

ECLA**EUROPEAN CLASSIFICATION****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 [B23K20/04](#))

Note

[C9409] 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.

B21B1/00

Metal-rolling methods or mills for making semi-finished products of solid or profiled cross-section ([B21B17/00](#) to [B21B23/00](#) take precedence; with respect to composition of material to be rolled [B21B3/00](#); extending closed shapes of metal bands by simultaneous rolling at two or more zones [B21B5/00](#); metal-rolling stands as units [B21B13/00](#); continuous casting into moulds having walls formed by moving rolls [B22D11/06](#)); **Sequence of operations in milling trains; Layout of rolling-mill plant, e.g. grouping of stands; Succession of passes or of sectional pass alternations**

B21B1/02

- . for rolling heavy work, e.g. ingots, slabs, [N: blooms] billets, in which the cross-sectional form is unimportant [N: Rolling combined with forging or pressing]

B21B1/02F

- . . [N: Forging or pressing (forging or pressing devices as units [B21B15/00F](#))]

B21B1/02R

- . . [N: Rolling]

B21B1/04

- . . in a continuous process

B21B1/06

- . . in a non-continuous process, [N: e.g. triplet mill, reversing mill]

B21B1/08

- . for rolling [N: 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 [B21H8/00](#)) [C0606]

B21B1/08C

- . . [N: Flat bars, i.e. having a substantially rectangular cross-section]

B21B1/08F

- . . [N: from flat-rolled products, e.g. by longitudinal shearing]

B21B1/082

- . . Piling sections having lateral edges specially adapted for interlocking with each other in order to build a wall [N0606]

B21B1/085

- . . Rail sections [N0606]

B21B1/085R

- . . . [N: Rerolling or processing worn or discarded rail sections] [N0606]

B21B1/088

- . . H- or I-sections [N0606]

B21B1/088F

- . . . [N: using forging or pressing devices] [N0606]

B21B1/088V

- . . . [N: using variable-width rolls] [N0606]

B21B1/09

- . . L-sections [N0606]

B21B1/092

- . . T-sections [N0606]

B21B1/095

- . . U-or channel sections [N0606]

B21B1/098

- . . Z-sections [N0606]

[N: **WARNING** [N0803]

Groups [B21B1/098](#) is not complete. See also other subgroups of [B21B1/08](#)]

- B21B1/10 . . in a single two-high or universal rolling mill [N: stand ([B21B1/08B](#) to [B21B1/08U](#) take precedence)]
- B21B1/12 . . in a continuous process, [N: i.e. without reversing stands ([B21B1/08B](#) to [B21B1/08U](#) take precedence)]
- B21B1/14 . . in a non-continuous process, [N: i.e. at least one reversing stand ([B21B1/08B](#) to [B21B1/08U](#) take precedence)]
- B21B1/16 . for rolling [N: wire rods, bars, merchant bars, rounds] wire or material of like small cross-section
- B21B1/16B . . [N: Rolling or cold-forming of concrete reinforcement bars or wire (reinforcement bars per se [E04C5/03](#)); Rolls therefor]
- B21B1/16S . . [N: Rolling wire into sections or flat ribbons]
- B21B1/18 . . in a continuous process
- B21B1/20 . . in a non-continuous process, (e.g. skew rolling, i.e. planetary cross rolling)
- B21B1/22 . for rolling [N: plates, strips,] bands or sheets of indefinite length ([B21B1/42](#) takes precedence)
- B21B1/22D . . [N: in a rolling-drawing process; in a multi-pass mill]
- B21B1/22E . . [N: Edge rolling of flat products]
- B21B1/22R . . [N: Surface roughening or texturing]
- B21B1/24 . . in a continuous [N: or semi-continuous] process [N: ([B21B1/22E](#) takes precedence)]
- B21B1/26 . . . by hot-rolling, [N: e.g. Steckel hot mill]
- B21B1/26C [N: and by compressing or pushing the material in rolling direction]
- B21B1/28 . . . by cold-rolling, [N: e.g. Steckel cold mill]
- B21B1/30 . . in a non-continuous process [N: ([B21B1/22E](#) takes precedence)]
- B21B1/32 . . . in reversing [N: single stand] mills, e.g. with intermediate storage reels for accumulating work
- B21B1/34 by hot-rolling
- B21B1/36 by cold-rolling
- B21B1/38 . for rolling sheets of limited length, e.g. folded sheets, superimposed sheets, [N: pack rolling] ([B21B1/40](#) takes precedence; folding sheets before, or separating layers after, rolling [B21B47/00](#))
- B21B1/40 . for rolling foils which present special problems, e.g. because of thinness
- B21B1/42 . for step-by-step or planetary rolling (making tubes by pilgrim-step rolling [B21B21/00](#))
- B21B1/46 . for rolling metal immediately subsequent to continuous casting (metal-rolling stands [B21B13/22](#); continuous casting [B22D11/00](#), e.g. into moulds with rolls [B22D11/06](#))
- B21B1/46C . . [N: in a continuous process, i.e. the cast not being cut before rolling]
- B21B1/46N . . [N: in a non-continuous process, i.e. the cast being cut before rolling]
- B21B3/00** **Rolling materials of special alloys so far as the composition of the alloy requires or permits special rolling methods or sequences** [N: 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](#))

- B21B3/00C . [N: Rolling non-ferrous metals immediately subsequent to continuous casting, i.e. in-line rolling]
- B21B3/02 . Rolling special iron alloys, [N: e.g. stainless steel]
- B21B5/00** **Extending closed shapes of metal bands by rolling (manufacture of circular shapes, e.g. wheel rims, B21H1/06) [C0606]**
- B21B9/00** **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**
- B21B11/00** **Subsidising the rolling process by subjecting rollers or work to vibrations, [N: e.g. ultrasonic vibrations]**
- B21B13/00** **Metal-rolling stands, i.e. an assembly composed of a stand frame, rolls, and accessories(B21B17/00toB21B23/00take precedence; details, component parts, accessories, auxiliary means, procedures in connection with metal rolling, see the relevant groups) [C0606]**
- B21B13/00C . [N: Convertible or tiltable stands, e.g. from duo to universal stands, from horizontal to vertical stands] [C0606]
- B21B13/00F . [N: Cantilevered roll stands]
- B21B13/00S . [N: Skew rolling stands, e.g. for rolling rounds] [N0108]
- B21B13/02 . with axes of rolls arranged horizontally
- B21B13/02C . . [N: the axis of the rolls being other than perpendicular to the direction of movement of the product, e.g. cross-rolling]
- B21B13/04 . . Three-high arrangement
- B21B13/06 . with axes of rolls arranged vertically, [N: e.g. edgers]
- B21B13/08 . with differently-directed roll axes, e.g. for the so-called "universal" rolling process
- B21B13/10 . . all axes being arranged in one plane
- B21B13/10B . . . [N: for rolling bars, rods or wire]
- B21B13/12 . . axes being arranged in different planes
- B21B13/14 . having counter-pressure devices acting on rolls to inhibit deflection of same under load; [N: Back-up rolls] (counter-pressure devices as such B21B29/00) [C0606]
- B21B13/14A . . [N: by axially shifting the rolls, e.g. rolls with tapered ends or with a curved contour for continuously-variable crown CVC] [C0606]
- B21B13/14M . . [N: Lateral support devices for rolls acting mainly in a direction parallel to the movement of the product] [N0606]
- B21B13/14Z . . [N: 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]

- B21B13/16 . with alternatively operative rolls, [N: e.g. revolver stands, turret mills]
- B21B13/18 . for step-by-step or planetary rolling; [N: pendulum mills] (methods [B21B1/42](#); making tubes by pilgrim-step rolling [B21B21/00](#))
- B21B13/20 . . for planetary rolling
- B21B13/22 . for rolling metal immediately subsequent to continuous casting, [N: i.e. in-line rolling of steel] (methods therefor [B21B1/46](#); continuous casting [B22D11/00](#), e.g. into moulds with rolls [B22D11/06](#))

- B21B15/00** **Arrangements for performing additional metal-working operations specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills**

- B21B15/00C . [N: Cutting or shearing the product]
- B21B15/00F . [N: Forging or pressing devices as units]
- B21B15/00F5 . . [N: Tool changers]
- B21B15/00F6 . . [N: Lubricating, cooling or heating means]
- B21B15/00W . [N: Joining ends of material to continuous strip, bar or sheet]
- B21B15/02 . in which work is subjected to permanent internal twisting, e.g. for producing reinforcement bars for concrete

- Guide heading:** **Rolling methods or mills specially designed for making or processing tubes (control of tube rolling [B21B37/78](#)) [C9409]**

- B21B17/00** **Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling**

- B21B17/02 . with mandrel, [N: i.e. the mandrel rod contacts the rolled tube over the rod length] ([B21B17/08](#) takes precedence)
- B21B17/04 . . in a continuous process
- B21B17/06 . . in a discontinuous process
- B21B17/08 . with mandrel having one or more protrusions, [N: i.e. only the mandrel plugs contact the rolled tube; Press-piercing mills]
- B21B17/10 . . in a continuous process
- B21B17/12 . . in a discontinuous process, [N: e.g. plug-rolling mills]
- B21B17/14 . without mandrel, [N: e.g. stretch-reducing mills]

- B21B19/00** **Tube-rolling by rollers arranged outside the work and having their axes not perpendicular to the axis of the work (straightening by rollers [B21D](#))**

- B21B19/02 . the axes of the rollers being arranged essentially diagonally to the axis of the work, e.g. "cross" tube-rolling [N: Diescher mills, Stiefel disc piercers, Stiefel rotary piercers]

- B21B19/04
 - . . Rolling basic material of solid, i.e. non-hollow, structure; Piercing, [N: e.g. rotary piercing mills]
- B21B19/06
 - . . Rolling hollow basic material, [N: e.g. Assel mills] (B21B19/04 takes precedence; separating work from mandrel B21C45/00)
- B21B19/08
 - . . . Enlarging tube diameter
- B21B19/10
 - . . . Finishing, e.g. smoothing, sizing, [N: reeling]
- B21B19/12
 - . the axes of the rollers being arranged essentially parallel to the axis of the work
- B21B19/14
 - . . Rolling tubes by means of additional rollers arranged inside the tubes
- B21B19/16
 - . . Rolling tubes without additional rollers arranged inside the tubes
- B21B21/00**
Pilgrim-step tube-rolling, [N: i.e. pilger mills]
- B21B21/00B
 - . [N: with reciprocating stand, e.g. driving the stand]
- B21B21/02
 - . Rollers therefor
- B21B21/04
 - . Pilgrim-step feeding mechanisms (B21B21/06 takes precedence)
- B21B21/04B
 - . . [N: for reciprocating stands]
- B21B21/06
 - . Devices for revolving work between the steps
- B21B21/06B
 - . . [N: for reciprocating stands]
- B21B23/00**
Tube-rolling not restricted to methods provided for in only one of groups B21B17/00, B21B19/00, B21B21/00, e.g. combined processes [N: planetary tube rolling, auxiliary arrangements, e.g. lubricating, special tube blanks, continuous casting combined with tube rolling] (B21B25/00 takes precedence)
- B21B25/00**
Mandrels for metal tube rolling mills, e.g. mandrels of the types used in the methods covered by group B21B17/00; Accessories or auxiliary means therefor; [N: Construction of, or alloys for, mandrels or plugs]
- B21B25/02
 - . Guides, supports, or abutments for mandrels, e.g. carriages [N: or steadiers]; Adjusting devices for mandrels
- B21B25/04
 - . Cooling or lubricating mandrels during operation
- B21B25/06
 - . Interchanging mandrels, [N: fixing plugs on mandrel rods or cooling during interchanging mandrels (separating tubes from mandrels B21C45/00)]
- B21B27/00**
Rolls, [N: roll alloys or roll fabrication] (shape of working surfaces required by special processes B21B1/00); Lubricating, cooling or heating rolls while in use
- B21B27/00R
 - . [N: Rolls with a roughened or textured surface; Methods for making same]
- B21B27/02
 - . Shape or construction of rolls (for rolling metal of indefinite length in repetitive shapes specially designed for the manufacture of particular objects B21H8/02) [N: (B21B27/00R takes precedence)] [C0606]
- B21B27/02A
 - . . [N: Rolls for sheets or strips] [N0606]

- B21B27/02C . . [N: Rolls for bars, rods, rounds, tubes, wire or the like] [N0606]
- B21B27/02C2 . . . [N: Skew rolls] [N0606]
- B21B27/02G . . [N: Vertical rolls] [N0606]
- B21B27/02W . . [N: Variable-width rolls]
- B21B27/03 . . Sleeved rolls [N: (B21B27/02W takes precedence)] [C0606]
- B21B27/03A . . . [N: Rolls for sheets or strips] [N0606]
- B21B27/03C . . . [N: Rolls for bars, rods, rounds, tubes, wire or the like] [N0606]
- B21B27/03C2 [N: Skew rolls] [N0606]
- B21B27/05 . . . with deflectable sleeves
- B21B27/05D [N: with sleeves radially deflectable on a stationary beam by means of hydraulic supports (in general F16C13/00; for paper-making machines D21G1/00; regulating devices therefor B21B37/36)] [N0606]

- B21B27/06 . Lubricating, cooling or heating rolls
- B21B27/08 . . internally
- B21B27/10 . . externally
- B21B27/10H . . . [N: Heating the rolls]

- B21B28/00** **Maintaining rolls or rolling equipment in effective condition** (lubricating, cooling or heating rolls while in use [B21B27/06](#))

- B21B28/02 . Maintaining rolls in effective condition, e.g. reconditioning
- B21B28/04 . . while in use, e.g. polishing [N: or grinding while the rolls are in their stands]

- B21B29/00** **Counter-pressure devices acting on rolls to inhibit deflection of same under load, e.g. backing rolls;** [N: Roll bending devices, e.g. hydraulic actuators acting on roll shaft ends (control devices responsive to roll bending [B21B37/38](#))] [C9409]

- B21B31/00** **Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames**

- B21B31/02 . Rolling stand frames [N: or housings]; Roll mountings; [N: Roll chocks]
- B21B31/02V . . [N: Prestressing of rolls or roll mountings in stand frames]
- B21B31/04 . . with tie rods [N: in frameless stands], e.g. prestressed tie rods [C0606]
- B21B31/06 . . Fastening stands or frames to foundation, e.g. to the sole plate (in general [F16M](#))

- B21B31/07 . Adaptation of roll [N: neck] bearings (bearings in general [F16C](#))
- B21B31/07H . . [N: Oil film bearings, e.g. "Morgoil" bearings]
- B21B31/07K . . [N: Cooling; Lubricating roller bearings]
- B21B31/07S . . [N: Sealing devices (Sealings in general F16J15/00)] [C0606]

- B21B31/08 . Interchanging rolls, roll mountings, or stand frames, [N: e.g. using C-hooks; Replacing roll chocks on roll shafts]
- B21B31/10 . . by horizontally displacing, [N: i.e. horizontal roll changing]
- B21B31/10M . . . [N: Manipulators or carriages therefor]

B21B31/10V	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> [N: Vertical displacement of rolls or roll chocks during horizontal roll changing]
B21B31/12	<ul style="list-style-type: none"> <ul style="list-style-type: none"> by vertically displacing
B21B31/14	<ul style="list-style-type: none"> <ul style="list-style-type: none"> by pivotally displacing
B21B31/16	<ul style="list-style-type: none"> Adjusting [N: or positioning] rolls (control devices B21B37/00)
B21B31/18	<ul style="list-style-type: none"> <ul style="list-style-type: none"> by moving rolls axially
B21B31/18C	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> [N: and by crossing rolls] [N9605]
B21B31/20	<ul style="list-style-type: none"> <ul style="list-style-type: none"> by moving rolls perpendicularly to roll axis
B21B31/20B	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> [N: Balancing rolls]
B21B31/22	<ul style="list-style-type: none"> <ul style="list-style-type: none"> mechanically, [N: e.g. by thrust blocks, inserts for removal]
B21B31/24	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> by screws
B21B31/26	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> Adjusting eccentrically-mounted roll bearings
B21B31/28	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> by toggle-lever mechanisms
B21B31/30	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> by wedges or their equivalent
B21B31/32	<ul style="list-style-type: none"> <ul style="list-style-type: none"> by liquid pressure, [N: e.g. hydromechanical adjusting]
B21B33/00	Safety devices not otherwise provided for (safety devices in general F16P); Breaker blocks; Devices for freeing jammed rolls [N: for handling cobbles; Overload safety devices]
B21B33/02	<ul style="list-style-type: none"> Preventing fracture of rolls
B21B35/00	Drives for metal-rolling mills, [N: e.g. hydraulic drives]
B21B35/02	<ul style="list-style-type: none"> for continuously-operating mills (B21B35/10, B21B35/12 take precedence)
B21B35/02R	<ul style="list-style-type: none"> <ul style="list-style-type: none"> [N: for stretch-reducing of tubes]
B21B35/04	<ul style="list-style-type: none"> <ul style="list-style-type: none"> each stand having its own motor or motors
B21B35/06	<ul style="list-style-type: none"> for non-continuously-operating mills or for single stands (B21B35/10, B21B35/12 take precedence)
B21B35/08	<ul style="list-style-type: none"> <ul style="list-style-type: none"> for reversing rolling mills
B21B35/10	<ul style="list-style-type: none"> Driving arrangements for rolls which have only a low-power drive; Driving arrangements for rolls which receive power from the shaft of another roll
B21B35/12	<ul style="list-style-type: none"> Toothed-wheel gearings specially adapted for metal-rolling mills; Housings or mountings therefor
B21B35/14	<ul style="list-style-type: none"> Couplings, driving spindles, or spindle carriers specially adapted for, or specially arranged in, metal-rolling mills (couplings or shafts in general F16)
B21B35/14B	<ul style="list-style-type: none"> <ul style="list-style-type: none"> [N: Rigid spindle couplings, e.g. coupling boxes placed on roll necks (rigid couplings in general F16D1/00)]
B21B35/14C	<ul style="list-style-type: none"> <ul style="list-style-type: none"> [N: Yielding spindle couplings; Universal joints for spindles (yielding couplings in general F16D3/00)]
B21B35/14C2	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> [N: having slidably-interengaging teeth, e.g. gear-type couplings (universal joints with the coupling parts having slidably-interengaging teeth, in general, F16D3/18)]

- B21B35/14C2B [N: Wobbler couplings]
- B21B35/14C3 . . . [N: Hooke`s joints or the like with each coupling part pivoted with respect to an intermediate member(Hooke`s joints in generalF16D3/26)]
- B21B35/14C3B [N: Tongue and slipper joints (tongue and slipper joints in general F16D3/26B)]
- B21B35/14D . . [N: Lubrication of spindle couplings]
- B21B35/14E . . [N: Spindle carriers or balancers]

- B21B37/00** **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 B21B38/00) [C9409]**

- B21B37/00P . [N: Control of time interval or spacing between workpieces]
- B21B37/00V . [N: Control for preventing or reducing vibration, chatter or chatter marks (B21B37/66 takes precedence)] [N9605]

- B21B37/16 . Control of thickness, width, diameter or other transverse dimensions (B21B37/58 takes precedence) [N9409]
- B21B37/16D . . [N: responsive mainly to the measured thickness of the product] [N9409]
- B21B37/18 . . Automatic gauge control [N9409]
- B21B37/20 . . . in tandem mills [N9409]
- B21B37/22 . . Lateral spread control; Width control, e.g. by edge rolling [N9409]
- B21B37/24 . . Automatic variation of thickness according to a predetermined programme [N9409]
- B21B37/26 . . . for obtaining one strip having successive lengths of different constant thickness [N9409]

- B21B37/28 . Control of flatness or profile during rolling of strip, sheets or plates [N9409]
- B21B37/30 . . using roll camber control [N9409]
- B21B37/32 . . . by cooling, heating or lubricating the rolls [N9409]
- B21B37/34 . . . by hydraulic expansion of the rolls [N9409]
- B21B37/36 . . . by radial displacement of the roll sleeve on a stationary roll beam by means of hydraulic supports [N9409]
- B21B37/38 . . using roll bending (B21B37/42 takes precedence) [N9409]
- B21B37/40 . . using axial shifting of the rolls (B21B37/42 takes precedence) [N9409]
- B21B37/42 . . using a combination of roll bending and axial shifting of the rolls [N9409]
- B21B37/44 . . using heating, lubricating or water-spray cooling of the product [N9409]

- B21B37/46 . Roll speed or drive motor control (B21B37/52, B21B37/60 take precedence) [N9409]

- B21B37/48 . Tension control; Compression control [N9409]
- B21B37/50 . . by looper control [N9409]
- B21B37/52 . . by drive motor control [N9409]
- B21B37/54 . . . including coiler drive control, e.g. reversing mills [N9409]

- B21B37/56 . Elongation control [N9409]

- B21B37/58 . Roll-force control; Roll-gap control [N: (B21B38/10C takes precedence)] [N9409]

- B21B37/60 . . by control of a motor which drives an adjusting screw [N9409]
- B21B37/62 . . by control of a hydraulic adjusting device [N9409]
- B21B37/64 . . Mill spring or roll spring compensation systems, e.g. control of prestressed mill stands [N9409]
- B21B37/66 . . Roll eccentricity compensation systems [N9409]
- B21B37/68 . Camber or steering control for strip, sheets or plates, e.g. preventing meandering [N9409]
- B21B37/70 . Length control ([B21B37/56](#) takes precedence) [N9409]
- B21B37/72 . Rear end control; Front end control [N9409]
- B21B37/74 . Temperature control, e.g. by cooling or heating the rolls or the product ([B21B37/32](#), [B21B37/44](#) take precedence) [N9409]
- B21B37/76 . . Cooling control on the run-out table [N9409]
- B21B37/78 . Control of tube rolling [N9409]
- B21B38/00** **Methods or devices for measuring, [N: detecting or monitoring] specially adapted for metal-rolling mills, e.g. position detection, inspection of the product [N: (Control devices or methods [B21B37/00](#))] [N9409] [C9605]**
- B21B38/00T . [N: for measuring temperature] [N9409]
- B21B38/00V . [N: Monitoring or detecting vibration, chatter or chatter marks] [N9605]
- B21B38/02 . for measuring flatness or profile of strips [N9409]
- B21B38/04 . for measuring thickness, width, diameter or other transverse dimensions of the product [N9409]
- B21B38/06 . for measuring tension or compression [N9409]
- B21B38/08 . for measuring roll-force [N9409]
- B21B38/10 . for measuring roll-gap, e.g. pass indicators [N9409]
- B21B38/10C . . [N: Calibrating or presetting roll-gap] [N9409]
- B21B38/12 . for measuring roll camber [N9409]
- B21B39/00** **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 [B21B41/00](#); specially associated with cooling-beds [B21B43/00](#); conveying or transporting in general [B65G](#))**
- B21B39/00B . [N: Piling, unpiling, unscrambling]
- B21B39/00C . [N: Transverse moving]

- B21B39/00D . [N: Pinch roll sets] [C0606]
- B21B39/00F . [N: Rollers for roller conveyers (roller-ways in general B65G13/00, B21B39/00)]
- B21B39/02 . Feeding or supporting work; Braking or tensioning arrangements, [N: e.g. threading arrangements]
- B21B39/04 . . 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 B21B39/20)
- B21B39/06 . . Pushing or forcing work into pass
- B21B39/08 . . Braking or tensioning arrangements [C0606]
- B21B39/08A . . . [N: Bridle devices] [N0606]
- B21B39/08B . . . [N: Looper devices] [N0606]
- B21B39/08H . . . [N: Braking devices] [N0606]
- B21B39/08K . . . [N: Bumpers, stopping devices] [N0606]
- B21B39/10 . . Arrangement or installation of feeding rollers in rolling stands
- B21B39/12 . . Arrangement or installation of roller tables in relation to a roll stand
- B21B39/14 . Guiding, positioning or aligning work (B21B43/12 takes precedence; guides in which work is subjected to permanent internal twisting B21B15/02)
- B21B39/16 . . immediately before entering or after leaving the pass
- B21B39/16B . . . [N: Guides or guide rollers for rods, bars, rounds, tubes (B21B39/28 takes precedence); Aligning guides]
- B21B39/18 . . Switches for directing work in metal-rolling mills or trains
- B21B39/20 . Revolving, turning-over, or like manipulation of work, [N: e.g. revolving in trio stands] (guides in which work is subjected to permanent internal twisting B21B15/02) [C0606]
- B21B39/22 . . by tipping, e.g. by lifting one side by levers or wedges (B21B39/26, B21B39/28 take precedence)
- B21B39/22A . . . [N: Side-guard manipulators]
- B21B39/22B . . . [N: Tilttable ingot chairs]
- B21B39/24 . . by tongs or grippers
- B21B39/26 . . by members, e.g. grooved, engaging opposite sides of the work and moved relatively to each other to revolve the work
- B21B39/28 . . by means of guide members shaped to revolve the work during its passage
- B21B39/30 . . by lodging it in a rotating ring manipulator or ring segment manipulator
- B21B39/32 . . Devices specially adapted for turning sheets
- B21B39/34 . Arrangements or constructional combinations specifically designed to perform functions covered by more than one of groups B21B39/02, B21B39/14, B21B39/20 [C0606]
- B21B41/00 Guiding, conveying, or accumulating easily-flexible work, e.g. wire, sheet metal bands, in loops or curves; Loop lifters**
- B21B41/02 . Returning work to repeat the pass or passes [N: within the same stand]
- B21B41/04 . . above or underneath the rolling stand or rolls

- B21B41/06
 - . in which the direction of movement of the work is turned through approximately 180 degrees, [N: e.g. repeaters, i.e. from one stand to another]
- B21B41/08
 - . without overall change in the general direction of movement of the work
- B21B41/10
 - . . Loop deflectors [N: (B21B39/08B takes precedence)] [C0606]
- B21B41/12
 - . Arrangements of interest only with respect to provision for indicating or controlling operations
- B21B43/00**

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) [C9502]
- B21B43/00A
 - . [N: Transfer to bed]
- B21B43/00B
 - . [N: Transfer from bed]
- B21B43/02
 - . Cooling beds comprising rakes [N: racks, walking beams] or bars (B21B43/10 takes precedence)
- B21B43/04
 - . Cooling beds comprising rolls or worms
- B21B43/06
 - . Cooling beds comprising carriages (B21B43/08 takes precedence)
- B21B43/08
 - . Cooling beds comprising revolving drums or recycling chains [N: or discs]
- B21B43/10
 - . Cooling beds with other work-shifting elements projecting through the bed
- B21B43/12
 - . Devices for positioning workpieces "flushed", i.e. with all their axial ends arranged in line on cooling beds or on co-operating conveyers, [N: e.g. before cutting]
- B21B45/00**

Devices for surface [N: or other] treatment of work, specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills (B21B15/00, [N: B21B1/22R and B21B27/00R] take precedence; technical features of scaling-off devices B21C43/00)
- B21B45/00F
 - . [N: Increasing friction between work and working rolls by using friction increasing substance] [N9502]
- B21B45/00H
 - . [N: Heating the product]
- B21B45/00S
 - . [N: Heat shields]
- B21B45/02
 - . for lubricating, cooling, or cleaning [N: (in particular in combination with forging or pressing devices B21B15/00F6, control of flatness or profile using lubricating or cooling B21B37/44)] [C9502]
- B21B45/02C
 - . . [N: Cooling] [N9502]
- B21B45/02C2
 - . . . [N: Coolants] [N9502]
- B21B45/02C4
 - . . . [N: Cooling devices, e.g. using gaseous coolants] [N9502]
- B21B45/02C4L
 - [N: using liquid coolants, e.g. for sections, for tubes] [N9502]

B21B45/02C4L2	. . . . .	[N: for strips, sheets, or plates (B21B45/02C4L10 , B21B45/02C4L12 take precedence)] [N9502]
B21B45/02C4L6	. . . . .	[N: for wire, rods, rounds, bars (B21B45/02C4L10 , B21B45/02C4L12 take precedence)] [N9502]
B21B45/02C4L10	. . . . .	[N: by immersion in a bath] [N9502]
B21B45/02C4L12	. . . . .	[N: Spray nozzles, Nozzle headers; Spray systems] [N9502]
B21B45/02L	. .	[N: Lubricating] [N9502]
B21B45/02L2	. . .	[N: Lubricants] [N9502]
B21B45/02L4	. . .	[N: Lubricating devices] [N9502]
B21B45/02L4L	. . . .	[N: using liquid lubricants, e.g. for sections, for tubes] [N9502]
B21B45/02L4L2	. . . . .	[N: for strips, sheets, or plates] [N9502]
B21B45/02L4L6	. . . . .	[N: for wire, rods, rounds, bars] [N9502]
B21B45/02L4S	. . . .	[N: using solid lubricants] [N9502]
B21B45/02M	. .	[N: Measuring or controlling thickness of liquid films] [N9502]
B21B45/02R	. .	[N: Cleaning] [N9502]
B21B45/02R2	. . .	[N: Cleaning compositions] [N9502] [C9909]
B21B45/02R4	. . .	[N: Cleaning devices] [N9502]
B21B45/02R4L	. . . .	[N: removing liquids] [N9502]
B21B45/02R4L2	. . . . .	[N: removing coolants] [N9502]
B21B45/02R4L4	. . . . .	[N: removing lubricants] [N9502]
B21B45/02R4S	. . . .	[N: removing solid particles, e.g. dust, rust] [N9502]
B21B45/02R6	. . .	[N: Liquid recovering devices] [N9502]
B21B45/02R6C	. . . .	[N: Recovering coolants] [N9502]
B21B45/02R6L	. . . .	[N: Recovering lubricants] [N9502]
B21B45/04	. .	for de-scaling, [N: e.g. by brushing (descaling of rod or wire B21C43/04)]
B21B45/06	. .	of strip material (B21B45/08 takes precedence)
B21B45/08	. .	hydraulically
B21B47/00		Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal (soaking pits C21D9/70)
B21B47/02	. .	for folding sheets before rolling
B21B47/04	. .	for separating layers after rolling
B21B99/00		Subject matter not provided for in other groups of this subclass [N0704]