movement of the work	45/0245	. . . {Lubricating devices}
41/10	. . Loop deflectors {(B21B 39/084 takes precedence)}	45/0248	. . . . {using liquid lubricants, e.g. for sections, for tubes}
41/12	. Arrangements of interest only with respect to provision for indicating or controlling operations	45/0251	. . . . . {for strips, sheets, or plates}
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)	2045/0254	. . . . . {for structural sections, e.g. H-beams}
43/003	. {Transfer to bed}	45/0257	. . . . . {for wire, rods, rounds, bars}
43/006	. {Transfer from bed}	2045/026	. . . . . {for tubes}
43/02	. Cooling beds comprising rakes {racks, walking beams} or bars (B21B 43/10 takes precedence)	45/0263	. . . . {using solid lubricants}
43/04	. Cooling beds comprising rolls or worms	45/0266	. . {Measuring or controlling thickness of liquid films}
43/06	. Cooling beds comprising carriages (B21B 43/08 takes precedence)	45/0269	. . {Cleaning}
43/08	. Cooling beds comprising revolving drums or recycling chains {or discs}	45/0272	. . . {Cleaning compositions}
43/10	. Cooling beds with other work-shifting elements projecting through the bed	45/0275	. . . {Cleaning devices}
43/12	. 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}	45/0278	. . . . . {removing liquids}
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)	45/0281	. . . . . {removing coolants}
45/002	. {Increasing friction between work and working rolls by using friction increasing substance}	45/0284	. . . . . {removing lubricants}
45/004	. {Heating the product}	45/0287	. . . . . {removing solid particles, e.g. dust, rust}
2045/006	. . {in vacuum or in inert atmosphere}	45/029	. . . {Liquid recovering devices}
45/008	. {Heat shields}	45/0293	. . . . {Recovering coolants}
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)}	45/0296	. . . . {Recovering lubricants}
45/0203	. . {Cooling}	45/04	. for de-scaling {, e.g. by brushing (descaling of rod or wire B21C 43/04)}
45/0206	. . . {Coolants}	45/06	. . of strip material (B21B 45/08 takes precedence)
45/0209	. . . {Cooling devices, e.g. using gaseous coolants}	45/08	. . hydraulically
2045/0212	. . . . {using gaseous coolants}	47/00	Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal (soaking pits C21D 9/70)
45/0215	. . . . {using liquid coolants, e.g. for sections, for tubes}	47/02	. for folding sheets before rolling
45/0218	. . . . . {for strips, sheets, or plates (B21B 45/023, B21B 45/0233 take precedence)}	47/04	. for separating layers after rolling
2045/0221	. . . . . {for structural sections, e.g. H-beams}	99/00	Subject matter not provided for in other groups of this subclass
45/0224	. . . . . {for wire, rods, rounds, bars (B21B 45/023, B21B 45/0233 take precedence)}	<hr/>	
2045/0227	. . . . . {for tubes}	2201/00	Special rolling modes
45/023	. . . . . {by immersion in a bath}	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	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	2267/00	Roll parameters
2203/20	. Flywheels	2267/02	. Roll dimensions
2203/22	. Hinged chocks	2267/06	. . Roll diameter
2203/24	. Hydrostatic bearings or guides	2267/065	. . . Top and bottom roll have different diameters; Asymmetrical rolling
2203/26	. Motors, drives	2267/08	. . Roll eccentricity
2203/28	. Mounting or dismounting bearing and chock as a unit	2267/10	. Roughness of roll surface
2203/30	. Quick or bayonet couplings	2267/12	. Roll temperature
2203/32	. Roll changing stools	2267/18	. Roll crown; roll profile
2203/34	. Rotational position or alignment	2267/19	. . Thermal crown
2203/36	. Spacers	2267/20	. . Ground camber or profile
2203/38	. Strain gauges	2267/22	. . Hydraulic expansion of rolls
2203/40	. Torsion bars or shafts	2267/24	. Roll wear
2203/42	. Turntables	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	. Roll bending; vertical bending of rolls
2205/04	. Taper- or wedge-shaped profiles	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	2271/00	Mill stand parameters
2261/08	. . Diameter	2271/02	. Roll gap, screw-down position, draft position
2261/10	. . Cross-sectional area	2271/025	. . Tapered roll gap
2261/12	. Length	2271/04	. . Screw-down speed, draft speed
2261/14	. Roughness	2271/06	. Mill spring
2261/18	. Weight	2273/00	Path parameters
2261/20	. Temperature	2273/02	. Vertical deviation, e.g. slack, looper height
2261/21	. . Temperature profile	2273/04	. Lateral deviation, meandering, camber of product
2261/22	. Hardness	2273/06	. Threading
2263/00	Shape of product	2273/08	. . Threading-in or before threading-in
2263/02	. Profile, e.g. of plate, hot strip, sections	2273/10	. . Threading-out or after threading-out
2263/04	. Flatness	2273/12	. End of product
2263/06	. . Edge waves	2273/14	. . Front end or leading end
2263/08	. . Centre buckles	2273/16	. . Tail or rear end
2263/10	. Lateral spread defects	2273/18	. Presence of product
2263/12	. . Dog bone	2273/20	. Track of product
2263/16	. Alligatoring	2273/22	. Aligning on rolling axis, e.g. of roll calibers
2263/20	. End shape; fish tail; tongue	2273/24	. Web positioning
2263/30	. Shape in top view	2275/00	Mill drive parameters
2265/00	Forming parameters	2275/02	. Speed
2265/02	. Tension	2275/04	. . Roll speed
2265/04	. . Front or inlet tension	2275/05	. . . Speed difference between top and bottom rolls
2265/06	. . Interstand tension	2275/06	. . Product speed
2265/08	. . Back or outlet tension	2275/08	. . Coiler speed
2265/10	. Compression, e.g. longitudinal compression	2275/10	. Motor power; motor current
2265/12	. Rolling load or rolling pressure; roll force	2275/12	. . Roll torque
2265/14	. Reduction rate		
2265/16	. . Extension		