

CPC 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 | 1/0815 | . . {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)} | 1/12 | . . in a continuous process {, i.e. without reversing stands (B21B 1/085 - B21B 1/098 take precedence)} |
| 1/026 | . . {Rolling} | 1/14 | . . in a non-continuous process {, i.e. at least one reversing stand (B21B 1/085 - B21B 1/098 take precedence)} |
| 2001/028 | . . {Slabs} | 1/16 | . for rolling {wire rods, bars, merchant bars, rounds} wire or material of like small cross-section |
| 1/04 | . . in a continuous process | 1/163 | . . {Rolling or cold-forming of concrete reinforcement bars or wire (reinforcement bars per se E04C 5/03); Rolls therefor} |
| 1/06 | . . in a non-continuous process {, e.g. triplet mill, reversing mill} | 1/166 | . . {Rolling wire into sections or flat ribbons} |
| 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) | 1/18 | . . in a continuous process |
| 1/0805 | . . {Flat bars, i.e. having a substantially rectangular cross-section} | 1/20 | . . in a non-continuous process, (e.g. skew rolling, i.e. planetary cross rolling) |
| 2001/081 | . . {Roughening or texturing surfaces of structural sections, bars, rounds, wire rods} | | |

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

| | | | |
|---|---|--------------|--|
| 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 (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 | | |
| 37/32 | . . . by cooling, heating or lubricating the rolls | 39/002 | . {Piling, unpling, 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} |
| 37/38 | . . using roll bending (B21B 37/42 takes precedence) | 39/008 | . {Rollers for roller conveyors (roller-ways in general B65G 13/00 , B21B 39/00)} |
| 37/40 | . . using axial shifting of the rolls (B21B 37/42 takes precedence) | 39/02 | . Feeding or supporting work; Braking or tensioning arrangements {, e.g. threading arrangements} |
| 37/42 | . . using a combination of roll bending and axial shifting of the rolls | 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) |
| 37/44 | . . 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) | 39/06 | . . Pushing or forcing work into pass |
| 37/48 | . Tension control; Compression control | 39/08 | . . Braking or tensioning arrangements |
| 37/50 | . . by looper control | 39/082 | . . . {Bridle devices} |
| 37/52 | . . by drive motor control | 39/084 | . . . {Looper devices} |
| 37/54 | . . . including coiler drive control, e.g. reversing mills | 39/086 | . . . {Braking devices} |
| 37/56 | . Elongation control | 39/088 | . . . {Bumpers, stopping devices} |
| 37/58 | . Roll-force control; Roll-gap control {(B21B 38/105 takes precedence)} | 39/10 | . . Arrangement or installation of feeding rollers in rolling stands |
| 37/60 | . . by control of a motor which drives an adjusting screw | 39/12 | . . Arrangement or installation of roller tables in relation to a roll stand |
| 37/62 | . . by control of a hydraulic adjusting device | 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) |
| 37/64 | . . Mill spring or roll spring compensation systems, e.g. control of prestressed mill stands | 39/16 | . . immediately before entering or after leaving the pass |
| 37/66 | . . Roll eccentricity compensation systems | 39/165 | . . . {Guides or guide rollers for rods, bars, rounds, tubes (B21B 39/28 takes precedence); Aligning guides} |
| 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 | 39/223 | . . . {Side-guard manipulators} |
| 37/78 | . Control of tube rolling | 39/226 | . . . {Tilttable ingot chairs} |
| 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)} | 39/24 | . . by tongs or grippers |
| 2038/002 | . {Measuring axial forces of rolls} | 39/26 | . . by members, e.g. grooved, engaging opposite sides of the work and moved relatively to each other to revolve the work |
| 2038/004 | . {Measuring scale thickness} | | |
| 38/006 | . {for measuring temperature} | 39/28 | . . by means of guide members shaped to revolve the work during its passage |
| 38/008 | . {Monitoring or detecting vibration, chatter or chatter marks} | 39/30 | . . by lodging it in a rotating ring manipulator or ring segment manipulator |
| 38/02 | . for measuring flatness or profile of strips | 39/32 | . . Devices specially adapted for turning sheets |
| 38/04 | . for measuring thickness, width, diameter or other transverse dimensions of the product | 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 |
| 38/06 | . 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)} | | |
| 2045/0227 | {for tubes} | | |
| 45/023 | {by immersion in a bath} | | |
| | | 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 shielings |
| | | 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 | | |