

SECTION B — PERFORMING OPERATIONS; TRANSPORTING

B23 MACHINE TOOLS; METAL-WORKING NOT OTHERWISE PROVIDED FOR

Note(s)

1. This class covers:
 - operations not provided for in any other class;
 - combinations of operations covered by different subclasses of classes B21-B24, which combinations are covered by subclass B23P, with the exception of subsidiary operations performed in conjunction with main operations covered by a single subclass;
 - features, specific to machine tools, which relate to a requirement or problem of a nature which is not peculiar to a particular kind of machine tool, e.g. feeding work, which are covered by subclass B23Q, although the realisation of these features may differ according to the kind of machine tool concerned. The said subclass covers such features, in general, even if the feature or a specific function, in any particular case, is to some extent peculiar to, or is claimed only for, machine tools designed for one particular operation; only in exceptional cases are such features classified in the subclass for the machine tool concerned. Certain features of this general nature are, however, referred to subclasses relating to particular metal-working operations, especially B23B, in which case the subclasses in question are not restricted, in respect of those features, to the kind of machine tool with which they are primarily concerned.
2. In this class, the following terms or expressions are used with the meanings indicated:
 - "metal-working" covers the working of other materials unless the context requires otherwise;
 - "kind of operations" and similar expressions relate to such metal-working operations as boring, drilling, milling and grinding;
 - "kind of machine" means a machine designed for a particular kind of metal-working operation (e.g. a lathe);
 - "form of machine" means a machine of a particular kind adapted or arranged for a particular way of working or for particular work, e.g. face-plate lathe, tailstock lathe, turret lathe;
 - "different machines" covers different forms of machines for performing the same type of metal-working operation, e.g. vertical and horizontal boring machines.
3. If details, components, or accessories have no essential feature specific to machine tools, the more general class, e.g. F16, takes precedence.

B23B TURNING; BORING (using an electrode which takes the place of a tool B23H, e.g. making holes B23H 9/14; working by laser beam B23K 26/00; arrangements for copying or controlling B23Q)

Subclass index

TURNING	
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hand-held machines.....	45/00
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DEVICES FOR ATTACHMENT TO ANY MACHINE TOOL.....	43/00

<u>Turning</u>	
1/00	Methods for turning or working essentially requiring the use of turning-machines; Use of auxiliary equipment in connection with such methods
3/00	General-purpose turning-machines or devices, e.g. centre lathes with feed rod and lead screw; Sets of turning-machines
3/02	• Small lathes, e.g. for toolmakers (specially designed for watchmakers G04D 3/00)
3/04	• Turning-machines in which the workpiece is rotated by means at a distance from the headstock
3/06	• Turning-machines or devices characterised only by the special arrangement of constructional units (B23Q 37/00 takes precedence; structural features of details, <i>see</i> the relevant groups; such features of general applicability B23Q)
3/08	• Turning-machines characterised by the use of faceplates
3/10	• • with the faceplate horizontal, i.e. vertical boring and turning machines
3/12	• • with the faceplate vertical, i.e. face lathes
3/14	• • Mountings or drives of faceplates
3/16	• Turret lathes for turning individually-chucked workpieces
3/18	• • with horizontal working-spindle
3/20	• • with vertical working-spindle
3/22	• Turning-machines or devices with rotary tool heads
3/24	• • the tools of which do not perform a radial movement; Rotary tool heads therefor
3/26	• • the tools of which perform a radial movement; Rotary tool heads thereof
3/28	• Turning-machines in which the feed is controlled by a copying device, i.e. copying lathes (features of copying devices B23Q 35/00)
3/30	• Turning-machines with two or more working-spindles, e.g. in fixed arrangement
3/32	• • for performing identical operations simultaneously on two or more workpieces
3/34	• Short turning-machines with one or multiple working-spindles attended from the end (B23B 3/12 takes precedence)
3/36	• Associations of only turning-machines directed to a particular metal-working result (if the metal-working result is not essential B23Q 39/00)
5/00	Turning-machines or devices specially adapted for particular work; Accessories specially adapted therefor
5/02	• for turning hubs or brake drums (B23B 5/04 takes precedence)
5/04	• for reconditioning hubs or brake drums or axle spindles without removing same from the vehicle
5/06	• for turning valves or valve bodies
5/08	• for turning axles, bars, rods, tubes, rolls, i.e. shaft-turning lathes, roll lathes; Centreless turning
5/10	• • for turning pilgrim rolls
5/12	• • for peeling bars or tubes by making use of cutting bits arranged around the workpiece (making use of cutting bits arranged around the workpiece otherwise than by turning B23D 79/12) [2]
5/14	• Cutting-off lathes (shearing B23D)
5/16	• for bevelling, chamfering, or deburring the ends of bars or tubes
5/18	• for turning crankshafts, eccentrics, or cams, e.g. crankpin lathes
5/20	• • without removing same from the engine
5/22	• • Holding the workpiece in the machine, e.g. chucking devices
5/24	• for turning pistons or other workpieces to a slightly non-circular cross-section
5/26	• for simultaneously turning internal and external surfaces of a body
5/28	• for turning wheels or wheel sets or cranks thereon, i.e. wheel lathes
5/30	• • Arrangements providing for tool control by templates
5/32	• • for reconditioning wheel sets without removing same from the vehicle; Underfloor wheel lathes for railway vehicles
5/34	• • Holding the workpiece in the machine, e.g. chucking devices therefor; Drivers therefor
5/36	• for turning specially-shaped surfaces by making use of relative movement of the tool and work produced by geometrical mechanisms, i.e. forming-lathes
5/38	• • for turning conical surfaces inside or outside, e.g. taper pins
5/40	• • for turning spherical surfaces inside or outside
5/42	• • for turning relieving surfaces, i.e. relieving-lathes
5/44	• • for turning polygonal or other non-circular surfaces controlled by gear or guide mechanisms, i.e. eccentric lathes
5/46	• • for turning helical or spiral surfaces (thread cutting B23G)
5/48	• • • for cutting grooves, e.g. oil grooves of helicoidal shape
7/00	Automatic or semi-automatic turning-machines with a single working-spindle, e.g. controlled by cams; Equipment therefor; Features common to automatic and semi-automatic turning-machines with one or more working-spindles
7/02	• Automatic or semi-automatic machines for turning of stock
7/04	• • Turret machines
7/06	• • with sliding headstock
7/08	• • with the working-spindle vertical
7/10	• • Accessories, e.g. guards
7/12	• Automatic or semi-automatic machines for turning of workpieces
7/14	• • with the working-spindle horizontal
7/16	• • with the working-spindle vertical
9/00	Automatic or semi-automatic turning-machines with a plurality of working-spindles, e.g. automatic multiple-spindle machines with spindles arranged in a drum carrier able to be moved into pre-determined positions; Equipment therefor (equipment applicable to single-spindle machines B23B 7/00)
9/02	• Automatic or semi-automatic machines for turning of stock
9/04	• • with the working-spindles horizontal
9/06	• • with the working-spindles vertical
9/08	• Automatic or semi-automatic machines for turning of workpieces
9/10	• • with the working-spindles horizontal
9/12	• • with the working-spindles vertical
11/00	Automatic or semi-automatic turning-machines incorporating equipment for performing other working procedures, e.g. slotting, milling, rolling
13/00	Arrangements for automatically conveying, chucking or guiding stock for turning machines

- 13/02 • for turning-machines with a single working-spindle
- 13/04 • for turning-machines with a plurality of working-spindles
- 13/06 • Arrangements for switching-off the drive of turning-machines after the stock has been completely machined
- 13/08 • Arrangements for reducing vibrations in feeding-passages or for damping noise (damping noise in general G10K)
- 13/10 • with magazines for stock
- 13/12 • Accessories, e.g. stops, grippers

15/00 Arrangements for conveying, loading, adjusting, reversing, chucking, or discharging workpieces specially designed for automatic or semi-automatic turning-machines

Components or accessories particularly for turning machines

- 17/00 Lathe beds** (foundation frames, carriage guides as such B23Q 1/00)
- 19/00 Headstocks; Equivalent parts of any machine tools**
- 19/02 • Working-spindles; Features relating thereto, e.g. supporting arrangements (B23B 13/00 takes precedence)
- 21/00 Lathe carriages; Cross-slides; Tool posts** (tool holders B23B 29/00); **Similar parts of any machine tools**
- 23/00 Tailstocks; Centres**
- 23/02 • Dead centres
- 23/04 • Live centres
- 25/00 Accessories or auxiliary equipment for turning-machines** (for machine tools in general B23Q; cooling or lubricating B23Q 11/12)
- 25/02 • Arrangements for chip-breaking in turning-machines (on cutting tools B23B 27/22)
- 25/04 • Safety guards specially designed for turning-machines (in general F16P)
- 25/06 • Measuring, gauging, or adjusting equipment on turning-machines for setting-on, feeding, controlling, or monitoring the cutting tools or work (measuring devices or gauges G01B)

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- 27/00 Tools for turning or boring machines** (for drilling machines B23B 51/00); **Tools of a similar kind in general; Accessories therefor**
 - 27/02 • Cutting tools with straight main part and cutting edge at an angle (B23B 27/04-B23B 27/08 take precedence)
 - 27/04 • Cutting-off tools (B23B 27/08 takes precedence)
 - 27/06 • Profile cutting tools, i.e. forming-tools
 - 27/08 • Cutting tools with blade- or disc-like main parts
 - 27/10 • Cutting tools with special provision for cooling
 - 27/12 • • with a continuously-rotated circular cutting edge; Holders therefor
 - 27/14 • Cutting tools of which the bits or tips are of special material
 - 27/16 • • with exchangeable cutting bits, e.g. able to be clamped
 - 27/18 • • with cutting bits or tips rigidly mounted, e.g. by brazing
 - 27/20 • • with diamond bits
 - 27/22 • Cutting tools with chip-breaking equipment

- 27/24 • Knurling tools

29/00 Holders for non-rotary cutting tools (B23B 27/12 takes precedence); **Boring bars or boring heads; Accessories for tool holders**

- 29/02 • Boring bars
- 29/03 • Boring heads
- 29/034 • • with tools moving radially, e.g. for making chamfers or undercuttings [4]
- 29/04 • Tool holders for a single cutting tool
- 29/06 • • Tool holders equipped with longitudinally-arranged grooves for setting the cutting tool
- 29/08 • • Tool holders equipped with grooves arranged crosswise to the longitudinal direction for setting the cutting tool
- 29/10 • • • with adjustable counterbase for the cutting tool
- 29/12 • • Special arrangements on tool holders
- 29/14 • • • affording a yielding support of the cutting tool, e.g. by spring clamping
- 29/16 • • • for supporting the workpiece in a backrest
- 29/18 • • • for retracting the cutting tool
- 29/20 • • • for placing same by shanks in sleeves of a turret
- 29/22 • • • for tool adjustment by means of shims or spacers
- 29/24 • Tool holders for a plurality of cutting tools, e.g. turrets
- 29/26 • • Tool holders in fixed position
- 29/28 • • Turrets manually adjustable about a vertical pivot
- 29/30 • • Turrets manually adjustable about a horizontal pivot
- 29/32 • • Turrets adjustable by power drive, i.e. turret heads
- 29/34 • • Turrets equipped with triggers for releasing the cutting tools
- 31/00 Chucks; Expansion mandrels; Adaptations thereof for remote control** (devices for securing work or tools to spindles in general B23Q 3/12; rotary devices holding by magnetic or electrical force acting directly on work B23Q 3/152)
- 31/02 • Chucks
- 31/06 • • Features relating to the removal of tools or work; Accessories therefor
- 31/07 • • • Ejector wedges [5]
- 31/08 • • holding tools or work yieldably
- 31/10 • • characterised by the retaining or gripping devices or their immediate operating means

Note(s)

Group B23B 31/12 takes precedence over groups B23B 31/103-B23B 31/117.

- 31/103 • • • Retention by pivotal elements, e.g. catches, pawls [5]
- 31/107 • • • Retention by laterally-acting detents, e.g. pins, screws, wedges; Retention by loose elements, e.g. balls [5]
- 31/11 • • • Retention by threaded connection [5]
- 31/113 • • • Retention by bayonet connection [5]
- 31/117 • • • Retention by friction only, e.g. using springs, resilient sleeves, tapers [5]
- 31/12 • • • Chucks with simultaneously-acting jaws, whether or not also individually adjustable
- 31/14 • • • • involving the use of centrifugal force
- 31/16 • • • • moving radially
- 31/163 • • • • • actuated by one or more spiral grooves [5]

B23B

- 31/165 • • • • actuated by screw-and-nut mechanisms [5]
 - 31/167 • • • • actuated by oblique racks [5]
 - 31/169 • • • • actuated by toothed gearing (B23B 31/167 takes precedence) [5]
 - 31/171 • • • • actuated by a cam surface in a radial plane [5]
 - 31/173 • • • • actuated by coaxial conical surfaces (B23B 31/177 takes precedence) [5]
 - 31/175 • • • • actuated by levers moved by a coaxial control rod [5]
 - 31/177 • • • • actuated by the oblique surfaces of a coaxial control rod (B23B 31/167 takes precedence) [5]
 - 31/18 • • • • pivotally movable in planes containing the axis of the chuck
 - 31/19 • • • • moving parallel to the axis of the chuck
 - 31/20 • • • • Longitudinally-split sleeves, e.g. collet chucks
 - 31/22 • • • • Jaws in the form of balls
 - 31/24 • • characterised by features relating primarily to remote control of the gripping means
 - 31/26 • • • using mechanical transmission through the working-spindle
 - 31/28 • • • using electric or magnetic means in the chuck
 - 31/30 • • • using fluid-pressure means in the chuck
 - 31/32 • • with jaws carried by diaphragm
 - 31/34 • • with means enabling the workpiece to be reversed or tilted
 - 31/36 • • with means for adjusting the chuck with respect to the working-spindle
 - 31/38 • • with overload clutches
 - 31/39 • • Jaw changers [5]
 - 31/40 • Expansion mandrels
 - 31/42 • • characterised by features relating primarily to remote control of the gripping means
- 33/00 Drivers; Driving centres; Nose clutches, e.g. lathe dogs**

Boring; Drilling [3]

- 35/00 Methods for boring or drilling, or for working essentially requiring the use of boring or drilling machines; Use of auxiliary equipment in connection with such methods**
- 37/00 Boring by making use of vibrations of ultrasonic frequency** (working materials by subjecting the grinding tools or the abrading medium to vibration, e.g. grinding with ultrasonic frequency, B24B 1/04)
- 39/00 General-purpose boring or drilling machines or devices; Sets of boring or drilling machines**
- 39/02 • Boring machines; Combined horizontal boring and milling machines
 - 39/04 • Co-ordinate boring or drilling machines; Machines for making holes without previous marking
 - 39/06 • • Equipment for positioning work
 - 39/08 • • Devices for programme control
 - 39/10 • characterised by the drive, e.g. by fluid-pressure drive, pneumatic power drive
 - 39/12 • Radial drilling machines
 - 39/14 • with special provision to enable the machine or the drilling or boring head to be moved into any desired position, e.g. with respect to immovable work

- 39/16 • Drilling machines with a plurality of working-spindles; Drilling automatons
- 39/18 • • Setting work or tool carrier along a straight index line
- 39/20 • • Setting work or tool carrier along a circular index line; Turret head drilling machines
- 39/22 • • with working-spindles in opposite headstocks
- 39/24 • • designed for programme control
- 39/26 • in which the working position of tool or work is controlled by copying discrete points of a pattern (features of copying devices B23Q 35/02)
- 39/28 • Associations of only boring or drilling machines directed to a particular metal-working result (if not producing a particular metal-working result B23Q 39/00)

41/00 Boring or drilling machines or devices specially adapted for particular work; Accessories specially adapted therefor

- 41/02 • for boring deep holes; Trepanning, e.g. of gun or rifle barrels
- 41/04 • for boring polygonal or other non-circular holes
- 41/06 • for boring conical holes
- 41/08 • for boring, drilling, or tapping holes in tubes under fluid or gas pressure (sealing features or operations, combined with placing branch parts F16L 41/04)
- 41/10 • for boring holes in steam boilers
- 41/12 • for forming working surfaces of cylinders, of bearings, e.g. in heads of driving rods, or of other engine parts
- 41/14 • for very small holes
- 41/16 • for boring holes with high-quality surface

43/00 Boring or drilling devices able to be attached to a machine tool, whether or not replacing an operative portion of the machine tool (if specially adapted for particular work B23B 41/00)

- 43/02 • to the tailstock of a lathe

45/00 Hand-held or like portable drilling machines, e.g. drill guns; Equipment therefor (details or components, e.g. casings, bodies, of portable power-driven tools not particularly related to the operation performed B25F 5/00) [4]

- 45/02 • driven by electric power
- 45/04 • driven by fluid-pressure or pneumatic power
- 45/06 • driven by man-power
- 45/08 • • for drilling rails or profiled stock
- 45/10 • • by using a fiddle bow or a belt
- 45/12 • • by using a ratchet brace
- 45/14 • Means for holding or guiding the drilling device or for securing it to the work (B23B 41/08 takes precedence); Thrust stands
- 45/16 • with superimposed percussive action (portable percussive machines with superimposed rotation B25D 16/00) [3]

Components or accessories for boring or drilling machines

- 47/00 Constructional features of components specially designed for boring or drilling machines; Accessories therefor** (working-spindles, bearing sleeves therefor B23B 19/02; for machine tools in general B23Q)
- 47/02 • Drives; Gearings (B23B 39/10 takes precedence)
 - 47/04 • • for rotating the working-spindle
 - 47/06 • • • driven essentially by electrical means

- 47/08 • • • driven essentially by fluid-pressure or pneumatic power
- 47/10 • • • • equipped with turbines or other rotating machines
- 47/12 • • • • equipped with oscillating pistons
- 47/14 • • • • Change-speed gearings; Reversing gearings
- 47/16 • • • • Belt or chain drives
- 47/18 • • • for feeding or retracting tool or work
- 47/20 • • • • actuated essentially by electric power
- 47/22 • • • • actuated essentially by fluid-pressure or pneumatic power
- 47/24 • • • Stops or feed interruption owing to fracture or overload of the boring or drilling tool
- 47/26 • Lifiable or lowerable drill heads or headstocks; Balancing arrangements therefor
- 47/28 • Drill jigs for workpieces (equipment for setting or guiding the drill B23B 49/00)
- 47/30 • Additional gear with one or more working-spindles attachable to the main working-spindle and mounting the additional gear
- 47/32 • Arrangements for preventing the running-out of drills or fracture of drills when getting through
- 47/34 • Arrangements for removing chips out of the holes made; Chip-breaking arrangements attached to the tool
- 49/00 Measuring or gauging equipment on boring machines for positioning or guiding the drill; Devices for indicating failure of drills during boring; Centring devices for holes to be bored** (marking-out equipment B25H 7/00; measuring devices, gauges G01B)
- 49/02 • Boring templates or bushings
- 49/04 • Devices for boring or drilling centre holes in workpieces
- 49/06 • Devices for drilling holes in brake bands or brake linings
- 51/00 Tools for drilling machines**
- 51/02 • Twist drills
- 51/04 • for trepanning
- 51/05 • • for cutting discs from sheet **[4]**
- 51/06 • Drills with lubricating or cooling equipment
- 51/08 • Drills combined with tool parts or tools for performing additional working
- 51/10 • Bits for countersinking
- 51/12 • Adapters for drills or chucks; Tapered sleeves
- 51/14 • • Adapters for broken drills

B23C MILLING (broaching B23D; broach-milling in making gears B23F; arrangements for copying or controlling B23Q)

Subclass index

MILLING MACHINES IN GENERAL.....	1/00
MILLING PARTICULAR WORK.....	3/00
COMPONENT PARTS, ACCESSORIES.....	5/00, 9/00
DEVICES FOR ATTACHMENT TO ANY MACHINE.....	7/00

- 1/00 Milling machines not designed for particular work or special operations**
- 1/02 • with one horizontal working-spindle
- 1/025 • • with working-spindle in a fixed position **[2]**
- 1/027 • • with working-spindle movable in a vertical direction **[2]**
- 1/04 • with a plurality of horizontal working-spindles
- 1/06 • with one vertical working-spindle
- 1/08 • with a plurality of vertical working-spindles
- 1/10 • with both horizontal and vertical working-spindles
- 1/12 • with spindle adjustable to different angles, e.g. either horizontally or vertically
- 1/14 • with rotary work-carrying table (work-tables for machine tools in general B23Q 1/00)
- 1/16 • specially designed for control by copying devices
- 1/18 • • for milling while revolving the work
- 1/20 • Portable devices or machines (details or components, e.g. casings, bodies, of portable power-driven tools not particularly related to the operation performed B25F 5/00); Hand-driven devices or machines **[4]**
- 3/00 Milling particular work; Special milling operations; Machines therefor** (milling gear teeth B23F; milling of threads B23G 1/32) **[2]**
- 3/02 • Milling surfaces of revolution (B23C 3/06, B23C 3/08 take precedence)
- 3/04 • • while revolving the work
- 3/05 • • Finishing valves or valve seats **[2]**
- 3/06 • Milling crankshafts
- 3/08 • Milling cams, camshafts, or the like
- 3/10 • Relieving by milling (lathes or turning devices for relieving B23B 5/42)
- 3/12 • Trimming or finishing edges, e.g. deburring welded corners
- 3/13 • Surface milling of plates, sheets or strips **[2]**
- 3/14 • Scrubbing or peeling ingots or similar workpieces
- 3/16 • Working surfaces curved in two directions
- 3/18 • • for shaping screw-propellers, turbine blades, or impellers
- 3/20 • • for shaping dies
- 3/22 • Forming overlapped joints, e.g. of the ends of piston-rings
- 3/24 • Making square or polygonal ends on workpieces, e.g. key studs on tools
- 3/26 • Making square or polygonal holes in workpieces, e.g. key holes in tools
- 3/28 • Grooving workpieces
- 3/30 • • Milling straight grooves, e.g. keyways
- 3/32 • • Milling helical grooves, e.g. in making twist-drills
- 3/34 • • Milling grooves of other forms, e.g. circumferential
- 3/35 • • Milling grooves in keys
- 3/36 • Milling milling-cutters (B23C 3/28 takes precedence)
- 5/00 Milling-cutters** (for cutting gear teeth B23F 21/12)
- 5/02 • characterised by the shape of the cutter

B23C

- 5/04 • • Plain cutters, i.e. having essentially a cylindrical or tapered cutting surface of substantial length (B23C 5/10 takes precedence)
- 5/06 • • Face-milling cutters, i.e. having only or primarily a substantially flat cutting surface
- 5/08 • • Disc-type cutters
- 5/10 • • Shank-type cutters, i.e. with an integral shaft
- 5/12 • • Cutters specially designed for producing particular profiles (B23C 5/10 takes precedence)
- 5/14 • • • essentially comprising curves
- 5/16 • characterised by physical features other than shape
- 5/18 • • with permanently-fixed cutter-bits or teeth
- 5/20 • • with removable cutter-bits or teeth
- 5/22 • • • Securing arrangements for bits or teeth
- 5/24 • • • • adjustable
- 5/26 • Securing milling-cutters to the driving spindle
- 5/28 • Features relating to lubricating or cooling
- 7/00 **Milling devices able to be attached to a machine tool, whether or not replacing an operative portion of the machine tool**
 - 7/02 • to lathes
 - 7/04 • to planing or slotting machines
- 9/00 **Details or accessories so far as specially adapted to milling machines or cutters** (drives, control devices, or accessories, in general B23Q)

B23D PLANING; SLOTTING; SHEARING; BROACHING; SAWING; FILING; SCRAPING; LIKE OPERATIONS FOR WORKING METAL BY REMOVING MATERIAL, NOT OTHERWISE PROVIDED FOR (making toothed gears or the like B23F; cutting metal by applying heat locally B23K; arrangements for copying or controlling B23Q)

Note(s)

This subclass covers machines for shearing sheet metal or other stock material except metal foils workable in a manner analogous to paper, which is covered by class B26.

Subclass index

PLANING; SLOTTING

- Working method of the machine.....1/00, 3/00, 5/00
- Machines characterised by constructional features of a part.....7/00
- Hand-operated devices; portable apparatus.....9/00
- Devices for attachment to any machine tool.....11/00
- Tools, tool holders.....13/00

SHEARING

- Working method of machines or apparatus.....15/00, 17/00, 19/00, 27/00, 31/00
- Hand-held devices.....21/06, 27/02, 29/00
- Tools, holders, chucks.....35/00
- Accessories.....33/00
- Machines for particular work.....21/00, 23/00, 25/00
- Control arrangements.....36/00

BROACHING; REAMING

- Working method of machines or apparatus.....37/00
- Machines or devices characterised by constructional features of a part.....41/00
- Tools.....43/00, 77/00
- Accessories.....39/00
- Machines or devices for reaming bored holes.....75/00

SAWING

- Working method of machines or apparatus
 - using saw discs.....45/00, 47/00
 - using straight saw blades.....49/00, 51/00
 - using endless saw blades.....53/00, 55/00
 - other working methods.....57/00
- Machines or devices characterised by constructional features of a part.....47/00, 51/00, 55/00
- Tools and attachment thereof; dressing thereof; making thereof.....51/00, 61/00, 63/00, 65/00
- Accessories.....59/00
- Control arrangements.....36/00

FILING; RASPING

- Working method of machines or apparatus.....67/00
- Machines or devices characterised by constructional features of a part.....69/00
- Tools; making thereof.....71/00, 73/00

OTHER METHODS, MACHINES, OR DEVICES; COMBINATIONS.....79/00, 81/00

Planing; Slotting

- 1/00 Planing or slotting machines cutting by relative movement of the tool and workpiece in a horizontal straight line only**
- 1/02 • by movement of the work-support
 - 1/04 • • with the tool supported only on one side of the bed
 - 1/06 • • with the tool supported on both sides of the bed
 - 1/08 • by movement of the tool
 - 1/10 • • with means for adjusting the tool-guide vertically
 - 1/12 • • • with the tool supported only on one side of the bed
 - 1/14 • • • with the tool supported on both sides of the bed
 - 1/16 • • without means for adjusting the tool-guide vertically
 - 1/18 • cutting on both the forward and the return stroke
 - 1/20 • with tool-supports or work-supports specially mounted or guided for working in different directions or at different angles; Special purpose machines
 - 1/22 • • for planing ingots or the like (scrubbing or peeling ingots by milling B23C 3/14)
 - 1/24 • • for planing inner surfaces, e.g. of moulds
 - 1/26 • • for planing edges or ridges or cutting grooves (cutting helical grooves B23D 5/02)
 - 1/28 • • in which the tool or workpiece is fed otherwise than in a straight line, e.g. for planing profiled stock
 - 1/30 • • • in which the direction of feed is controlled by a copying device, e.g. by a pattern (features of copying devices B23Q 35/00)
- 3/00 Planing or slotting machines cutting by relative movement of the tool and workpiece in a vertical or inclined straight line**
- 3/02 • for cutting grooves (cutting helical grooves B23D 5/02)
 - 3/04 • in which the tool or workpiece is fed otherwise than in a straight line
 - 3/06 • • in which the direction of feed is controlled by a copying device, e.g. by a pattern (features of copying devices B23Q 35/00)
- 5/00 Planing or slotting machines cutting otherwise than by relative movement of the tool and workpiece in a straight line**
- 5/02 • involving rotary and straight-line movements only, e.g. for cutting helical grooves
 - 5/04 • controlled by a copying device, e.g. by a pattern (features of copying devices B23Q 35/00)
- 7/00 Planing or slotting machines characterised only by constructional features of particular parts (constructional features of these parts *per se* B23Q)**
- 7/02 • of frames, of work-table beds
 - 7/04 • of pillars, of cross-beams
 - 7/06 • of tool-carrying arrangements
 - 7/08 • of work-tables
 - 7/10 • of drives for reciprocating parts
 - 7/12 • of arrangements for impact damping or regenerating energy
- 9/00 Hand-operated planing devices; Portable planing apparatus (details or components, e.g. casings, bodies, of portable power-driven tools not particularly related to the operation performed B25F 5/00) [4]**

- 11/00 Planing or slotting devices able to be attached to a machine tool, whether or not replacing an operative portion of the machine tool**
- 13/00 Tools or tool holders specially designed for planing or slotting machines (features applicable also to turning-machines B23B 27/00, B23B 29/00; for cutting gear teeth B23F 21/04)**
- 13/02 • Pivotaly-mounted holders
 - 13/04 • Holders for tool sets
 - 13/06 • Devices for lifting or lowering the tool

Shearing; Similar cutting

- 15/00 Shearing machines or shearing devices cutting by blades which move parallel to each other**
- 15/02 • having both upper and lower moving blades
 - 15/04 • having only one moving blade
 - 15/06 • Sheet shears
 - 15/08 • • with a blade moved in one plane, e.g. perpendicular to the surface of the sheet
 - 15/10 • • with a blade moved in a curved surface, e.g. for producing an edge with a curved cross-section
 - 15/12 • characterised by drives or gearings therefor
 - 15/14 • • actuated by fluid or gas pressure
- 17/00 Shearing machines or shearing devices cutting by blades pivoted on a single axis (on an axis parallel to the blade B23D 15/10; hand-held devices B23D 29/00)**
- 17/02 • characterised by drives or gearings therefor
 - 17/04 • • actuated by a rotary shaft
 - 17/06 • • actuated by fluid or gas pressure
 - 17/08 • • actuated by hand or foot operated lever mechanism
- 19/00 Shearing machines or shearing devices cutting by rotary discs (by friction saw discs B23D 45/00)**
- 19/02 • having both a fixed shearing blade and a rotary shearing disc
 - 19/04 • having rotary shearing discs arranged in co-operating pairs
 - 19/06 • • with several spaced pairs of shearing discs working simultaneously, e.g. for trimming or making strips
 - 19/08 • for special use, e.g. for cutting curves, for chamfering edges
- 21/00 Machines or devices for shearing or cutting tubes (as additional equipment for deep-drawing presses B21D 24/16; by sawing, *see* the relevant groups for sawing machines or sawing devices)**
- 21/02 • otherwise than in a plane perpendicular to the axis of the tube, e.g. for making mitred cuts, for making bicycle frames
 - 21/04 • Tube-severing machines with rotating tool-carrier
 - 21/06 • Hand-operated tube cutters
 - 21/08 • • with cutting wheels
 - 21/10 • • with other cutting blades or tools
 - 21/12 • • • with provision for hammering on the tool
 - 21/14 • cutting inside the tube
- 23/00 Machines or devices for shearing or cutting profiled stock (hand-held devices B23D 29/00)**
- 23/02 • otherwise than in a plane perpendicular to the axis of the stock
 - 23/04 • by means of holding-dies, arranged side by side, subjecting the stock to torsional stress

B23D

- 25/00 Machines or arrangements for shearing stock while the latter is travelling otherwise than in the direction of the cut** (control arrangements specially adapted for machines for shearing stock while the latter is travelling otherwise than in the direction of the cut B23D 36/00; controlling slack in travelling flexible stock B21C 47/10) [2]
- 25/02 • Flying shearing machines (B23D 25/12 takes precedence; flying shears for cutting in general B26D 1/56)
- 25/04 • • in which a cutting unit moves bodily with the work while cutting (B23D 25/06 takes precedence)
- 25/06 • • having a cutting device mounted on an oscillating lever
- 25/08 • • having two coacting shearing blades mounted independently
- 25/10 • • • on co-operating beams moving parallel to each other and attached to lever mechanisms
- 25/12 • Shearing machines with blades on coacting rotating drums
- 25/14 • without regard to the exact dimensions of the resulting material, e.g. for cutting-up scrap
- 27/00 Machines or devices for cutting by a nibbling action**
- 27/02 • Hand-held devices (details or components, e.g. casings, bodies, of portable power-driven tools not particularly related to the operation performed B25F 5/00) [4]
- 27/04 • • actuated by electric power
- 27/06 • • actuated by fluid or gas pressure
- 29/00 Hand-held metal-shearing or metal-cutting devices** (with nibbling action B23D 27/02; hand-operated devices for metal-cutting otherwise than by shearing B26B)
- 29/02 • Hand-operated metal-shearing devices
- 31/00 Shearing machines or shearing devices covered by none or more than one of the groups B23D 15/00-B23D 29/00; Combinations of shearing machines**
- 31/02 • for performing different cutting operations on travelling stock, e.g. slitting and severing simultaneously
- 31/04 • for trimming stock combined with devices for shredding scrap
- 33/00 Accessories for shearing machines or shearing devices** (feeding stock to machines or removing stock B21D 43/00)
- 33/02 • Arrangements for holding, guiding, or feeding work during the operation
- 33/04 • • for making circular cuts
- 33/06 • • in which the direction of feed is controlled by a copying device, e.g. by a pattern (features of copying devices B23Q 35/00)
- 33/08 • Press-pads; Counter-bases; Hold-down devices
- 33/10 • Stops for positioning work
- 33/12 • Equipment for indicating where to cut
- 35/00 Tools for shearing machines or shearing devices; Holders or chucks for shearing tools**
-
- 36/00 Control arrangements specially adapted for machines for shearing or similar cutting, or for sawing, stock while the latter is travelling otherwise than in the direction of the cut** [2]

Broaching

- 37/00 Broaching machines or broaching devices**
- 37/02 • Broaching machines with horizontally-arranged working tools
- 37/04 • • for broaching inner surfaces
- 37/06 • • for broaching outer surfaces
- 37/08 • Broaching machines with vertically-arranged working tools
- 37/10 • • for broaching inner surfaces
- 37/12 • • for broaching outer surfaces
- 37/14 • Broaching machines with rotatably-arranged working tools
- 37/16 • • for broaching helical grooves
- 37/18 • Broaching machines with working tools mounted on an endless chain or belt
- 37/20 • Broaching machines with arrangements for working in opposite directions
- 37/22 • for special purposes (B23D 37/14 takes precedence)
- 39/00 Accessories for broaching machines or broaching devices**
- 41/00 Broaching machines or broaching devices characterised only by constructional features of particular parts** (constructional features of these parts per se B23Q)
- 41/02 • of frames; of work supports
- 41/04 • of tool-carrying arrangements
- 41/06 • of devices for feeding, clamping, or ejecting workpieces
- 41/08 • of drives; of control devices
- 43/00 Broaching tools** (for cutting gear teeth B23F 21/26)
- 43/02 • for cutting by rectilinear movement (B23D 43/08 takes precedence)
- 43/04 • • having inserted cutting edges
- 43/06 • for cutting by rotational movement
- 43/08 • mounted on an endless chain or belt
- ## Sawing
- 45/00 Sawing machines or sawing devices with circular saw blades or with friction saw discs** (shearing machines with rotary discs B23D 19/00-B23D 25/00)
- 45/02 • with a circular saw blade or the stock mounted on a carriage
- 45/04 • with a circular saw blade or the stock carried by a pivoted lever
- 45/06 • with a circular saw blade arranged underneath a stationary work-table
- 45/08 • with a ring blade having inside saw teeth
- 45/10 • with a plurality of circular saw blades
- 45/12 • with a circular saw blade for cutting tubes
- 45/14 • for cutting otherwise than in a plane perpendicular to the axis of the stock, e.g. for making a mitred cut
- 45/16 • Hand-held sawing devices with circular saw blades
- 45/18 • Machines with circular saw blades for sawing stock while the latter is travelling otherwise than in the direction of the cut (control of such machines B23D 36/00) [2]
- 45/20 • • Flying sawing machines, the saw carrier of which is reciprocated in a guide and moves with the travelling stock during sawing
- 45/22 • • Flying sawing machines with lever-supported saw carrier which moves in a complete circular path

- 45/24 • • Flying sawing machines with lever-supported saw carrier which oscillates in an arc
- 45/26 • with high-speed cutting discs, performing the cut by frictional heat melting the material (grinders for cutting-off B24B 27/06)
- 47/00 Sawing machines or sawing devices working with circular saw blades, characterised only by constructional features of particular parts** (constructional features of these parts *per se* B23Q; details or components, e.g. casings, bodies, of portable power-driven tools not particularly related to the operation performed B25F 5/00) [4]
- 47/02 • of frames; of guiding arrangements for work-table or saw-carrier
- 47/04 • of devices for feeding, positioning, clamping, or rotating work
- 47/06 • • for stock of indefinite length
- 47/08 • of devices for bringing the circular saw blade to the workpiece or removing same therefrom
- 47/10 • • actuated by fluid or gas pressure
- 47/12 • of drives for circular saw blades
- 49/00 Machines or devices for sawing with straight reciprocating saw blades, e.g. hacksaws**
- 49/02 • Hacksaw machines with straight saw blades secured to a rectilinearly-guided frame, e.g. with the frame fed stepwise in the plane of the guide
- 49/04 • Hacksaw machines with straight saw blades secured to a pivotally-arranged frame
- 49/06 • Hacksaw machines with straight saw blades for special use
- 49/08 • Pad-saw machines, i.e. machines in which the blade is attached to a carrier at one end only
- 49/10 • Hand-held or hand-operated sawing devices with straight saw blades
- 49/11 • • for special purposes, e.g. offset-blade hand saws [5]
- 49/12 • • Hacksaws (B23D 49/11, B23D 49/16 take precedence; bows adjustable in length or height B23D 51/12) [5]
- 49/14 • • Pad saws (B23D 49/11, B23D 49/16 take precedence) [5]
- 49/16 • • actuated by electric or magnetic power or prime movers (B23D 49/11 takes precedence) [5]
- 51/00 Sawing machines or sawing devices working with straight blades, characterised only by constructional features of particular parts** (constructional features of these parts *per se* B23Q; details or components, e.g. casings, bodies, of portable power-driven tools not particularly related to the operation performed B25F 5/00); **Carrying or attaching means for tools, covered by this subclass, which are connected to a carrier at both ends** [4]
- 51/01 • characterised by the handle [5]
- 51/02 • of beds; of guiding arrangements for work-tables or saw carriers; of frames [5]
- 51/03 • • with extensible or collapsible frames [5]
- 51/04 • of devices for feeding, positioning, clamping, or rotating work
- 51/06 • • for stock of indefinite length
- 51/08 • of devices for mounting straight saw blades or other tools
- 51/10 • • for hand-held or hand-operated devices
- 51/12 • • for use with tools, dealt with in this subclass, which are connected to a carrier at both ends, e.g. bows adjustable in length or height
- 51/14 • • • Attachment of the tool
- 51/16 • of drives or feed mechanisms for straight tools, e.g. saw blades, or bows
- 51/18 • • actuated by fluid or gas pressure (B23D 51/20 takes precedence)
- 51/20 • • with controlled feed of the tool, or with special arrangements for relieving or lifting the tool on the return stroke
- 53/00 Machines or devices for sawing with strap saw blades which are effectively endless in use, e.g. for contour cutting**
- 53/02 • with stationarily-mounted wheels carrying the strap (B23D 53/06 takes precedence)
- 53/04 • with the wheels carrying the strap mounted shiftably or swingingly, other than merely for adjustment
- 53/06 • with shiftable or swinging work-table
- 53/08 • for cutting profiled stock
- 53/10 • Sawing devices working with strap saw blades able to be attached to a machine tool, whether or not replacing an operative portion of the machine tool
- 53/12 • Hand-held or hand-operated sawing devices working with strap saw blades
- 55/00 Sawing machines or sawing devices working with strap saw blades, characterised only by constructional features of particular parts** (constructional features of these parts *per se* B23Q)
- 55/02 • of frames; of tables
- 55/04 • of devices for feeding or clamping work
- 55/06 • of drives for strap saw blades; of wheel mountings
- 55/08 • of devices for guiding or feeding strap saw blades
- 55/10 • of devices for tensioning strap saw blades (B23D 55/06 takes precedence; incorporated in the strap B23D 61/12)
- 57/00 Sawing machines or sawing devices not covered by one of groups B23D 45/00-B23D 55/00**
- 57/02 • with chain saws
- 59/00 Accessories specially designed for sawing machines or sawing devices** (lubricating or cooling machine tools in general B23Q 11/12)
- 59/02 • Devices for lubricating or cooling circular saw blades
- 59/04 • Devices for lubricating or cooling straight or strap saw blades
- 61/00 Tools for sawing machines or sawing devices** (tools for trepanning B23B 51/04); **Clamping devices for these tools**
- 61/02 • Circular saw blades
- 61/04 • • with inserted saw teeth
- 61/06 • • • in exchangeable arrangement
- 61/08 • • Ring saw blades with internal saw teeth
- 61/10 • • clamped between hubs; Clamping or aligning devices therefor
- 61/12 • Straight saw blades; Strap saw blades
- 61/14 • • with inserted saw teeth
- 61/16 • • • in exchangeable arrangement
- 61/18 • Sawing tools of special type, e.g. wire saw strands, saw blades or saw wire equipped with diamonds or other abrasive particles in selected individual positions
- 63/00 Dressing the tools of sawing machines or sawing devices for use in cutting any kind of material, e.g. in the manufacture of sawing tools**
- 63/02 • Setting saw teeth by means of hand-operated devices

B23D

- 63/04 • Setting saw teeth of circular, straight, or strap saw blades by means of power-operated devices
- 63/06 • Upsetting the cutting edges of saw teeth, e.g. swaging
- 63/08 • Sharpening the cutting edges of saw teeth
- 63/10 • • by filing
- 63/12 • • by grinding
- 63/14 • • • Sharpening circular saw blades
- 63/16 • • of chain saws (of mortise chain cutters B24B 3/14)
- 63/18 • Straightening damaged saw blades; Reconditioning the side surface of saw blades, e.g. by grinding
- 63/20 • Combined processes for dressing saw teeth, e.g. both hardening and setting

65/00 Making tools for sawing machines or sawing devices for use in cutting any kind of material

- 65/02 • Making saw teeth by punching, cutting, or planing
- 65/04 • Making saw teeth by milling

Filing or rasping

- 67/00 **Filing or rasping machines or devices** (securing arrangements for files or rasps B23D 71/00)
- 67/02 • with reciprocating tools, mounted on a yoke or the like
- 67/04 • with reciprocating tools, attached to a carrier at one end only
- 67/06 • with rotating tools
- 67/08 • with tools mounted on an endless chain or belt
- 67/10 • for special use, e.g. for filing keys; Accessories therefor
- 67/12 • Hand-held or hand-operated filing or rasping devices (hand files or rasps B23D 71/04)

69/00 Filing or rasping machines or devices, characterised only by constructional features of particular parts, e.g. guiding arrangements, drives (constructional features of these parts *per se* B23Q; details or components, e.g. casings, bodies, of portable power-driven tools not particularly related to the operation performed B25F 5/00); Accessories for filing or rasping (attached to the tool B23D 71/10) [4]

- 69/02 • Guiding arrangements for hand tools

71/00 Filing or rasping tools; Securing arrangements therefor (tool holders for machine tools B23Q 3/00; handles for hand implements B25G)

- 71/02 • for filing or rasping machines or devices
- 71/04 • Hand files or hand rasps (carrying or attaching means for tools which are connected to a carrier at both ends B23D 51/12; guiding arrangements B23D 69/02)
- 71/06 • • using a single interchangeable blade
- 71/08 • • using a plurality of interchangeable cutting elements
- 71/10 • Accessories for filing or rasping tools, e.g. for preventing scoring of workpieces by the edges of the tool

73/00 Making files or rasps

- 73/02 • Preliminary treatment of blanks, e.g. grinding, polishing, specially adapted for the manufacture of files or rasps

- 73/04 • Methods or machines for the manufacture of files or rasps (non-mechanical methods, *see* the relevant classes)
- 73/06 • • Cutting the working surfaces by means of chisels
- 73/08 • • Milling, planing, slotting, knurling, or broaching the working surfaces
- 73/10 • • Grinding the working surfaces
- 73/12 • • Peculiar procedures for sharpening or otherwise treating the working surfaces (special treatment by sand-blast B24C 1/02; sharpening files by etching C23F 1/06)
- 73/14 • Tools or accessories specially adapted for making files or rasps, e.g. chisels, supporting-frames

Reaming bored holes

75/00 Reaming machines or reaming devices (tool holders for machine tools B23Q 3/00; handles for hand implements B25G)

77/00 Reaming tools

- 77/02 • Reamers with inserted cutting edges
- 77/04 • • with cutting edges adjustable to different diameters along the whole cutting length
- 77/06 • Reamers with means for compensating wear (B23D 77/04 takes precedence)
- 77/08 • • by spreading slotted parts of the tool body
- 77/10 • • by expanding a tube-like non-slotted part of the tool body
- 77/12 • Reamers with cutting edges arranged in tapered form
- 77/14 • Reamers for special use, e.g. for working cylinder ridges

79/00 Methods, machines or devices not covered elsewhere, for working metal by removal of material (by combined operations B23D 81/00; working of metal by the action of a high concentration of electric current B23H; cutting by electron-beam B23K 15/00, by laser beam B23K 26/00; other working of metal B23P; tool holders for machine tools B23Q 3/00; handles for hand implements B25G)

- 79/02 • Machines or devices for scraping (turning machines for bevelling, chamfering, or deburring the ends of bars or tubes B23B 5/16; scrubbing or peeling ingots by milling B23C 3/14)
- 79/04 • • with rotating cutting-tool, e.g. for smoothing linings of bearings
- 79/06 • • with reciprocating cutting-tool
- 79/08 • • Hand scraping-implements
- 79/10 • • Accessories for holding scraping tools or work to be scraped
- 79/12 • Machines or devices for peeling bars or tubes by making use of cutting bits arranged around the workpiece, otherwise than by turning (by turning B23B 5/12) [2]

81/00 Methods, machines, or devices for working metal, covered by more than one main group in this subclass (in combination with other metal-working operations B23P 13/00, B23P 23/00)

B23F MAKING GEARS OR TOOTHED RACKS (by stamping B21D; by rolling B21H; by forging or pressing B21K; by casting B22; arrangements for copying or controlling B23Q; machines or devices for grinding or polishing, in general B24B)

Note(s)

- This subclass covers:
 - the use of methods or apparatus specially designed to produce accurately the shapes of gear teeth which are essential for proper intermeshing of toothed gearing elements to ensure the required relative motions;
 - the use of similar methods or apparatus in the production of other articles of toothed or like form, e.g. dog clutches, splined shafts, milling cutters.
- This subclass does not cover the production of such other articles of toothed or like form using methods or apparatus other than those mentioned under Note (1) above.
- In this subclass, the following terms or expressions are used with the meanings indicated:
 - "gear teeth" covers the teeth or lobes of other accurately-intermeshing members having relative movement of a similar kind, such as rotors of rotary pumps and blowers;
 - "profile" may include the outline of both faces or only one face of a tooth, or the opposing faces of adjacent teeth;
 - "straight" means that a tooth as a whole (ignoring any curvature of the tooth-face alone, e.g. crowning) is straight in the direction of its length, for example as seen in the direction of a radius of a spur wheel. It accordingly includes the teeth of helical gears and of the normal type of bevel gear;
 - "broach-milling" means milling with a rotary cutter having a number of teeth of progressively increasing depth or width.

Subclass index

MAKING GEAR TEETH

General methods.....	1/00, 3/00, 17/00
Making teeth with special shape.....	5/00, 7/00, 9/00, 15/00, 17/00
Finishing.....	19/00
Tools; accessories.....	21/00, 23/00

MAKING WORMS

Methods.....	13/00
Worm wheels.....	11/00
Accessories.....	23/00

MAKING OTHER GEARING WHEELS OF SPECIAL TYPE.....15/00

1/00	Making gear teeth by tools of which the profile matches the profile of the required surface (special adaptations for making curved teeth B23F 9/00)	5/18	• • the tool having the same profile as a tooth of a crown wheel
1/02	• by grinding	5/20	• by milling
1/04	• by planing or slotting	5/22	• • the tool being a hob for making spur gears
1/06	• by milling	5/24	• • the tool being a hob for making bevel gears
1/08	• by broaching; by broach-milling	5/26	• • the tool having the same profile as a tooth or teeth of a rack, for making spur gears
3/00	Making gear teeth involving copying operations controlled by templates having a profile which matches that of the required tooth face or part thereof or a copy thereof to a different scale (copying systems or devices <u>per se</u> B23Q 35/00)	5/27	• • the tool having the same profile as a tooth or teeth of a crown or bevel wheel [2]
		5/28	• by broaching; by broach-milling
5/00	Making straight gear teeth involving moving a tool relatively to a workpiece with a rolling-off or an enveloping motion with respect to the gear teeth to be made	7/00	Making herring-bone gear teeth
5/02	• by grinding	9/00	Making gears having teeth curved in their longitudinal direction
5/04	• • the tool being a grinding worm	9/02	• by grinding
5/06	• • the tool being a grinding disc with a plane front surface	9/04	• by planing or slotting with reciprocating cutting tools
5/08	• • the tool being a grinding disc having the same profile as the tooth or teeth of a rack	9/06	• • having a shape similar to a spur wheel of part thereof
5/10	• • the tool being a grinding disc having the same profile as the tooth or teeth of a crown or bevel wheel	9/07	• • having a shape similar to a crown wheel or a part thereof [2]
5/12	• by planing or slotting	9/08	• by milling, e.g. with helicoidal hob
5/14	• • the tool having the same profile as a tooth or teeth of a rack	9/10	• • with a face-mill
5/16	• • the tool having a shape similar to that of a spur wheel or part thereof	9/12	• • • for non-continuous generating processes [2]
		9/14	• • • for continuous generating processes [2]
		11/00	Making worm wheels, e.g. by hobbing
		13/00	Making worms by methods essentially requiring the use of machines of the gear-cutting type (making screw-thread B23G)
		13/02	• Making worms of cylindrical shape

B23F

- 13/04 • • by grinding
- 13/06 • Making worms of globoidal shape
- 13/08 • • by grinding
- 15/00 Methods or machines for making gear wheels of special kinds, not covered by groups B23F 7/00-B23F 13/00**
- 15/02 • Making gear teeth on wheels of varying radius of operation, e.g. on elliptical wheels
- 15/04 • Making fine-pitch gear teeth on clock wheels or the like by special machining
- 15/06 • Making gear teeth on the front surface of wheels, e.g. for clutches or couplings with toothed faces
- 15/08 • Making intermeshing rotors, e.g. of pumps
- 17/00 Special methods or machines for making gear teeth, not covered by groups B23F 1/00-B23F 15/00**
- 19/00 Finishing gear teeth by other tools than those used for manufacturing gear teeth**
- 19/02 • Lapping gear teeth
- 19/04 • • Lapping spur gears by making use of a correspondingly shaped counterpart
- 19/05 • Honing gear teeth [2]
- 19/06 • Shaving the faces of gear teeth
- 19/10 • Chamfering the end edges of gear teeth
- 19/12 • • by grinding
- 21/00 Tools specially adapted for use in machines for manufacturing gear teeth**
- 21/02 • Grinding discs; Grinding worms (truing grinding tools B24B; grinding tools in general B24D)
- 21/03 • Honing tools [2]
- 21/04 • Planing or slotting tools
- 21/06 • • having a profile which matches a gear tooth profile
- 21/08 • • having the same profile as a tooth or teeth of a rack
- 21/10 • • Gear-shaper cutters having a shape similar to a spur wheel or part thereof
- 21/12 • Milling tools
- 21/14 • • Profile cutters of disc type
- 21/16 • • Hobs
- 21/18 • • • Taper hobs, e.g. for bevel gears
- 21/20 • • Fly cutters
- 21/22 • • Face-mills for longitudinally-curved gear teeth
- 21/23 • • • with cutter teeth arranged on a spiral curve for continuous generating processes [2]
- 21/24 • Broach-milling tools
- 21/26 • Broaching tools
- 21/28 • Shaving cutters
- 23/00 Accessories or equipment combined with or arranged in, or specially designed to form part of, gear-cutting machines** (accessories or equipment not restricted to gear-cutting machines B23Q; tool-guiding mechanisms, *see* the relevant groups for making gear teeth)
- 23/02 • Loading or chucking arrangements for workpieces
- 23/04 • • Loading arrangements
- 23/06 • • Chucking arrangements
- 23/08 • Index mechanisms
- 23/10 • Arrangements for compensating irregularities in drives or indexing mechanisms
- 23/12 • Other devices, e.g. tool holders; Checking devices for controlling workpieces in machines for manufacturing gear teeth

B23G THREAD CUTTING; WORKING OF SCREWS, BOLT HEADS OR NUTS, IN CONJUNCTION THEREWITH (thread-forming by corrugating tubes B21D 15/04, by rolling B21H 3/02, by forging, pressing or hammering B21K 1/56; making helical grooves by turning B23B 5/48, by milling B23C 3/32, by grinding B24B 19/02; arrangements for copying or controlling B23Q)

Note(s)

In this subclass, the following expression is used with the meaning indicated:

- "thread cutting" includes the use of tools similar both in form and in manner of use to thread-cutting tools, but without removing any material.

Subclass index

THREAD-CUTTING METHODS, MACHINES OR DEVICES THEREFOR.....	1/00, 3/00, 7/00, 9/00
FINISHING.....	9/00
TOOLS.....	5/00, 7/02
ACCESSORIES.....	11/00

- 1/00 Thread cutting; Automatic machines specially designed therefor**
- 1/02 • on an external or internal cylindrical or conical surface, e.g. on recesses (B23G 1/16, B23G 1/22, B23G 1/32, B23G 1/36 take precedence)
- 1/04 • • Machines with one working-spindle
- 1/06 • • • specially adapted for making conical screws, e.g. wood-screws
- 1/08 • • Machines with a plurality of working-spindles
- 1/10 • • • specially adapted for making conical screws, e.g. wood-screws
- 1/12 • • Machines with a toothed cutter in the shape of a spur gear or the like which is rotated to generate the thread profile as the work rotates
- 1/14 • • • specially adapted for making conical screws, e.g. wood-screws
- 1/16 • in holes of workpieces by taps (B23G 1/26, B23G 1/32, B23G 1/36 take precedence)
- 1/18 • • Machines with one working-spindle
- 1/20 • • Machines with a plurality of working-spindles
- 1/22 • Machines specially designed for operating on pipes or tubes
- 1/24 • • portable

- 1/26 • Manually-operated thread-cutting devices (features of the threading tool B23G 5/00)
- 1/28 • • with means for adjusting the threading tool
- 1/30 • • without means for adjusting the threading tool, e.g. with die-stocks (tap wrenches B25B)
- 1/32 • by milling
- 1/34 • • with a cutting bit moving in a closed path arranged eccentrically with respect to the axis of the rotating workpiece
- 1/36 • by grinding
- 1/38 • • with grinding discs guided along the workpiece in accordance with the pitch of the required thread
- 1/40 • • with grinding discs guided radially to the workpiece
- 1/42 • Centreless grinding
- 1/44 • Equipment or accessories specially designed for machines or devices for thread cutting
- 1/46 • • for holding the threading tools
- 1/48 • • for guiding the threading tools
- 1/50 • • for cutting thread by successive operations
- 1/52 • • for operating on pipes or tubes

- 3/00 Arrangements or accessories for enabling machine tools not specially designed only for thread cutting to be used for this purpose, e.g. arrangements for reversing the working-spindle**
- 3/02 • for withdrawing or resetting the threading tool
- 3/04 • • for repeatedly setting the threading tool in a predetermined working position
- 3/06 • for compensating inaccuracies in the pitch of the lead-screw
- 3/08 • for advancing or controlling the threading tool or the work by templates, cams, or the like
- 3/10 • • for cutting thread of variable pitch

- 3/12 • • for using several adjacently-arranged threading tools, e.g. using several chasers
- 3/14 • • for cutting thread of conical shape

- 5/00 Thread-cutting tools; Die-heads**
- 5/02 • without means for adjustment
- 5/04 • • Dies
- 5/06 • • Taps (chucks therefor B23B 31/00)
- 5/08 • with means for adjustment
- 5/10 • • Die-heads
- 5/12 • • • self-releasing
- 5/14 • • Tapping-heads
- 5/16 • • • self-releasing
- 5/18 • Milling cutters
- 5/20 • combined with other tools, e.g. drills

- 7/00 Forming thread by means of tools similar both in form and in manner of use to thread-cutting tools, but without removing any material (features of machines or devices not specially adapted to the particular mode of forming the thread B23G 1/00)**
- 7/02 • Tools for this purpose

- 9/00 Working screws, bolt heads or nuts in conjunction with thread cutting, e.g. slotting screw heads or shanks, removing burrs from screw heads or shanks; Finishing, e.g. polishing, any screw thread (making washers or nuts by processing metal sheets, tubes or profiles without essentially removing material B21D 53/20, B21D 53/24)**

- 11/00 Feeding or discharging mechanisms combined with, or arranged in, or specially adapted for use in connection with, thread-cutting machines (for machine tools in general B23Q)**

B23H WORKING OF METAL BY THE ACTION OF A HIGH CONCENTRATION OF ELECTRIC CURRENT ON A WORKPIECE USING AN ELECTRODE WHICH TAKES THE PLACE OF A TOOL; SUCH WORKING COMBINED WITH OTHER FORMS OF WORKING OF METAL (processes for the electrolytic or electrophoretic production of coatings, electroforming, or apparatus therefor C25D; processes for the electrolytic removal of material from objects C25F; manufacturing printed circuits using precipitation techniques to apply the conductive material to form the desired conductive pattern H05K 3/18) [4]

Note(s)

This subclass covers the working of metal described as "electroerosion".

Subclass index

ELECTRICAL DISCHARGE MACHINING.....	1/00
ELECTROCHEMICAL MACHINING.....	3/00
COMBINED MACHINING.....	5/00
COMMON PROCESSES OR APPARATUS.....	7/00
MACHINING PARTICULAR OBJECTS OR OBTAINING SPECIAL EFFECTS OR RESULTS.....	9/00
AUXILIARY APPARATUS OR DETAILS.....	11/00

- 1/00 Electrical discharge machining, i.e. removing metal with a series of rapidly recurring electrical discharges between an electrode and a workpiece in the presence of a fluid dielectric [4]**
- 1/02 • Electric circuits specially adapted therefor, e.g. power supply, control, preventing short circuits or other abnormal discharges [4]
- 1/04 • Electrodes specially adapted therefor or their manufacture (B23H 9/00 takes precedence) [4]
- 1/06 • • Electrode material [4]
- 1/08 • Working media [4]
- 1/10 • Supply or regeneration of working media [4]

- 3/00 Electrochemical machining, i.e. removing metal by passing current between an electrode and a workpiece in the presence of an electrolyte [4]**
- 3/02 • Electric circuits specially adapted therefor, e.g. power supply, control, preventing short circuits [4]

B23H

- 3/04 • Electrodes specially adapted therefor or their manufacture (B23H 9/00 takes precedence) [4]
- 3/06 • • Electrode material [4]
- 3/08 • Working media [4]
- 3/10 • Supply or regeneration of working media [4]
- 5/00 Combined machining [4]**
- 5/02 • Electrical discharge machining combined with electrochemical machining [4]
- 5/04 • Electrical discharge machining combined with mechanical working [4]
- 5/06 • Electrochemical machining combined with mechanical working, e.g. grinding or honing [4]
- 5/08 • • Electrolytic grinding [4]
- 5/10 • Electrodes specially adapted therefor or their manufacture (B23H 1/04, B23H 3/04 take precedence) [4]
- 5/12 • Working media [4]
- 5/14 • Supply or regeneration of working media [4]
- 7/00 Processes or apparatus applicable to both electrical discharge machining and electrochemical machining [4]**
- 7/02 • Wire-cutting [4]
- 7/04 • • Apparatus for supplying current to working gap; Electric circuits specially adapted therefor [4]
- 7/06 • • Control of the travel curve of the relative movement between electrode and workpiece [4]
- 7/08 • • Wire electrodes [4]
- 7/10 • • • Supporting, winding or electrical connection of wire-electrode [4]
- 7/12 • Rotating-disc electrodes [4]
- 7/14 • Electric circuits specially adapted therefor, e.g. power supply [4]
- 7/16 • • for preventing short circuits or other abnormal discharges [4]
- 7/18 • • for maintaining or controlling the desired spacing between electrode and workpiece [4]
- 7/20 • • for programme-control, e.g. adaptive [4]
- 7/22 • Electrodes specially adapted therefor or their manufacture (B23H 7/08, B23H 7/12, B23H 9/00 take precedence) [4]
- 7/24 • • Electrode material [4]
- 7/26 • Apparatus for moving or positioning electrode relatively to workpiece; Mounting of electrode [4]
- 7/28 • • Moving electrode in a plane normal to the feed direction, e.g. orbiting [4]
- 7/30 • • Moving electrode in the feed direction (B23H 7/32 takes precedence) [4]
- 7/32 • • Maintaining desired spacing between electrode and workpiece [4]
- 7/34 • Working media [4]
- 7/36 • Supply or regeneration of working media [4]
- 7/38 • Influencing metal working by using specially adapted means not directly involved in the removal of metal, e.g. ultrasonic waves, magnetic fields or laser irradiation [4]
- 9/00 Machining specially adapted for treating particular metal objects or for obtaining special effects or results on metal objects (heat treatment by cathodic discharge C21D 1/38) [4]**
- 9/02 • Trimming or deburring [4]
- 9/04 • Treating surfaces of rolls [4]
- 9/06 • Marking or engraving [4]
- 9/08 • Sharpening [4]
- 9/10 • Working turbine blades or nozzles [4]
- 9/12 • Forming parts of complementary shape, e.g. punch-and-die [4]
- 9/14 • Making holes [4]
- 9/16 • • using an electrolytic jet [4]
- 9/18 • Producing external conical surfaces or spikes (B23H 9/08 takes precedence) [4]
- 11/00 Auxiliary apparatus or details, not otherwise provided for [4]**

B23K SOLDERING OR UNSOLDERING; WELDING; CLADDING OR PLATING BY SOLDERING OR WELDING; CUTTING BY APPLYING HEAT LOCALLY, e.g. FLAME CUTTING; WORKING BY LASER BEAM (making metal-coated products by extruding metal B21C 23/22; building up linings or coverings by casting B22D 19/08; casting by dipping B22D 23/04; manufacture of composite layers by sintering metal powder B22F 7/00; arrangements on machine tools for copying or controlling B23Q; covering metals or covering materials with metals, not otherwise provided for C23C; burners F23D)

Note(s)

1. This subclass covers also electric circuits specially adapted for the purposes covered by the title of the subclass.
2. In this subclass, the following term is used with the meaning indicated:
 - "soldering" means uniting metals using solder and applying heat without melting either of the parts to be united.
3. In groups B23K 1/00-B23K 31/00, it is desirable to add the indexing codes of groups B23K 101/00 or B23K 103/00.

Subclass index

SOLDERING.....	1/00, 3/00
WELDING	
Characterised by the means used to produce heat	
by flame.....	5/00
by electricity.....	9/00, 11/00, 13/00
by means of plasma.....	10/00
by nuclear particles.....	15/00, 17/00
by alumino-thermic means.....	23/00
by laser beam.....	26/00
otherwise.....	25/00, 28/00
Characterised by the use of impact or pressure.....	20/00

Characterised by other features, processes not restricted to one particular group of this subclass.....	28/00
CUTTING BY APPLYING HEAT LOCALLY; SEVERING.....	7/00, 9/00, 15/00, 26/00, 28/00, 11/00
SCARFING, DESURFACING.....	7/00
MATERIALS; AUXILIARY DEVICES.....	35/00, 37/00
SPECIAL PROCESSES.....	31/00, 33/00

Soldering, e.g. brazing, or unsoldering

- 1/00 Soldering, e.g. brazing, or unsoldering** (B23K 3/00 takes precedence; characterised only by the use of special materials or media B23K 35/00; dip or wave soldering in the manufacture of printed circuits H05K 3/34) [5]
- 1/002 • Soldering by means of induction heating [5]
 - 1/005 • Soldering by means of radiant energy [5]
 - 1/008 • Soldering within a furnace (B23K 1/012 takes precedence) [5]
 - 1/012 • Soldering with the use of hot gas [5]
 - 1/015 • • Vapour-condensation soldering [5]
 - 1/018 • Unsoldering; Removal of melted solder or other residues [5]
 - 1/06 • making use of vibrations, e.g. supersonic vibrations
 - 1/08 • Soldering by means of dipping in molten solder
 - 1/14 • specially adapted for soldering seams (making tubes involving operations other than soldering B21C) [5]
 - 1/16 • • longitudinal seams, e.g. of shells [5]
 - 1/18 • • circumferential seams, e.g. of shells [5]
 - 1/19 • taking account of the properties of the materials to be soldered [3]
 - 1/20 • Preliminary treatment of work or areas to be soldered, e.g. in respect of a galvanic coating (preparation of surfaces in particular ways, see the relevant classes for the treatments or the materials treated, e.g. C04B, C23C)
- 3/00 Tools, devices, or special appurtenances for soldering, e.g. brazing, or unsoldering, not specially adapted for particular methods** (materials used for soldering B23K 35/00) [5]
- 3/02 • Soldering irons; Bits
 - 3/03 • • electrically heated [5]
 - 3/04 • Heating appliances (soldering lamps or blow-pipes F23D; electric heating in general H05B)
 - 3/047 • • electric [5]
 - 3/053 • • • using resistance wires [5]
 - 3/06 • Solder feeding devices; Solder melting pans
 - 3/08 • Auxiliary devices therefor (cleaning pipes or tubes or systems of pipes or tubes, e.g. before soldering, B08B 9/02) [5]

Flame welding or cutting

- 5/00 Gas flame welding**
- 5/02 • Seam welding (making tubes involving operations other than welding B21C)
 - 5/04 • • using additional profiled strips or like of welding metal along seam edges
 - 5/06 • • Welding longitudinal seams
 - 5/08 • • Welding circumferential seams
 - 5/10 • Welding workpieces essentially comprising layers of different metals, e.g. plated workpieces

- 5/12 • taking account of the properties of the material to be welded
 - 5/14 • • of non-ferrous metals (B23K 5/16 takes precedence)
 - 5/16 • • of different metals
 - 5/18 • for purposes other than joining parts, e.g. built-up welding
 - 5/20 • making use of vibrations, e.g. supersonic vibrations
 - 5/213 • Preliminary treatment [3]
 - 5/22 • Auxiliary equipment, e.g. backings, guides
 - 5/24 • • Arrangements for supporting torches (not restricted to flame welding B23K 37/02)
- 7/00 Cutting, scarfing, or desurfacing by applying flames**
- 7/06 • Machines, apparatus, or equipment specially designed for scarfing or desurfacing
 - 7/08 • by applying additional compounds or means favouring the cutting, scarfing, or desurfacing procedure
 - 7/10 • Auxiliary devices, e.g. for guiding or supporting the torch (guiding means applicable to other metal-working machines B23Q)

Electric welding or cutting

- 9/00 Arc welding or cutting** (electro-slag welding B23K 25/00; welding transformers H01F; welding generators H02K)
- 9/007 • Spot arc welding [5]
 - 9/013 • Arc cutting, gouging, scarfing or desurfacing [5]
 - 9/02 • Seam welding; Backing means; Inserts
 - 9/022 • • Welding by making use of electrode vibrations [5]
 - 9/025 • • for rectilinear seams [5]
 - 9/028 • • for curved planar seams [5]
 - 9/032 • • for three-dimensional seams [5]
 - 9/035 • • with backing means disposed under the seam [5]
 - 9/038 • • using moulding means (not restricted to arc welding B23K 37/06) [5]
 - 9/04 • Welding for other purposes than joining, e.g. built-up welding
 - 9/06 • Arrangements or circuits for starting the arc, e.g. by generating ignition voltage, or for stabilising the arc [5]
 - 9/067 • • Starting the arc [5]
 - 9/073 • • Stabilising the arc [5]
 - 9/08 • Arrangements or circuits for magnetic control of the arc
 - 9/09 • Arrangements or circuits for arc welding with pulsed current or voltage [3]
 - 9/095 • Monitoring or automatic control of welding parameters [5]
 - 9/10 • Other electric circuits therefor; Protective circuits; Remote controls
 - 9/12 • Automatic feeding or moving of electrodes or work for spot or seam welding or cutting

B23K

- 9/127 • • Means for tracking lines during arc welding or cutting (copying in general B23Q 35/00) [5]
- 9/133 • • Means for feeding electrodes, e.g. drums, rolls, motors [5]
- 9/14 • making use of insulated electrodes
- 9/16 • making use of shielding gas
- 9/167 • • and of a non-consumable electrode [5]
- 9/173 • • and of consumable electrode [5]
- 9/18 • Submerged-arc welding
- 9/20 • Stud welding
- 9/22 • Percussion welding
- 9/23 • taking account of the properties of the materials to be welded [3]
- 9/235 • Preliminary treatment [3]
- 9/24 • Features related to electrodes (form or composition of electrodes B23K 35/00)
- 9/26 • • Accessories for electrodes, e.g. ignition tips
- 9/28 • • Supporting devices for electrodes (not restricted to arc welding or cutting B23K 37/02)
- 9/29 • • • Supporting devices adapted for making use of shielding means [5]
- 9/30 • • • Vibrating holders for electrodes (B23K 9/022 takes precedence) [5]
- 9/32 • Accessories (earthing connections H01R)

10/00 Welding or cutting by means of a plasma [5]

- 10/02 • Plasma welding [5]

11/00 Resistance welding; Severing by resistance heating

- 11/02 • Pressure butt welding
- 11/04 • Flash butt welding
- 11/06 • using roller electrodes
- 11/08 • Seam welding not restricted to one of the preceding subgroups
- 11/087 • • for rectilinear seams [5]
- 11/093 • • for curved planar seams [5]
- 11/10 • Spot welding; Stitch welding
- 11/11 • • Spot welding [5]
- 11/12 • • making use of vibrations
- 11/14 • Projection welding
- 11/16 • taking account of the properties of the material to be welded
- 11/18 • • of non-ferrous metals (B23K 11/20 takes precedence)
- 11/20 • • of different metals
- 11/22 • Severing by resistance heating
- 11/24 • Electric supply or control circuits therefor
- 11/25 • • Monitoring devices [5]
- 11/26 • • Storage discharge welding
- 11/28 • Portable welding equipment
- 11/30 • Features relating to electrodes (form or composition of electrodes B23K 35/00)
- 11/31 • • Electrode holders (not restricted to resistance welding or severing by resistance heating B23K 37/02) [5]
- 11/34 • Preliminary treatment [3]
- 11/36 • Auxiliary equipment (B23K 11/31 takes precedence) [3, 5]

13/00 Welding by high-frequency current heating [5]

- 13/01 • by induction heating [5]
- 13/02 • • Seam welding
- 13/04 • by conduction heating [5]

- 13/06 • characterised by the shielding of the welding zone against influence of the surrounding atmosphere (selection of media B23K 35/38) [5]
- 13/08 • Electric supply or control circuits therefor [5]

Other welding or cutting: Working by laser beam [3]

- 15/00 **Electron-beam welding or cutting** (electron- or ion-beam tubes H01J 37/00)
- 15/02 • Control circuits therefor [5]
- 15/04 • for welding annular seams [5]
- 15/06 • within a vacuum chamber (B23K 15/04 takes precedence) [5]
- 15/08 • Removing material, e.g. by cutting, by hole drilling [5]
- 15/10 • Non-vacuum electron beam-welding or cutting [5]
- 17/00 **Use of the energy of nuclear particles in welding or related techniques**
- 20/00 **Non-electric welding by applying impact or other pressure, with or without the application of heat, e.g. cladding or plating [3]**
- 20/02 • by means of a press [3]
- 20/04 • by means of a rolling mill [3]
- 20/06 • by means of high energy impulses, e.g. magnetic energy [3]
- 20/08 • • Explosive welding [3]
- 20/10 • making use of vibrations, e.g. ultrasonic welding [3]
- 20/12 • the heat being generated by friction; Friction welding [3]
- 20/14 • Preventing or minimising gas access, or using protective gases or vacuum during welding (formed by material interposed between workpieces B23K 20/18) [3]
- 20/16 • with interposition of special material to facilitate connection of the parts, e.g. material for absorbing or producing gas [3]
- 20/18 • Zonal welding by interposing weld-preventing substances between zones not to be welded [3]
- 20/20 • Special methods allowing subsequent separation, e.g. of metals of high quality from scrap material [3]
- 20/22 • taking account of the properties of the materials to be welded [3]
- 20/227 • • with ferrous layer [5]
- 20/233 • • without ferrous layer [5]
- 20/24 • Preliminary treatment [3]
- 20/26 • Auxiliary equipment [3]

23/00 Alumino-thermic welding

- 25/00 **Slag welding, i.e. using a heated layer or mass of powder, slag, or the like in contact with the material to be joined** (B23K 23/00 takes precedence; submerged-arc welding B23K 9/18)

26/00 *Working by laser beam, e.g. welding, cutting or boring [2, 3, 2014.01]*

Note(s) [2014.01]

1. *This main group covers :*
 - *laser working for making a weakened layer, with or without removing material;*
 - *laser shock processing;*
 - *apparatus for laser surface treatment;*
 - *laser ablation.*
2. *This main group does not cover :*

- laser assisted deposition which is covered by subclass C23C;
 - laser sintering which is covered by group B22F 3/105 for metallic powder, by group B29C 67/04 for plastics, by group C03B 19/06 for glass or by group C04B 35/64 for ceramics;
 - laser assisted chemical etching which is covered by group C23F 1/00.
- 26/02 • Positioning or observing the workpiece, e.g. with respect to the point of impact; Aligning, aiming or focusing the laser beam [3, 2014.01]
- 26/03 • Observing, e.g. monitoring, the workpiece [7]
- 26/035 • Aligning the laser beam (automatically B23K 26/042) [2014.01]
- 26/04 • Automatically aligning, aiming or focusing the laser beam, e.g. using the back-scattered light [3, 2014.01]
- 26/042 • Automatically aligning the laser beam [2014.01]
- 26/044 • Seam tracking [2014.01]
- 26/046 • Automatically focusing the laser beam [2014.01]
- 26/06 • Shaping the laser beam, e.g. by masks or multi-focusing [3, 2014.01]
- 26/062 • by direct control of the laser beam [2014.01]
- 26/0622 • by shaping pulses [2014.01]
- 26/064 • by means of optical elements, e.g. lenses, mirrors or prisms [2014.01]
- 26/066 • by using masks [2014.01]
- 26/067 • Dividing the beam into multiple beams, e.g. multi-focusing [7]
- 26/073 • Shaping the laser spot [7]
- 26/08 • Devices involving relative movement between laser beam and workpiece [3, 2014.01]
- 26/082 • Scanning systems, i.e. devices involving movement of the laser beam relative to the laser head [2014.01]
- 26/10 • using a fixed support [3]
- 26/12 • in a special environment or atmosphere, e.g. in an enclosure [3, 2014.01]
- 26/122 • in a liquid, e.g. underwater [2014.01]
- 26/14 • using a fluid stream, e.g. a jet of gas, in conjunction with the laser beam; Nozzles therefor (B23K 26/12 takes precedence) [3, 2014.01]
- 26/142 • for the removal of by-products [2014.01]
- 26/144 • the fluid stream containing particles, e.g. powder [2014.01]
- 26/146 • the fluid stream containing a liquid [2014.01]
- 26/16 • Removal of by-products, e.g. particles or vapours produced during treatment of a workpiece (by a fluid stream B23K 26/142) [3]
- 26/18 • using absorbing layers on the workpiece, e.g. for marking or protecting purposes [3]
- 26/20 • Bonding (soldering by means of radiant energy B23K 1/005; joining of preformed plastics parts by heating using laser beam B29C 65/16) [7, 2014.01]
- 26/21 • by welding [2014.01]
- 26/211 • with interposition of special material to facilitate connection of the parts [2014.01]
- 26/22 • Spot welding [7]
- 26/24 • Seam welding [7, 2014.01]
- 26/242 • Fillet welding, i.e. involving a weld of substantially triangular cross section joining two parts [2014.01]
- 26/244 • Overlap seam welding [2014.01]
- 26/26 • of rectilinear seams [7, 2014.01]
- 26/262 • of longitudinal seams of tubes [2014.01]
- 26/28 • of curved planar seams [7, 2014.01]
- 26/282 • of tube sections [2014.01]
- 26/30 • of three-dimensional seams [7, 2014.01]
- 26/302 • of helicoidal seams [2014.01]
- 26/32 • taking account of the properties of the material involved [7, 2014.01]
- 26/322 • involving coated metal parts (using absorbing layers on the workpiece B23K 26/18) [2014.01]
- 26/323 • involving parts made of dissimilar metallic material [2014.01]
- 26/324 • involving non-metallic parts [2014.01]
- 26/34 • Laser welding for purposes other than joining [7, 2014.01]
- 26/342 • Build-up welding [2014.01]
- 26/346 • in combination with welding or cutting covered by groups B23K 5/00-B23K 25/00, e.g. in combination with resistance welding [2014.01]
- 26/348 • in combination with arc heating, e.g. TIG [tungsten inert gas], MIG [metal inert gas] or plasma welding (laser beam for starting a welding or cutting arc B23K 9/067) [2014.01]
- 26/351 • for trimming or tuning of electrical components [2014.01]
- 26/352 • for surface treatment [2014.01]
- 26/354 • by melting [2014.01]
- 26/356 • by shock processing [2014.01]
- 26/359 • by providing a line or line pattern, e.g. a dotted break initiation line [2014.01]
- 26/36 • Removing material (B23K 26/55, B23K 26/57 take precedence) [7, 2014.01]
- 26/361 • for deburring or mechanical trimming (B23K 26/351 takes precedence) [2014.01]
- 26/362 • Laser etching [2014.01]
- 26/364 • for making a groove or trench, e.g. for scribing a break initiation groove [2014.01]
- 26/38 • by boring or cutting [7, 2014.01]
- 26/382 • by boring [2014.01]
- 26/384 • of specially shaped holes [2014.01]
- 26/386 • of blind holes [2014.01]
- 26/388 • Trepanning, i.e. boring by moving the beam spot about an axis [2014.01]
- 26/40 • taking account of the properties of the material involved [7, 2014.01]
- 26/402 • involving non-metallic material, e.g. isolators [2014.01]
- 26/50 • Working by transmitting the laser beam through or within the workpiece [2014.01]
- 26/53 • for modifying or reforming the material inside the workpiece, e.g. for producing break initiation cracks [2014.01]
- 26/55 • for creating voids inside the workpiece, e.g. for forming flow passages or flow patterns [2014.01]
- 26/57 • the laser beam entering a face of the workpiece from which it is transmitted through the workpiece material to work on a different workpiece face, e.g. for effecting removal, fusion splicing, modifying or reforming [2014.01]
- 26/60 • Preliminary treatment [2014.01]
- 26/70 • Auxiliary operations or equipment [2014.01]
- 28/00** **Welding or cutting not covered by groups B23K 5/00-B23K 26/00** (joining workpieces by electrolysis C25D 2/00; electrolytic removal of materials C25F) [2]
- 28/02 • Combined welding or cutting procedures or apparatus [2, 2014.01]

- 31/00 Processes relevant to this subclass, specially adapted for particular articles or purposes, but not covered by any single one of main groups B23K 1/00-B23K 28/00** (making tubes or profiled bars involving operations other than soldering or welding B21C 37/04, B21C 37/08)
- 31/02 • relating to soldering or welding (dip or wave soldering in the manufacture of printed circuits H05K 3/34)
- 31/10 • relating to cutting or desurfacing
- 31/12 • relating to investigating the properties, e.g. the weldability, of materials [5]
- 33/00 Specially-profiled edge portions of workpieces for making soldering or welding connections; Filling the seams formed thereby**
- 35/00 Rods, electrodes, materials, or media, for use in soldering, welding, or cutting**
- 35/02 • characterised by mechanical features, e.g. shape
- 35/04 • • specially designed for use as electrodes (ignition tips for arc welding or cutting B23K 9/26)
- 35/06 • • • of non-circular cross-section; with special arrangement, e.g. internal
- 35/08 • • • • multi-cored; multiple
- 35/10 • • • • with more than one layer of coating or sheathing material
- 35/12 • • not specially designed for use as electrodes
- 35/14 • • • for soldering
- 35/16 • • • of non-circular cross-section; with special arrangement, e.g. internal (B23K 35/14 takes precedence)
- 35/18 • • • • multi-cored; multiple
- 35/20 • • • • with more than one layer of coating or sheathing material
- 35/22 • characterised by the composition or nature of the material
- 35/24 • • Selection of soldering or welding materials proper (B23K 35/34 takes precedence)
- 35/26 • • • with the principal constituent melting at less than 400°C
- 35/28 • • • with the principal constituent melting at less than 950°C
- 35/30 • • • with the principal constituent melting at less than 1550°C
- 35/32 • • • with the principal constituent melting at more than 1550°C
- 35/34 • • comprising compounds which yield metals when heated
- 35/36 • • Selection of non-metallic compositions, e.g. coatings, fluxes (B23K 35/34 takes precedence); Selection of soldering or welding materials, conjoint with selection of non-metallic compositions, both selections being of interest (selection of soldering or welding materials proper B23K 35/24) [2]
- 35/362 • • • Selection of compositions of fluxes (B23K 35/365, B23K 35/368 take precedence) [2]
- 35/363 • • • • for soldering or brazing [4]
- 35/365 • • • Selection of non-metallic compositions of coating materials either alone or conjoint with selection of soldering or welding materials [2]
- 35/368 • • • Selection of non-metallic compositions of core materials either alone or conjoint with selection of soldering or welding materials [2]

- 35/38 • • Selection of media, e.g. special atmospheres for surrounding the working area
- 35/40 • Making wire or rods for soldering or welding (processes involving a single technical art, see the relevant subclasses, e.g. B05D, B21C)

- 37/00 Auxiliary devices or processes, not specially adapted to a procedure covered by only one of the other main groups of this subclass** (eye-shields for welders worn on the operator's body or carried in the hand A61F 9/00; applicable to metal-working machines other than soldering, welding, or flame-cutting machines B23Q; other protective shields F16P 1/06)
- 37/02 • Carriages for supporting the welding or cutting element
- 37/04 • for holding or positioning work
- 37/047 • • moving work to adjust its position between soldering, welding or cutting steps (B23K 37/053 takes precedence) [5]
- 37/053 • • aligning cylindrical work; Clamping devices therefor [5]
- 37/06 • for positioning the molten material, e.g. confining it to a desired area
- 37/08 • for flash removal [5]

Indexing scheme associated with groups B23K 1/00-B23K 31/00, relating to articles made by soldering, welding or cutting or to materials to be soldered, welded or cut. [5]

101/00 Articles made by soldering, welding or cutting [5]

- 101/02 • Honeycomb structures [5]
- 101/04 • Tubular or hollow articles [5]
- 101/06 • • Tubes [5]
- 101/08 • • • finned or ribbed [5]
- 101/10 • • Pipe-lines [5]
- 101/12 • • Vessels [5]
- 101/14 • • Heat exchangers [5]
- 101/16 • Bands or sheets of indefinite length [5]
- 101/18 • Sheet panels [5]
- 101/20 • Tools [5]
- 101/22 • Nets, wire fabrics or the like [5]
- 101/24 • Frameworks [5]
- 101/26 • Railway- or like rails [5]
- 101/28 • Beams [5]
- 101/30 • Chains, hoops or rings [5]
- 101/32 • Wires [5]
- 101/34 • Coated articles [5]
- 101/36 • Electric or electronic devices [5]
- 101/38 • • Conductors [5]
- 101/40 • • Semiconductor devices [5]
- 101/42 • • Printed circuits [5]

103/00 Materials to be soldered, welded or cut [5]

- 103/02 • Iron or ferrous alloys [5]
- 103/04 • • Steel alloys [5]
- 103/06 • • Cast-iron alloys [5]
- 103/08 • Non-ferrous metals or alloys [5]
- 103/10 • • Aluminium or alloys thereof [5]
- 103/12 • • Copper or alloys thereof [5]
- 103/14 • • Titanium or alloys thereof [5]
- 103/16 • Composite materials [5]
- 103/18 • Dissimilar materials [5]
- 103/20 • • Ferrous alloys and aluminium or alloys thereof [5]
- 103/22 • • Ferrous alloys and copper or alloys thereof [5]
- 103/24 • • Ferrous alloys and titanium or alloys thereof [5]

B23P OTHER WORKING OF METAL; COMBINED OPERATIONS; UNIVERSAL MACHINE TOOLS (arrangements for copying or controlling B23Q)

Note(s)

1. This subclass does not cover non-mechanical operations on non-metallic materials unless such operations are specially mentioned in this subclass.
2. In this subclass, the following expressions are used with the meanings indicated:
 - "combined operations" excludes the assembling of parts if it is an essential feature of the next metal-working operation, since it is not regarded as an operation per se;
 - "working of metal" and equivalent expressions include non-mechanical treatment of metal so far as it is not provided for in any other class or subclass, for example, in C21D, C22C, C22F, C23. Thus, combinations of such non-mechanical treatment with other metal-working are classified in this subclass.
3. Attention is drawn to the Notes following the title of class B23.

Subclass index

METAL-WORKING PROCESSES

Setting of diamonds.....	5/00
Reconditioning; finishing.....	6/00, 9/00
Connecting or disconnecting.....	11/00, 19/00, 21/00
Other processes.....	6/00, 13/00, 15/00, 17/00
Auxiliary treatments.....	25/00

COMBINED PROCESSES; MULTI-PURPOSE MACHINES

Reconditioning; finishing.....	6/00, 9/00
Other combined operations.....	6/00, 23/00
Auxiliary treatments.....	25/00

5/00	Setting gems or the like on metal parts, e.g. diamonds on tools	13/00	Making metal objects by operations essentially involving machining but not covered by a single other subclass (making specific objects B23P 15/00)
6/00	Restoring or reconditioning objects (straightening or restoring form of sheet metal, metal rods, metal tubes, metal profiles, or specific articles made therefrom B21D 1/00, B21D 3/00; repairing defective or damaged objects by casting techniques B22D 19/10; procedures or apparatus covered by a single other subclass, <u>see</u> the relevant subclass) [3]	13/02	• in which only the machining operations are important
6/02	• Pistons or cylinders [3]	13/04	• involving slicing of profiled material
6/04	• Repairing fractures or cracked metal parts or products, e.g. castings [3]	15/00	Making specific metal objects by operations not covered by a single other subclass or a group in this subclass
9/00	Treating or finishing surfaces mechanically, with or without calibrating, primarily to resist wear or impact, e.g. smoothing or roughening turbine blades or bearings (treatment covered by a single other subclass, <u>see</u> the relevant subclass, e.g. B24C, C21D 7/00, C22F 1/00); Features of such surfaces not otherwise provided for, their treatment being unspecified	15/02	• turbine or like blades from one piece
9/02	• Treating or finishing by applying pressure, e.g. knurling (B23P 9/04 takes precedence)	15/04	• turbine or like blades from several pieces
9/04	• Treating or finishing by hammering or applying repeated pressure	15/06	• piston rings from one piece
11/00	Connecting or disconnecting metal parts or objects by metal-working techniques, not otherwise provided for (connecting sheet metal or metal tubes, rods or profiles B21D 39/00; riveting B21J; soldering, unsoldering, welding B23K; hand tools for connecting wire or strip B25B 25/00; connecting metal parts by adhesives F16B 11/00) [1, 7]	15/08	• piston rings from several pieces
11/02	• by first expanding and then shrinking or <u>vice versa</u> , e.g. by using pressure fluids; by making force fits	15/10	• pistons
		15/12	• gratings
		15/14	• gear parts, e.g. gear wheels
		15/16	• plates with holes of very small diameter e.g. for spinning or burner nozzles
		15/18	• brake shoes
		15/20	• railroad requirements, e.g. buffers
		15/22	• cartridges or like shells
		15/24	• dies (B21C 3/18, B21C 25/10, B21D 37/20 take precedence)
		15/26	• heat exchangers
		15/28	• cutting tools (sawing tools B23D 63/00, B23D 65/00; files or rasps B23D 73/00)
		15/30	• • lathes or like tools
		15/32	• • twist-drills
		15/34	• • milling cutters
		15/36	• • • for thread cutting
		15/38	• • planing or slotting tools (B23P 15/30 takes precedence)
		15/40	• • shearing tools
		15/42	• • broaching tools
		15/44	• • scraping or shaving tools
		15/46	• • reaming tools

B23P

- 15/48 • • threading tools (milling cutters for thread-cutting B23P 15/36)
- 15/50 • • • dies
- 15/52 • • • taps
- 17/00 Metal-working operations, not covered by a single other subclass or another group in this subclass**
- 17/02 • Single metal-working processes; Machines or apparatus therefor
- 17/04 • characterised by the nature of the material involved or the kind of product independently of its shape
- 17/06 • • Making steel wool or the like
- 19/00 Machines for simply fitting together or separating metal parts or objects, or metal and non-metal parts, whether or not involving some deformation; Tools or devices therefor so far as not provided for in other classes (hand tools in general B25) [3]**
- 19/02 • for connecting objects by press fit or for detaching same (B23P 19/10 takes precedence) [1, 7]
- 19/027 • • using hydraulic or pneumatic means (B23P 19/033 takes precedence) [7]
- 19/033 • • using vibration [7]
- 19/04 • for assembling or disassembling parts (B23P 19/10 takes precedence) [1, 7]
- 19/06 • • Screw or nut setting or loosening machines
- 19/08 • • Machines for placing washers, circlips, or the like on bolts or other members

- 19/10 • Aligning parts to be fitted together [7]
- 19/12 • • Alignment of parts for insertion into bores [7]
- 21/00 Machines for assembling a multiplicity of different parts to compose units, with or without preceding or subsequent working of such parts, e.g. with programme control**
- 23/00 Machines or arrangements of machines for performing specified combinations of different metal-working operations not covered by a single other subclass (combined horizontal boring and milling machines B23B 39/02; if the particular kinds of operation are not essential B23Q 37/00-B23Q 41/00; features relating to operations covered by a single subclass, see the relevant subclass for the operation)**
- 23/02 • Machine tools for performing different machining operations (lathes, e.g. capstan lathes, B23B)
- 23/04 • for both machining and other metal-working operations
- 23/06 • Metal-working plant comprising a number of associated machines or apparatus
- 25/00 Auxiliary treatment of workpieces, before or during machining operations, to facilitate the action of the tool or the attainment of a desired final condition of the work, e.g. relief of internal stress**

B23Q DETAILS, COMPONENTS, OR ACCESSORIES FOR MACHINE TOOLS, e.g. ARRANGEMENTS FOR COPYING OR CONTROLLING (tools of the kind used in lathes or boring machines B23B 27/00); MACHINE TOOLS IN GENERAL, CHARACTERISED BY THE CONSTRUCTION OF PARTICULAR DETAILS OR COMPONENTS; COMBINATIONS OR ASSOCIATIONS OF METAL-WORKING MACHINES, NOT DIRECTED TO A PARTICULAR RESULT

Note(s)

- In this subclass, groups designating parts of machine tools cover machine tools characterised by constructional features of such parts.
- In this subclass, the following terms or expressions are used with the meanings indicated:
 - "controlling" means influencing a variable in any way, e.g. changing its direction or its value (including changing it to or from zero), maintaining it constant, limiting its range of variation;
 - "regulation" means maintaining a variable automatically at a desired value or within a desired range of values. The desired value or range may be fixed, or manually varied, or may vary with time according to a predetermined "programme" or according to variation of another variable. Regulation is a form of control;
 - "automatic control" is often used in the art as a synonym for regulation.
- Attention is drawn to the Notes following the title of class B23.

Subclass index

BASIC COMPONENTS OF MACHINE TOOLS.....	1/00, 9/00
DEVICES FOR SUPPORTING, HANDLING, OR FEEDING WORK OR TOOLS.....	3/00, 5/00, 7/00
AUXILIARY EQUIPMENT, SAFETY DEVICES.....	11/00, 13/00, 27/00
MEASURING; INDICATING; CONTROLLING	
Controlling the movements of the tool or work.....	15/00, 16/00, 23/00
Indicating.....	17/00
COPYING.....	33/00, 35/00
MACHINES COMPRISING UNITS OR SUB-ASSEMBLIES, TRANSFER MACHINES, ASSOCIATIONS OF MACHINES OR UNITS.....	37/00, 39/00, 41/00

- 1/00 Members which are comprised in the general build-up of a form of machine, particularly relatively large fixed members (B23Q 37/00 takes precedence)**
- 1/01 • Frames, beds, pillars or like members; Arrangement of ways [6]
- 1/03 • Stationary work or tool supports (B23Q 1/70 takes precedence; auxiliary tables B23Q 1/74; tailstocks B23B 23/00) [6]
- 1/25 • Movable or adjustable work or tool supports [6]

- 1/26 • • characterised by constructional features relating to the co-operation of relatively movable members; Means for preventing relative movement of such members [6]
- 1/28 • • • Means for securing sliding members in any desired position [6]
- 1/30 • • • controlled in conjunction with the feed mechanism [6]
- 1/32 • • • Relative movement obtained by co-operating spherical surfaces, e.g. ball-and-socket joints [6]
- 1/34 • • • Relative movement obtained by use of deformable elements, e.g. piezo-electric, magnetostrictive, elastic or thermally-dilatable elements (sensitive elements capable of producing movement or displacement for purposes not limited to measurement G12B 1/00) [6]
- 1/36 • • • • Springs [6]
- 1/38 • • • using fluid bearings or fluid cushion supports [6]
- 1/40 • • • using ball, roller or wheel arrangements [6]
- 1/42 • • • using T-, V-, dovetail-section or like guides (B23Q 1/40 takes precedence) [6]
- 1/44 • • using particular mechanisms (B23Q 1/26 takes precedence) [6]
- Note(s)**
1. In this group, the following expressions are used with the meaning indicated:
- "sliding pair" means a pair consisting of two elements operating in such a way that only straight line movement between both elements is possible;
 - "rotating pair" means a pair consisting of two elements operating in such a way that only rotary movement between both elements is possible;
 - "screw pair" means a pair consisting of two elements operating in such a way as to produce simultaneous rotation and axial translation between both elements.
2. In this group, where more than one pair of elements is provided on the same axis for the same kind of movement, the pairs are regarded as a single pair for the purposes of classification.
- 1/46 • • • with screw pairs [6]
- 1/48 • • • with sliding pairs and rotating pairs (B23Q 1/46 takes precedence) [6]
- 1/50 • • • with rotating pairs only [6]
- 1/52 • • • • a single rotating pair [6]
- 1/54 • • • • two rotating pairs only [6]
- 1/56 • • • with sliding pairs only [6]
- 1/58 • • • • a single sliding pair [6]
- 1/60 • • • • two sliding pairs only [6]
- 1/62 • • • • • with perpendicular axes, e.g. cross-slides [6]
- 1/64 • • characterised by the purpose of the movement (indexing equipment B23Q 16/02) [6]
- 1/66 • • • Work-tables interchangeably movable into operating positions [6]
- 1/68 • • • for withdrawing tool or work during reverse movement [6]
- 1/70 • Stationary or movable members for carrying working-spindles for attachment of tools or work (headstocks or the like, working-spindle supports B23B 19/00; working-spindles B23B 19/02) [6]
- 1/72 • Auxiliary arrangements; Interconnections between auxiliary tables and movable machine elements [6]
- 1/74 • • Auxiliary tables [6]
- 1/76 • • Steadies; Rests [6]
- 3/00 Devices holding, supporting, or positioning, work or tools, of a kind normally removable from the machine** (work-tables or other parts, e.g. faceplates, normally not incorporating means for securing work B23Q 1/00; automatic position control B23Q 15/00; rotary tool heads for turning-machines B23B 3/24, B23B 3/26; non-driven tool holders B23B 29/00; general features of turrets B23B 29/24; tools or bench devices for fastening, connecting, disengaging or holding B25B)
- 3/02 • for mounting on a work-table, tool-slide, or analogous part (B23Q 3/15 takes precedence)
- 3/04 • • adjustable in inclination
- 3/06 • • Work-clamping means
- 3/08 • • • other than mechanically-actuated
- 3/10 • • Auxiliary devices, e.g. bolsters, extension members
- 3/12 • for securing to a spindle in general (B23Q 3/152 takes precedence; chucks B23B 31/02)
- 3/14 • • Mandrels in general (expansion mandrels B23B 31/40)
- 3/15 • Devices for holding work using magnetic or electric force acting directly on the work
- 3/152 • • Rotary devices
- 3/154 • • Stationary devices
- 3/155 • Arrangements for automatic insertion or removal of tools
- 3/157 • • of rotary tools
- 3/16 • controlled in conjunction with the operation of the tool
- 3/18 • for positioning only
- 5/00 Driving or feeding mechanisms; Control arrangements therefor** (automatic control B23Q 15/00; copying B23Q 33/00, B23Q 35/00; specially adapted for boring or drilling machines B23B 39/10, B23B 47/02)
- 5/02 • Driving main working members
- 5/027 • • reciprocating members [2]
- 5/033 • • • driven essentially by fluid pressure [2]
- 5/04 • • rotary shafts, e.g. working-spindles
- 5/06 • • • driven essentially by fluid pressure or pneumatic power
- 5/08 • • • • electrically controlled
- 5/10 • • • driven essentially by electrical means
- 5/12 • • • Mechanical drives with means for varying the speed ratio
- 5/14 • • • • step-by-step
- 5/16 • • • • infinitely-variable
- 5/18 • • • • Devices for preselecting speed of working-spindle
- 5/20 • • • Adjusting or stopping working-spindles in a predetermined position
- 5/22 • Feeding members carrying tools or work
- 5/26 • • Fluid-pressure drives [3]
- 5/28 • • Electric drives [3]
- 5/32 • • Feeding working-spindles (feeding working-spindle supports B23Q 5/34) [3]
- 5/34 • • Feeding other members supporting tools or work, e.g. saddles, tool-slides, through mechanical transmission [3]
- 5/36 • • • in which a servomotor forms an essential element [3]

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- 5/38 • • • feeding continuously [3]
- 5/40 • • • • by feed shaft, e.g. lead screw [3]
- 5/42 • • • • • Mechanism associated with headstock [3]
- 5/44 • • • • • Mechanism associated with the moving member [3]
- 5/46 • • • • • with variable speed ratio [3]
- 5/48 • • • • • by use of toothed gears [3]
- 5/50 • • • feeding step by step [3]
- 5/52 • • Limiting feed movement
- 5/54 • Arrangements or details not restricted to group B23Q 5/02 or group B23Q 5/22 respectively
- 5/56 • • Preventing backlash
- 5/58 • • Safety devices

7/00 Arrangements for handling work specially combined with or arranged in, or specially adapted for use in connection with, machine tools, e.g. for conveying, loading, positioning, discharging, sorting (incorporated in working-spindles B23B 13/00, B23B 19/02; for automatic or semi-automatic turning machines B23B 15/00) [2]

- 7/02 • by means of drums or rotating tables or discs
- 7/03 • by means of endless chain conveyors (B23Q 7/16 takes precedence) [2]
- 7/04 • by means of grippers
- 7/05 • by means of roller-ways (B23Q 7/16 takes precedence) [2]
- 7/06 • by means of pushers
- 7/08 • by means of slides or chutes
- 7/10 • by means of magazines
- 7/12 • Sorting arrangements
- 7/14 • co-ordinated in production lines
- 7/16 • Loading work on to conveyors; Arranging work on conveyors, e.g. varying spacing between individual workpieces [2]
- 7/18 • • Orienting work on conveyors [2]

9/00 Arrangements for supporting or guiding portable metal-working machines or apparatus (for tapping pipes B23B 41/08; specially designed for drilling B23B 45/14)

- 9/02 • for securing machines or apparatus to workpieces, or other parts, of particular shape, e.g. to beams of particular cross-section

Accessories

- 11/00 **Accessories fitted to machine tools for keeping tools or parts of the machine in good working condition or for cooling work; Safety devices specially combined with or arranged in, or specially adapted for use in connection with, machine tools** (in respect of boring or drilling machines B23B 47/24, B23B 47/32 take precedence; safety devices in general F16P)
- 11/02 • Devices for removing scrap from the cutting teeth of circular cutters
- 11/04 • Arrangements preventing overload of tools, e.g. restricting load
- 11/06 • Safety devices for circular cutters
- 11/08 • Protective coverings for parts of machine tools; Splash guards
- 11/10 • Arrangements for cooling or lubricating tools or work (incorporated in tools, see the relevant subclass for the tool) [1, 2006.01]
- 11/12 • Arrangements for cooling or lubricating parts of the machine (B23Q 11/14 takes precedence) [1, 2006.01]

- 11/14 • Methods or arrangements for maintaining a constant temperature in parts of machine tools [1, 2006.01]

13/00 Equipment for use with tools or cutters when not in operation, e.g. protectors for storage

Measuring; Indicating; Controlling [3]

15/00 Automatic control or regulation of feed movement, cutting velocity or position of tool or work [3]

- 15/007 • while the tool acts upon the workpiece [3]
- 15/013 • • Control or regulation of feed movement (B23Q 15/12 takes precedence) [3]
- 15/02 • • • according to the instantaneous size and the required size of the workpiece acted upon (B23Q 15/06 takes precedence) [3]
- 15/04 • • • according to the final size of the previously machined workpiece (B23Q 15/06 takes precedence) [3]
- 15/06 • • • according to measuring results produced by two or more gauging methods using different measuring principles, e.g. by both optical and mechanical gauging [3]
- 15/08 • • Control or regulation of cutting velocity (B23Q 15/12 takes precedence) [3]
- 15/10 • • • to maintain constant cutting velocity between tool and workpiece [3]
- 15/12 • • Adaptive control, i.e. adjusting itself to have a performance which is optimum according to a preassigned criterion [3]
- 15/14 • • Control or regulation of the orientation of the tool with respect to the work [3]
- 15/16 • • Compensation for wear of the tool [3]
- 15/18 • • Compensation of tool-deflection due to temperature or force [3]
- 15/20 • before or after the tool acts upon the workpiece [3]
- 15/22 • • Control or regulation of position of tool or workpiece [3]
- 15/24 • • • of linear position [3]
- 15/26 • • • of angular position [3]
- 15/28 • • with compensation for tool wear [3]

16/00 Equipment for precise positioning of tool or work into particular locations not otherwise provided for (automatic control or regulation of position of tool or work B23Q 15/22; arrangements for indicating or measuring existing or desired position of tool or work B23Q 17/22) [4]

- 16/02 • Indexing equipment (specially adapted for gear-cutting machines B23F 23/08) [4]
- 16/04 • • having intermediate members, e.g. pawls, for locking the relatively movable parts in the indexed position [4]
- 16/06 • • • Rotary indexing [4]
- 16/08 • • having means for clamping the relatively movable parts together in the indexed position [4]
- 16/10 • • • Rotary indexing [4]
- 16/12 • • using optics [4]

17/00 Arrangements for indicating or measuring on machine tools (for automatic control or regulation of feed movement, cutting velocity or position of tool or work B23Q 15/00) [3, 4]

- 17/09 • for indicating or measuring cutting pressure or cutting-tool condition, e.g. cutting ability, load on tool (arrangements preventing overload of tools B23Q 11/04; devices for indicating failure of drills during boring B23B 49/00) [4]
- 17/10 • for indicating or measuring cutting speed or number of revolutions
- 17/12 • for indicating or measuring vibration
- 17/20 • for indicating or measuring workpiece characteristics, e.g. contour, dimension, hardness [4]
- 17/22 • for indicating or measuring existing or desired position of tool or work [4]
- 17/24 • using optics [4]
- 23/00 Arrangements for compensating for irregularities or wear, e.g. of ways, of setting mechanisms** (automatic control B23Q 15/00) [3]
- 27/00 Geometrical mechanisms for the production of work of particular shapes, not fully provided for in another subclass**

Copying

Note(s)

In groups B23Q 33/00 or B23Q 35/00, the following term is used with the meaning indicated:

- "copying" covers the derivation of a required shape from a pattern, of the same or a different shape or scale, by a mechanism or equivalent means controlled by a member following the pattern. The pattern may be a model or drawing, or an element such as a cam incorporated in the operating mechanism of a machine. This term does not cover the derivation of a required shape from simple geometrical shapes, e.g. generating a cycloid by a rolling circle, which in general is provided for in group B23Q 27/00.

33/00 Methods for copying

35/00 Control systems or devices for copying directly from a pattern or a master model; Devices for use in copying manually

- 35/02 • Copying discrete points from the pattern, e.g. for determining the position of holes to be drilled
- 35/04 • using a feeler or the like travelling along the outline of the pattern, model or drawing; Feelers, patterns, or models therefor
- 35/06 • • specially adapted for controlling successive operations, e.g. separate cuts, on a workpiece
- 35/08 • • Means for transforming movement of the feeler or the like into feed movement of tool or work
- 35/10 • • • mechanically only
- 35/12 • • • involving electrical means (programme recording for copying purposes in a separate apparatus G05, G11)
- 35/121 • • • • using mechanical sensing
- 35/122 • • • • • the feeler opening or closing electrical contacts
- 35/123 • • • • • the feeler varying the impedance in a circuit
- 35/124 • • • • • • varying resistance
- 35/125 • • • • • • varying capacitance
- 35/126 • • • • • • varying inductance
- 35/127 • • • • • using non-mechanical sensing

- 35/128 • • • • • Sensing by using optical means
- 35/129 • • • • • Sensing by means of electric discharges
- 35/13 • • • • • Sensing by using magnetic means
- 35/14 • • • • • controlling one or more electromotors
- 35/16 • • • • • controlling fluid motors
- 35/18 • • • • involving fluid means (B23Q 35/16 takes precedence)
- 35/20 • • • • with special means for varying the ratio of reproduction
- 35/22 • • • • specially adapted for compensating for wear of the tool
- 35/24 • • • Feelers; Feeler units
- 35/26 • • • • designed for physical contact with a pattern or a model
- 35/28 • • • • for control of a mechanical copying system
- 35/30 • • • • for control of an electrical or electro-hydraulic copying system
- 35/32 • • • • • in which the feeler makes and breaks an electrical contact or contacts, e.g. with brush-type tracers
- 35/34 • • • • • in which the feeler varies an electrical characteristic in a circuit, e.g. capacity, frequency
- 35/36 • • • • • for control of a hydraulic or pneumatic copying system
- 35/38 • • • • • designed for sensing the pattern, model, or drawing without physical contact (sensing by means of a fluid jet B23Q 35/36)
- 35/40 • • • • • involving optical or photoelectrical systems
- 35/42 • • • Patterns; Master models
- 35/44 • • • • provided with means for adjusting the contact face, e.g. comprising flexible bands held by set-screws
- 35/46 • • • • Supporting devices therefor
- 35/48 • • • • using a feeler or the like travelling to-and-fro between opposite parts of the outline of the pattern, model, or drawing

Metal-working machines comprising units or sub-assemblies; Associations of metal-working machines or units

- 37/00 Metal-working machines, or constructional combinations thereof, built-up from units designed so that at least some of the units can form parts of different machines or combinations; Units therefor in so far as the feature of interchangeability is important** (features relating to particular metal-working operations, see the relevant subclasses, e.g. B23P 23/00)
- 39/00 Metal-working machines incorporating a plurality of sub-assemblies, each capable of performing a metal-working operation** (B23Q 33/00, B23P 23/00 take precedence; if the operations are similar and the kind of operation is essential, see the relevant subclass for the operation)
- 39/02 • the sub-assemblies being capable of being brought to act at a single operating station
- 39/04 • the sub-assemblies being arranged to operate simultaneously at different stations, e.g. with an annular work-table moved in steps (associations of machines connected only by work-transferring means B23Q 41/00)

B23Q

- 41/00** **Combinations or associations of metal-working machines not directed to a particular result according to classes B21, B23, or B24** (B23Q 37/00, B23Q 39/00 take precedence; features relating to operations performed, if the different metal-working operations are of the same kind, see the subclass for the kind of operation, e.g. punching B21D, welding B23K, grinding B24B; features relating to technically specified combinations of different metal-working operations B23P 23/00)
- 41/02 • Features relating to transfer of work between machines (arrangements for handling work for machine tools co-ordinated in production lines B23Q 7/14)
- 41/04 • Features relating to relative arrangements of machines
- 41/06 • Features relating to organisation of working of machines
- 41/08 • Features relating to maintenance of efficient operation