COOPERATIVE PATENT CLASSIFICATION

B PERFORMING OPERATIONS; TRANSPORTING
(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 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
1/02 . for rolling heavy work, e.g. ingots, slabs [, blooms]
billets, in which the cross-sectional form is
unimportant [Rolling combined with forging or
pressing]

2001/022 . . . {Blooms or billets}
1/024 . . . {Forging or pressing (forging or pressing devices
as units B21B 15/0035)}
1/026 . . . {Rolling}
2001/028 . . . {Slabs}
1/04 . . . in a continuous process
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)
1/0805 . . . {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]
1/088 . . . H- or I-sections
1/0883 . . . {using forging or pressing devices}
1/0886 . . . {using variable-width rolls}
1/09 . . . L-sections
1/092 . . . T-sections
1/095 . . . U- or channel sections
1/098 . . . Z-sections
1/10 . . . in a single two-high or universal rolling
mill {stand (B21B 1/085 - B21B 1/098 take
precedence)}
1/12 . . . in a continuous process [, i.e. without reversing
stands (B21B 1/085 - B21B 1/098 take
precedence)}
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
1/163 . . . {Rolling or cold-forming of concrete
reinforcement bars or wire (reinforcement bars
per se E04C 5/03); Rolls therefor]
1/166 . . . {Rolling wire into sections or flat ribbons}
1/18 . . . in a continuous process
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 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 1/24 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 1/24 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

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 . . . (Sixto, 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 rolling acts 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 thereof 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

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 . . . (Leveling 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

Rolling methods or mills specially designed for making or processing tubes (control of tube rolling B21B 37/78)

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

17/02 . . with mandrel, {i.e. the mandrel rod contacts the rolled tube over the rod length} (B21B 17/08 takes precedence)
17/04 . . . in a continuous process
17/06 . . . in a discontinuous process
17/08 . . with mandrel having one or more protrusions {, i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills}
17/10 . . . in a continuous process
17/12 . . . in a discontinuous process {, e.g. plug-rolling mills}
17/14 . . . without mandrel {, e.g. stretch-reducing mills}

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)

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}
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} (B21B 19/04 takes precedence; separating work from mandrel B21C 45/00)
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)

23/005 . . . [Roughening or texturizing 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 B21C 45/00)
Rolling methods or mills specially designed for making or processing tubes

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

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 some under load, e.g. backing rolls (B21B 37/38)

31/00 Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames

31/02 . . Rolling stand frames [or housings]; Roll mountings [B21B 38/00]

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 F16M)

31/07 . . Adaptation of roll [neck] bearings (bearings in general F16C)

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 F16J)]

31/08 . . Interchanging rolls, roll mountings, or stand frames [e.g. using C-hooks; Replacing roll chocks on roll shafts]

31/10 . . by horizontally displacing [, i.e. horizontal roll changing]

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 B21B 37/00)

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 F16P; Breaker blocks; Devices for freeing jammed rolls [for handling cobbles; Overload safety devices)

2033/005 . . . . [Cobble-freeing]

33/02 . . Preventing fracture of rolls

35/00 Drives for metal-rolling mills [, e.g. hydraulic drives]

2035/005 . . . . [Hydraulic drive motors]

35/02 . . for continuously-operating mills (B21B 35/10, B21B 35/12 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 (B21B 35/10, B21B 35/12 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 slidable-interengaging teeth, e.g. gear-type couplings (universal joints with the coupling parts having slidable-interengaging teeth, in general, F16D 3/18)]

35/144 . . . . . . [Wobbler couplings]

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)]

35/146 . . . . . . [Tongue and slipper joints (tongue and slipper joints in general F16D 3/265)]

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 B21B 38/00)

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 (B21B 37/66 takes precedence)]

37/16 . . . . Control of thickness, width, diameter or other transverse dimensions (B21B 37/58 takes precedence)

37/165 . . . . [responsive mainly to the measured thickness of the product]

37/18 . . . . Automatic gauge control

37/20 . . . . . . in tandem mills
Rolling methods or mills specially designed for making or processing tubes

37/22 Lateral spread control; Width control, e.g. by edge rolling
37/24 Automatic variation of thickness according to a predetermined programme
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
37/32 by cooling, heating or lubricating the rolls
37/34 by hydraulic expansion of the rolls
37/36 by radial displacement of the roll sleeve on a stationary roll beam by means of hydraulic supports
37/38 using roll bending (B21B 37/42 takes precedence)
37/40 using axial shifting of the rolls (B21B 37/42 takes precedence)
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
37/46 Roll speed or drive motor control (B21B 37/52, B21B 37/60 take precedence)
37/48 Tension control; Compression control
37/50 by looper control
37/52 by drive motor control
37/54 including coiler drive control, e.g. reversing mills
37/56 Elongation control
37/58 Roll-force control; Roll-gap control (B21B 38/105 takes precedence)
37/60 by control of a motor which drives an adjusting screw
37/62 by control of a hydraulic adjusting device
37/64 Mill spring or roll spring compensation systems, e.g. control of prestressed mill stands
37/66 Roll eccentricity compensation systems
37/68 Camber or steering control for strip, sheets or plates, e.g. preventing meandering
37/70 Length control (B21B 37/56 takes precedence)
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)
37/76 Cooling control on the run-out table
37/78 Control of tube rolling

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))

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

38/12 for measuring roll camber

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)

39/002 Piling, unpinning, unscrambling
39/004 Transverse moving
39/006 Pinch roll sets
39/008 Rollers for roller conveyors (roller-ways in general B65G 13/00, B21B 39/00)

39/02 Feeding or supporting work; Braking or tensioning arrangements, e.g. threading arrangements
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)
39/06 Pushing or forcing work into pass
39/08 Braking or tensioning arrangements
39/082 Bridle devices
39/084 Looper devices
39/086 Braking devices
39/088 Bumpers, stopping devices
39/10 Arrangement or installation of feeding rollers in rolling stands
39/12 Arrangement or installation of roller tables in relation to a roll stand
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)
39/16 immediately before entering or after leaving the pass
39/165 Guides or guide rollers for rods, bars, rounds, tubes (B21B 39/28 takes precedence); Aligning guides
39/18 Switches for directing work in metal-rolling mills or trains
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)
39/22 by tipping, e.g. by lifting one side by levers or wedges (B21B 39/26, B21B 39/28 take precedence)

39/223 Side-guard manipulators
39/226 Tiltable ingot chairs
39/24 by tongs or grippers
39/26 by members, e.g. grooved, engaging opposite sides of the work and moved relatively to each other to revolve the work
39/28 by means of guide members shaped to revolve the work during its passage
39/30 by lodging it in a rotating ring manipulator or ring segment manipulator
39/32 Devices specially adapted for turning sheets
39/34 Arrangements or constructonal combinations specifically designed to perform functions covered by more than one of groups B21B 39/02, B21B 39/14, B21B 39/20
Rolling methods or mills specially designed for making or processing tubes

41/00 Guiding, conveying, or accumulating easily-flexible work, e.g. wire, sheet metal bands, in loops or curves; Loop lifters
41/02 . Returning work to repeat the pass or passes {within the same stand}
41/04 . above or underneath the rolling stand or rolls
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]
41/08 . without overall change in the general direction of movement of the work
41/10 . Loop deflectors (B21B 39/084 takes precedence)
41/12 . Arrangements of interest only with respect to provision for indicating or controlling operations

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)
43/003 . [Transfer to bed]
43/006 . [Transfer from bed]
43/02 . Cooling beds comprising rakes [racks, walking beams] or bars (B21B 43/10 takes precedence)
43/04 . Cooling beds comprising rolls or worms
43/06 . Cooling beds comprising carriages (B21B 43/08 takes precedence)
43/08 . Cooling beds comprising revolving drums or recycling chains [or discs]
43/10 . Cooling beds with other work-shifting elements projecting through the bed
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]

45/00 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
45/002 . [Increasing friction between work and working rolls by using friction increasing substance]
45/004 . [Heating the product]
45/006 . [in vacuum or in inert atmosphere]
45/008 . [Heat shields]
45/02 . for lubricating, cooling, or cleaning {in particular in combination with forging or pressing devices B21B 15/0005, control of flatness or profile using lubricating or cooling B21B 37/44}
45/0203 . [Cooling]
45/0206 . [Coolants]
45/0209 . [Cooling devices, e.g. using gaseous coolants]
45/0212 . [using gaseous coolants]
45/0215 . [using liquid coolants, e.g. for sections, for tubes]
45/0218 . . . . [for strips, sheets, or plates (B21B 45/023, B21B 45/0233 take precedence)]
45/0221 . . . . [for structural sections, e.g. H-beams]
45/0224 . . . . [for wire, rods, rounds, bars (B21B 45/023, B21B 45/0233 take precedence)]
45/0227 . . . . [for tubes]
45/023 . . . . [by immersion in a bath]

45/0233 . . . . [Spray nozzles, Nozzle headers; Spray systems]
2045/0236 . . [Laying heads for overlapping rings on cooling conveyors]
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]
45/0289 . . . . [Liquid recovering devices]
45/0293 . . . . [Recovering coolants]
45/0296 . . . . [Recovering lubricants]
45/04 . . . . . . . . . . . . [for de-scaling, e.g. by brushing (de-scaling of rod or wire B21C 43/04)]
45/05 . . . . . . . . . . . . [of strip material (B21B 45/08 takes precedence)]
45/08 . . . . . . . . . . . . [hydraulically]
47/00 Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal (soaking pits C21D 9/70)
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
Equipment codes

2203/16 . Eccentrics
2203/18 . Rolls or rollers
2203/182 . Fluid driven rolls or rollers
2203/185 . Reversible rolls for changing grooves
2203/187 . Tilting rolls
2203/20 . Flywheels
2203/22 . Hinged chocks
2203/24 . Hydrostatic bearings or guides
2203/26 . Motors, drives
2203/28 . Mounting or dismounting bearing and chock as a unit
2203/30 . Quick or bayonet couplings
2203/32 . Roll changing stools
2203/34 . Rotational position or alignment
2203/36 . Spacers
2203/38 . Strain gauges
2203/40 . Torsion bars or shafts
2203/42 . Turntables
2203/44 . Vibration dampers

2205/00 Particular shaped rolled products
2205/02 . Tailored blanks
2205/04 . Taper- or wedge-shaped profiles

2261/00 Product parameters
2261/02 . Transverse dimensions
2261/04 . Thickness, gauge
2261/043 . . Blanks with variable thickness in the rolling direction
2261/046 . . Different thickness in width direction
2261/05 . . Different constant thicknesses in one rolled product
2261/06 . . Width
2261/065 . . Blanks with variable width
2261/08 . . Diameter
2261/10 . . Cross-sectional area
2261/12 . . Length
2261/14 . . Roughness
2261/18 . . Weight
2261/20 . . Temperature
2261/21 . . Temperature profile
2261/22 . . Hardness

2263/00 Shape of product
2263/02 . Profile, e.g. of plate, hot strip, sections
2263/04 . Flatness
2263/06 . . Edge waves
2263/08 . . Centre buckles
2263/10 . . Lateral spread defects
2263/12 . . Dog bone
2263/16 . . Alligating
2263/20 . . End shape; fish tail; tongue
2263/30 . . Shape in top view

2265/00 Forming parameters
2265/02 . . Tension
2265/04 . . Front or inlet tension
2265/06 . . Interstand tension
2265/08 . . Back or outlet tension
2265/10 . . Compression, e.g. longitudinal compression
2265/12 . . Rolling load or rolling pressure; roll force
2265/14 . . Reduction rate
2265/16 . . Extension

2265/18 . . Elongation
2265/20 . . Slip
2265/22 . . Pass schedule
2265/24 . . asymmetric rolling

2267/00 Roll parameters
2267/02 . . Roll dimensions
2267/06 . . Roll diameter
2267/065 . . . Top and bottom roll have different diameters; Asymmetrical rolling
2267/08 . . . Roll eccentricity
2267/10 . . . Roughness of roll surface
2267/12 . . . Roll temperature
2267/18 . . . Roll crown; roll profile
2267/19 . . . Thermal crown
2267/20 . . . Ground camber or profile
2267/22 . . . Hydraulic expansion of rolls
2267/24 . . . Roll wear
2267/26 . . . Hardness of the roll surface
2267/28 . . . Elastic moduli of rolls

2269/00 Roll bending or shifting
2269/02 . . Roll bending; vertical bending of rolls
2269/04 . . Work roll bending
2269/06 . . Intermediate roll bending
2269/08 . . Back-up roll bending
2269/10 . . Horizontal bending of rolls
2269/12 . . Axial shifting the rolls
2269/14 . . Work rolls
2269/16 . . Intermediate rolls
2269/18 . . Back-up rolls

2271/00 Mill stand parameters
2271/02 . . Roll gap, screw-down position, draft position
2271/025 . . Tapered roll gap
2271/04 . . Screw-down speed, draft speed
2271/06 . . Mill spring

2273/00 Path parameters
2273/02 . . Vertical deviation, e.g. slack, looper height
2273/04 . . Lateral deviation, meandering, camber of product
2273/06 . . Threading
2273/08 . . Threading-in or before threading-in
2273/10 . . Threading-out or after threading-out
2273/12 . . End of product
2273/14 . . Front end or leading end
2273/16 . . Tail or rear end
2273/18 . . Presence of product
2273/20 . . Track of product
2273/22 . . Aligning on rolling axis, e.g. of roll calibers
2273/24 . . Web positioning

2275/00 Mill drive parameters
2275/02 . . Speed
2275/04 . . Roll speed
2275/05 . . . Speed difference between top and bottom rolls
2275/06 . . Product speed
2275/08 . . Cooler speed
2275/10 . . Motor power; motor current
2275/12 . . Roll torque