

B24B

MACHINES, DEVICES, OR PROCESSES FOR GRINDING OR POLISHING (grinding of gear teeth B23F, of screw-threads B23G1/36; by electro-erosion B23H; abrasive or related blasting B24C; tools for grinding, buffing or sharpening B24D; polishing compositions C09G1/00; abrasives C09K3/14; electrolytic etching or polishing C25F3/00; grinding arrangements for use on assembled railway tracks E01B31/17); DRESSING OR CONDITIONING OF ABRADING SURFACES; FEEDING OF GRINDING, POLISHING, OR LAPPING AGENTS

Definition statement

This subclass/group covers:

Grinding or polishing processes not particular to specific machines, devices or work, including the use of auxiliary equipment in connection with such processes, e.g. of grinding with ultrasonic frequency;

Machines, devices or processes for sharpening cutting edges, or accessories therefor, adapted e.g. to the cutting edges of milling cutters, turning or planing tools, drills or cutting blades;

Machines, devices or processes for grinding, or accessories therefor,

adapted to surfaces on work with particular geometric shapes, e.g. surfaces of revolution or plane, lens shaped or spherical surfaces,

adapted to particular surface elements on work, e.g. to edges, bevels, grooves, seat surfaces, or to burr removal

adapted to surfaces of particular work, e.g. turbine blades, dies, work of non-circular cross section, such as shafts of polygonal cross-section, sharp pointed workpieces or workpieces with arcuate surfaces,

adapted to properties of the material of articles to be ground,

adapted for grinding controlled by patterns, drawings, magnetic tapes or the like, e.g. by deriving a required shape from a pattern, of the same or a different shape or scale, by a mechanism controlled by a member following the pattern,

embodied as a particular form of machine, e.g. using grinding or polishing belts, as portable grinding machine or as grinding machine of universal type,

whereby in connection with glass the terms "grinding" and "polishing" are treated as being equivalent.

Machines, devices or processes for polishing or finishing surfaces, or accessories therefor, according to the kind of operation performed, which are

polishing or finishing surfaces on work by means of tools made of soft or flexible material, with or without the application of solid or liquid polishing agents, e.g. using buffing wheels or polishing belts,

polishing or abrading surfaces on work by means of tumbling apparatus, including abrading-bodies specially designed therefor, or by means of other apparatus in which the work or the abrasive material is loose, e.g. using a magnetically consolidated grinding powder or a plastically deformable grinding compound, moved relatively to the workpiece under the influence of pressure,

honing, i.e. abrading by means of fine grit abrasive blocks along a controlled path of combined movements in order to smoothen a surface or to produce a defined surface texture,

superfinishing, i.e. by means of abrading blocks reciprocating with high frequency,

lapping, i.e. rubbing the surface of the work and the surface of a lapping tool, in general of corresponding shapes, against each other and with loose abrasives rolling and sliding between the surfaces, whereby the abrasives may be loosely dispersed in a liquid medium or adhered to a lapping pad,

burnishing, i.e. requiring pressure members for compacting the surface zone, e.g. rollers or balls;

Component parts, accessories, or auxiliary devices, of general applicability for grinding, polishing or finishing machines or devices, comprising

component parts, such as frames, beds, carriages, headstocks or work supports,

means for securing grinding or polishing wheels on rotary arbors,

drives or gearings including equipment therefor, e.g. for the exact control of the position of the tool or work at the start of the operation or for preventing backlash,

measuring or gauging equipment for controlling the feed movement of the tool or work, as well as arrangements of indicating or measuring equipment, e.g. for indicating the start of the grinding operation,

arrangements for automatic control of a series of individual steps in grinding or polishing a workpiece,

devices or means for dressing or conditioning abrasive surfaces,

safety devices for grinding or polishing machines,

accessories fitted to grinding or polishing machines for keeping tools or parts of the machine in good working condition,

devices for feeding, applying, grading or recovering grinding, polishing or lapping agents.

Relationship between large subject matter areas

- Abrasive machining

Subclass [B24C](#) complements the abrasive grinding and polishing operations covered by [B24B](#) by abrasive blasting with particulate material, whereby blasting is defined as using a blast of any particles or pellets dispersed in air, gas or liquid, or an equivalent jet of material projected or energised by other means, for the treatment of surfaces or cutting of materials, the particles usually being of abrasive material.

Abrading internal surfaces, e.g. of a tube or a flow channel, by operations in which a plastically deformable grinding compound is used as a loose abrasive material under the influence of pressure, known in the art as abrasive flow machining, extrude honing or hydro-erosive machining, is covered by group [B24B 31/116](#) when the dynamic viscosity of the carrier medium is higher than that of conventional fuels such as diesel. When the dynamic viscosity of the carrier is less than or equal to that of conventional fuel, e.g. when water is used as a carrier, the machining is considered as particulate blasting of an internal surface, which is covered by [B24C 3/32](#).

Subclass [B24D](#) covers the grinding, polishing and sharpening tools used with the machines and devices covered by subclass [B24B](#). The tools specially designed for the particular grinding or polishing operations of tumbling ([B24B 31/14](#)), honing ([B24B 33/08](#)), or lapping ([B24B 37/11](#)) or guided peening ([B24B 39/006](#)) are however covered by [B24B](#). [B24B](#) further provides places for the tools specially adapted for grinding or polishing optical surfaces on lenses ([B24B 13/01](#)) as a particular kind of work. Devices or means for securing grinding or polishing wheels on rotary arbors of the machines or for dressing or conditioning abrasive surfaces of the tools are as well covered by [B24B](#).

Machining metal by electro-erosion for surface improvement or improvement of the dimensional accuracy is covered by subclass [B23H](#), including electrical discharge or electrochemical machining combined with mechanical working, e.g. grinding or honing ([B23H 5/00](#)). Electrolytic etching or polishing for the same purposes is covered by main group [C25F 3/00](#), covering the working of metallic and non-metallic materials, especially the electrolytic polishing of semiconductor materials ([C25F 3/30](#)).

- Abrasive materials and polishing compositions

Abrasive particles, powders or compositions per se are covered by group [C09K 3/14](#), which may be used in abrasive tools or in suspensions or pastes for polishing. Polishing compositions, suitable for the operations covered by [B24B 29/00](#), are covered by main group [C09G 1/00](#). When they contain abrasives or grinding agents ([C09G 1/02](#)) they are as well suitable for lapping ([B24B 37/00](#)).

References relevant to classification in this subclass

This subclass/group does not cover:

Abrasive or related blasting with particulate material	B24C
Working metal by electro-erosion, e.g. electrolytic grinding	B23H
Surface treatment by laser	B23K 26/0066
Electrolytic etching or polishing	C25F 3/00

Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Grinding of gear teeth	B23F
Grinding of screw threads	B23G 1/36 , B23G 1/42
Grinding arrangements for use on assembled railway tracks	E01B 31/17

Informative references

Attention is drawn to the following places, which may be of interest for search:

Tools for grinding, buffing or sharpening	B24D
Polishing compositions containing abrasives or grinding agents	C09G 1/02
Abrasives	C09K 3/14
Details, components, or accessories for machine tools, in general	B23Q 1/00 - B23Q 35/00

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Grinding	Grinding means machining by fixed abrasive particles in its most general sense and covers "corrective" operations, such as correction of dimension, e.g. diameter, or shape, e.g. roundness. It is characterised by a comparatively high material removal rate.
Polishing	Polishing means mechanically finishing the surface of a work so as to improve, e.g. smoothen, its surface, without substantial change of dimension or shape of the work as would occur in grinding.
Abrading	Abrading is used in its most general sense to mean mechanically removing material by a multitude of fixed or loose particles that are forced into the surface of the work so that each particle cuts away small chips of material
Honing	Honing means abrading by means of one or more, often compliant, fine grit abrasive blocks or stones along a controlled path of combined movements, including a reciprocating movement, in order to smoothen a surface or to produce a defined surface texture such as a cross-hatch pattern.
Superfinishing	Superfinishing means abrading by means of one or more fine grit abrading blocks or an abrasive band pressed by a shoe (bandfinishing) along a controlled path of combined movements. Typically, the block or shoe is oscillated with a short stroke and relatively high frequency while the work is rotated, in order to improve surface finish or produce a defined surface texture such as a cross-hatch pattern. Superfinishing is also referred to as microfinishing, or short-stroke honing, in the art.
Lapping	Lapping is surface finishing by

	rubbing the surface of the work and the surface of a lapping tool, e.g. a lapping plate or lapping pad, that is mostly shaped corresponding to the work surface, against each other, mainly with loose abrasives rolling and sliding between the surfaces; the abrasives may be dispersed in a liquid medium, i.e. a slurry, or in a paste, or fixed to the lapping pad
Burnishing	Burnishing means plastically deforming a work on a small scale by means of rubbing or rolling a tool, e.g. a roller or ball, on the work. It is not an abrading operation but used as an alternative to abrasive finishing operations in order to improve the surface finish or surface hardness of the work.
Conditioning	Conditioning is used in its most general sense to mean truing by removing material from the abrasive tool to maintain tool geometry, e.g. concentricity, or to (re-) profile a form into the abrasive surface, sharpening by removing small amounts of binding material from the abrasive surface to expose abrasive grains or by breaking abrasive grains to produce sharper cutting edges on the grain, cleaning the surface of an abrasive tool or a lapping pad in order to remove debris from the space between the grains or pores of the pad.

It is noted that the above terms overlap in material removal rate and surface roughness such that a clear distinction by these parameters is not possible.

In groups [B24B 1/00](#) - [B24B 27/00](#), in connection with glass the terms "grinding" and "polishing" are treated as being equivalent.

Synonyms and Keywords

In patent documents the following expressions: "dressing" and "conditioning" are often used as synonyms.

B24B 1/00

Processes of grinding or polishing; Use of auxiliary equipment in connection with such processes (processes characterised by the use of special machines or devices, see the relevant places for those machines or devices)

Definition statement

This subclass/group covers:

Grinding or polishing processes not particular to specific machines, devices or work, including the use of auxiliary equipment in connection with such processes, e.g. of grinding with ultrasonic frequency

B24B 1/04

subjecting the grinding or polishing tools, the abrading or polishing medium or work to vibration, e.g. grinding with ultrasonic frequency (polishing or abrading surfaces on work by means of tumbling apparatus B24B31/00, involving oscillating or vibrating containers B24B31/06; superfinishing surfaces on work, e.g. by means of abrading blocks reciprocating with high frequency, B24B35/00)

References relevant to classification in this group

This subclass/group does not cover:

Polishing or abrading surfaces on work by means of tumbling apparatus involving oscillating or vibrating containers	B24B 31/06
Superfinishing surfaces on work, e.g. by means of abrading blocks reciprocating with high frequency	B24B 35/00

B24B 3/00

Sharpening cutting edges, e.g. of tools; Accessories therefor, e.g. for holding the tools (non-abrasive sharpening devices for scythes, sickles, or the like A01D3/00; sharpening devices designed as components of machines with cutters, see the relevant places for the machines, e.g. A01D75/08, [N: B23F23/1225,] B26D7/12; sharpening of saw teeth B23D63/12;

sharpening of files or rasps B23D73/00; grinding of die-stocks or chasers B23G1/36)

Definition statement

This subclass/group covers:

Motor, hand or foot driven machines or devices for sharpening cutting edges, or accessories therefor, adapted e.g. to the cutting edges of milling cutters, turning or planing tools, drills or cutting and shear blades.

References relevant to classification in this group

This subclass/group does not cover:

Hand tools, i.e. on a grip or holder or where the workpiece to be sharpened is moved by hand with respect to a non-driven tool or other manual devices for non-rotary grinding, polishing or stropping specially designed for sharpening cutting edges	B24D 15/06
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Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Sharpening of saw teeth	B23D 63/12
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B24B 3/006

[N: for edges of skis, snowboards or the like]

References relevant to classification in this group

This subclass/group does not cover:

Hand tools or other devices for non-rotary grinding polishing, or stropping specially designed for sharpening ski edges	B24D 15/068
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Accessories for skiing or snowboarding, for treating skis or snowboards, edge sharpeners	A63C 11/06
Hand-held or hand-operated filing or rasping devices	B23D 67/12

B24B 3/24

of drills (by fluting the shank B24B19/14)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Single purpose machines or devices for fluting drill shanks	B24B 19/04
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B24B 3/368

[N: installed as an accessory on another machine (B26D7/12 takes precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Sharpening apparatus fixed to the harvester or mower	A01D 75/08
Arrangements of abrasive wheel dressing devices on gear-cutting machines	B23F 23/1225
Details of apparatus for cutting, cutting-out, stamping-out, punching, perforating, or severing by means other than cutting, means for treating work or cutting member to facilitate cutting by sharpening the cutting member	B26D 7/12

B24B 3/44

of scythes or sickles

References relevant to classification in this group

This subclass/group does not cover:

Non-abrasive sharpening devices for scythes, sickles, or the like	A01D 3/00
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B24B 3/607

[N: of files]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Methods or machines for the manufacture of files or rasps; Peculiar procedures for sharpening or otherwise treating the working surfaces	B23D 73/12
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B24B 5/00

Machines or devices designed for grinding surfaces of revolution on work, including those which also grind adjacent plane surfaces; Accessories therefor (B24B11/00 to B24B21/00 take precedence; honing machines or devices using abrading blocks performing axial and rotary movements superimposed on one another B24B33/00)

Definition statement

This subclass/group covers:

Machines, devices or processes for grinding, or accessories therefor,

- involving centres or centreless means for holding work for grinding cylindrical, conical or other rotationally symmetrical surfaces externally or internally,
- adapted to particular type of work, e.g. crankshafts or crankpins,
- adapted to properties of the material of non-metallic articles to be ground,

- for combined grinding of surfaces of revolution and of adjacent plane surfaces of work.

References relevant to classification in this group

This subclass/group does not cover:

Honing machines or devices designed for working surfaces of revolution	B24B 33/02 , B24B 33/04
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B24B 5/04

for grinding cylindrical surfaces externally (grinding combined cylindrical and conical surfaces B24B5/14);

References relevant to classification in this group

This subclass/group does not cover:

Grinding combined cylindrical and conical surfaces	B24B 5/14
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B24B 5/18

involving centreless means for supporting, guiding, floating or rotating work (centreless turning B23B5/08; centreless grinding of threads B23G1/42)

References relevant to classification in this group

This subclass/group does not cover:

Centreless grinding of threads	B23G 1/42
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Centreless turning	B23B 5/08
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B24B 5/50

characterised by a special design with respect to properties of the material of non-metallic articles to be ground, e.g. strings (cutting profiles into the treads of tyres B29D30/68)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cutting profiles into the treads of tyres	B29D 30/68
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B24B 7/00

Machines or devices designed for grinding plane surfaces on work, including polishing plane glass surfaces; Accessories therefor (B24B21/00 takes precedence; honing of plane surfaces on work B24B33/055)

Definition statement

This subclass/group covers:

- Machines, devices or processes for grinding, or accessories therefor,
- adapted to plane surfaces on work, including polishing plane glass surfaces,
- embodied as a particular structure of machine, e.g. having a stationary or reciprocatingly movable work-table or a conveyor belt,
- adapted to a particular purpose, e.g. end faces of piston rings or floorings,
- adapted to properties of the material of articles to be ground,
- whereby in connection with glass the terms "grinding" and "polishing" are treated as being equivalent.

References relevant to classification in this group

This subclass/group does not cover:

Honing of plane surfaces on work	B24B 33/055
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B24B 7/10

Single-purpose machines or devices (grinding tools or

machines specially designed for use on assembled railway track E01B31/17)

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Grinding tools or machines specially designed for use on assembled railway track	E01B 31/17
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B24B 7/14

for grinding slideways (portable grinding machines designed for fastening on workpieces B24B23/08)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Portable grinding machines designed for fastening on workpieces	B24B 23/08
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B24B 7/16

for grinding end-faces, e.g. of gauges, rollers, nuts, piston rings (for combined grinding of surfaces of revolution and adjacent plane surfaces on work B24B5/01; for grinding edges of bevels on work B24B9/00)

References relevant to classification in this group

This subclass/group does not cover:

Devices for combined grinding of surfaces of revolution and adjacent plane surfaces on work	B24B 5/01
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Devices for grinding edges or bevels on work	B24B 9/00
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B24B 7/18

for grinding floorings, walls, ceilings or the like (machines or devices for cleaning floorings A47L11/00, A47L13/00)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Machines or devices for cleaning floorings	A47L 11/00 , A47L 13/00
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B24B 7/228

[N: for grinding thin, brittle parts, e.g. semiconductors, wafers (grinding edges of thin, brittle parts B24B9/065)]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lapping pads for working plane surfaces with fixed abrasives	B24B 37/245
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B24B 7/28

for grinding wood

Informative references

Attention is drawn to the following places, which may be of interest for search:

Single-purpose machines for grinding of wood, e.g. furniture	B24B 19/24
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B24B 9/00

Machines or devices designed for grinding edges or bevels on work or for removing burrs; Accessories therefor (B24B21/00 takes precedence ; for sharpening cutting edges on tools B24B3/00; removing burrs by loose abrasive material B24B31/00)

Definition statement

This subclass/group covers:

- Machines, devices or processes for grinding edges or bevels on work or for removing burrs, or accessories therefor,
- adapted to properties of material of the articles to be ground, e.g. metal, non-metallic inorganic material, wood or plastics.

References relevant to classification in this group

This subclass/group does not cover:

Devices for sharpening cutting edges on tools	B24B 3/00
Removing burrs by loose abrasive material	B24B 31/00

B24B 9/007

[N: for end faces of tubes (cleaning pipe ends or pipe fittings, e.g. before soldering B08B9/021)]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cleaning pipe ends or pipe fittings, e.g. before soldering	B08B 9/021
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B24B 9/04

of metal, e.g. skate blades [N: (B24B3/003 takes precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Sharpening skate blades	B24B 3/003
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B24B 9/065

[N: of thin, brittle parts, e.g. semiconductors, wafers]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Edge treatment, chamfering of semiconductor devices	H01L 21/02021
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B24B 9/085

[N: for watch glasses]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Devices for shaping watch glasses by removing material, e.g. cutting out from a plate, milling the edges	G04D 3/065
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B24B 9/14

of optical work, e.g. lenses, prisms [N: (control of the position of the tool for bevelling optical work B24B47/225)]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of the position of the tool for bevelling optical work	B24B 47/225
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B24B 9/16

of diamonds; of jewels or the like; Diamond grinders` dops; Dop holders or tongs (for grinding sharp pointed diamonds or sapphires B24B19/16)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Devices for grinding sharp pointed diamonds or sapphires	B24B 19/16
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B24B 11/00

Machines or devices designed for grinding spherical surfaces or parts of spherical surfaces on work; Accessories therefor (specially designed for optical surfaces B24B13/00, for seat surfaces B24B15/00)

Definition statement

This subclass/group covers:

Machines, devices, processes for grinding spherical surfaces or parts of spherical surfaces on work, e.g. balls, involving particular type of grinding wheels, e.g. cup type.

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Specially designed for optical surfaces	B24B 13/00
For seat surfaces	B24B 15/00

B24B 13/00

Machines or devices designed for grinding or polishing optical surfaces on lenses or surfaces of similar shape on other work; Accessories therefor (edging optical work, e.g. lenses, prisms B24B9/14)

Definition statement

This subclass/group covers:

Machines, devices, processes for grinding or polishing optical surfaces on

lenses or surfaces of similar shape on other work, e.g. headlight reflectors. I Accessories, components, e.g. blocking and deblocking means, specific tools and machining control therefor.

References relevant to classification in this group

This subclass/group does not cover:

Edging optical work, e.g. lenses, prisms	B24B 9/14
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B24B 13/005

Blocking means, chucks or the like; Alignment devices

Definition statement

This subclass/group covers:

Devices and processes for holding of optical work, e.g. by bonding (blocking) or suction.

Accessory therefor, alignment devices or means and methods for deblocking optical work, i.e. adapted to release the bond between the optical work and its support or a protection film through chemical, thermal, mechanical or other means or any practical combination thereof.

B24B 15/00

Machines or devices designed for grinding seat surfaces; Accessories therefor (for spherical surfaces in general B24B11/00)

Definition statement

This subclass/group covers:

Machines, devices or processes for grinding, or accessories therefor, adapted to seat surfaces, e.g. in valve components.

Informative references

Attention is drawn to the following places, which may be of interest for search:

For spherical surfaces in general	B24B 11/00
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B24B 17/00

Special adaptations of machines or devices for grinding controlled by patterns, drawings, magnetic tapes or the like (machines or devices so-controlled for grinding the edges of lenses B24B9/14; for grinding or polishing optical lens surfaces B24B13/06; for grinding non-circular cross-sections B24B19/08; for grinding trochoidal surfaces B24B19/09; for grinding cams B24B19/12; for grinding turbine blades or the like B24B19/14; such control means per se B23Q33/00, B23Q35/00, G05); Accessories therefor

Definition statement

This subclass/group covers:

Special adaptations of machines or devices for grinding or polishing controlled by mechanical transmission, e.g. by templates, electrical transmission, e.g. by magnetic tape, optical means, e.g. by optical projection, or fluid transmission.

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Machines or devices so-controlled for grinding the edges of lenses	B24B 9/14
For grinding or polishing optical lens surfaces	B24B 13/06
For grinding non-circular cross-sections	B24B 19/08
For grinding trochoidal surfaces	B24B 19/09
For grinding cams	B24B 19/12
For grinding turbine blades or the like	B24B 19/14

Informative references

Attention is drawn to the following places, which may be of interest for search:

Methods for copying	B23Q 33/00
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Control systems or devices for copying directly from a pattern or a master model; Devices for use in copying manually	B23Q 35/00
Controlling; Regulating	G05

B24B 19/00

Single-purpose machines or devices for particular grinding operations not covered by any other main group (tapering, chamfering, or relief cutting of taps or reamers B24B3/20, B24B3/22, grinding screw threads B23G)

Definition statement

This subclass/group covers:

Machines, devices or processes for grinding specifically adapted to surfaces of particular work, e.g. turbine blades, microgrooves, ends of optical fibres, work of non-circular cross section, such as shafts of polygonal cross-section or pistons, sharp pointed workpieces or workpieces with arcuate surfaces, not covered by any other main group.

References relevant to classification in this group

This subclass/group does not cover:

Grinding screw threads	B23G 1/36
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Tapering, chamfering, or relief cutting of taps or reamers	B24B 3/20 , B24B 3/22
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B24B 19/002

[N: for knife blades (sharpening table knife blades B24B3/54)]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sharpening table knife blades	B24B 3/54
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B24B 19/004

[N: for grinding rails, T, I, H or other similar profiles]

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Grinding arrangements for use on assembled railway tracks	E01B 31/17
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B24B 19/11

for grinding the circumferential surface of rings, e.g. piston rings (grinding end faces B24B7/16, B24B7/17)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grinding end faces	B24B 7/16 , B24B 7/17
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B24B 19/14

for grinding turbine blades, propeller blades or the like (using grinding belts B24B21/16)

References relevant to classification in this group

This subclass/group does not cover:

Using grinding belts	B24B 21/16
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B24B 19/16

for grinding sharp-pointed workpieces, e.g. needles, pens, fish hooks, tweezers, record player styli (grinding bevels on diamonds or sapphires B24B9/16; polishing of needles B24B29/08)

References relevant to classification in this group

This subclass/group does not cover:

Polishing of needles	B24B 29/08
Grinding or resharpening the ends of welding electrodes	B23K 9/32

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grinding bevels on diamonds or sapphires	B24B 9/16
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B24B 19/18

for grinding carding equipment, e.g. card-clothings (devices for sharpening card-clothings built in or attachable to carding machines D01G)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for driving carding-machine elements during grinding	D01G 15/38
Card clothing, manufacture thereof	D01G 15/84

B24B 19/20

for grinding dies (for grinding walls of very fine holes B24B5/48)

References relevant to classification in this group

This subclass/group does not cover:

For grinding walls of very fine holes	B24B 5/48
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B24B 19/226

[N: of the ends of optical fibres]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Preparing the ends of light guides for coupling, e.g. cutting	G02B 6/25
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B24B 19/24

of wood, e.g. furniture

References relevant to classification in this group Informative references

Attention is drawn to the following places, which may be of interest for search:

Grinding plane surfaces of wood	B24B 7/28
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B24B 19/26

for grinding workpieces with arcuate surfaces, e.g. parts of car bodies, bumpers, magnetic recording heads (grinding of spherical surfaces in general B24B11/00, of optical surfaces on lenses or surfaces of similar shape on other work B24B13/00)

References relevant to classification in this group

This subclass/group does not cover:

Grinding of spherical surfaces in general	B24B 11/00
Of optical surfaces on lenses or surfaces of similar shape on other work	B24B 13/00

B24B 19/28

for grinding shoes or linings of drum brakes (of brake drum hubs B24B5/06, of brake discs B24B7/17)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Of brake drum hubs	B24B 5/06
Of brake discs	B24B 7/17

B24B 21/00

Machines or devices using grinding or polishing belts (for sharpening cutting edges of tools B24B3/00; portable belt-grinding machines B24B23/06); Accessories therefor

Definition statement

This subclass/group covers:

Machines, devices or processes for grinding or polishing, or accessories therefor, using grinding or polishing belts, adapted to the type of workpiece or the shape of the surface to be ground or polished, i.e. rotationally symmetrical, plane or particular shaped surfaces. Accessories therefor, such as belt tension or tracking means.

References relevant to classification in this group

This subclass/group does not cover:

Portable belt-grinding machines	B24B 23/06
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B24B 21/002

[N: for grinding edges or bevels]

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

For sharpening cutting edges of tools	B24B 3/00
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B24B 21/16

for grinding other surfaces of particular shape (single purpose machines for grinding cams or camshafts B24B19/12)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Single purpose machines for grinding cams or camshafts	B24B 19/12
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B24B 23/00

Portable grinding machines, e.g. hand-guided; Accessories therefor (B24B7/18 takes precedence; for grinding seat surfaces B24B15/00; having a flexible shaft B24B27/027; grinders for cutting-off B24B27/08; dust extraction equipment B24B55/10; details or components, e.g. casings, bodies of portable power-driven tools not particularly related to the operation performed B25F5/00)

Definition statement

This subclass/group covers:

Portable, e.g. hand-guided, grinding or polishing machines or power tools, embodied as a particular form of machine defined by the tool movement, such as a rotating or oscillating tool or an abrasive belt, or adapted to be fastened on workpieces.

References relevant to classification in this group

This subclass/group does not cover:

Dust extraction equipment	B24B 55/10
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Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

For grinding seat surfaces in valve housings	B24B 15/03
Grinders for cutting-off	B24B 27/08

Informative references

Attention is drawn to the following places, which may be of interest for search:

Having a flexible shaft	B24B 27/027
Details or components, e.g. casings, bodies of portable power-driven tools not particularly related to the operation performed	B25F 5/00

B24B 25/00

Grinding machines of universal type

Definition statement

This subclass/group covers:

Grinding machines adapted to carry out a plurality of different grinding operations, e.g. external, internal circular and flat surface grinding.

B24B 27/00

Other grinding machines or devices

Definition statement

This subclass/group covers:

Grinding machines and devices defined by their general layout, e.g. of columnar or robot type, or specially adapted to a particular purpose, e.g. descaling or cutting off.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sawing machines and devices	B23D 45/00 to B23D 65/00
Working stone or stone-like materials by sawing	B28D 1/02

B24B 29/00

Machines or devices for polishing surfaces on work by means of tools made of soft or flexible material with or without the application of solid or liquid polishing agents (polishing tools in general B24D13/00)

Definition statement

This subclass/group covers:

Machines, devices or processes for polishing or finishing surfaces on work by means of tools made of soft or flexible material, with or without the application of solid or liquid polishing agents, e.g. using buffing wheels.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polishing tools in general	B24D 13/00
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B24B 31/00

Machines or devices designed for polishing or abrading surfaces on work by means of tumbling apparatus or other apparatus in which the work and/or the abrasive material is loose; Accessories therefor (abrasive blasting machines B24C3/26)

Definition statement

This subclass/group covers:

- Machines, devices or processes for polishing or abrading surfaces, or accessories therefor,
- by means of tumbling apparatus, involving work support means such as holders on which the work is fixed, rotary barrels or vibratory containers, or
- by means of other apparatus in which the work or the abrasive material is loose, e.g. using a magnetically consolidated grinding powder or a plastically deformable grinding compound, moved relatively to the work under the influence of pressure,
- including abrading bodies specially designed therefor, e.g. abrading balls.

Informative references

Attention is drawn to the following places, which may be of interest for search:
for cleaning and working on castings

Tumbling mills for cleaning and working on castings	B22D 31/007
Chemically accelerated vibratory finishing (CAVF)	C23C 22/00

B24B 31/116

using plastically deformable grinding compound, moved relatively to the workpiece under the influence of pressure

Definition statement

This subclass/group covers:

Machines, devices or processes for polishing or abrading surfaces on work by means of plastically deformable grinding compound, moved relatively to the workpiece. When abrading internal surfaces, e.g. of a tube or a flow channel, by operations known in the art as abrasive flow machining, extrude honing or hydro-erosive grinding, the operation is considered as abrading surfaces by means of a plastically deformable grinding compound under the influence of pressure, when the dynamic viscosity of the carrier medium is higher than that of conventional fuels such as diesel.

References relevant to classification in this group

This subclass/group does not cover:

Abrasive flow machining when the dynamic viscosity of the carrier is less than or equal to that of conventional fuels like diesel, e.g. when water is used as a carrier	B24C 3/327
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B24B 31/12

**Accessories; Protective equipment or safety devices;
Installations for exhaustion of dust or for sound absorption
specially designed for machines covered by group
B24B31/00(in general B24B55/00)**

Informative references

Attention is drawn to the following places, which may be of interest for search:

In general	B24B 55/00
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B24B 33/00

Honing machines or devices; Accessories therefor

Definition statement

This subclass/group covers:

Machines, devices or processes for honing, i.e. abrading by means of fine grit abrasive blocks along a controlled path of combined movements in order to smoothen a surface or to produce a defined surface texture.

B24B 33/06

with controlling or gauging equipment (gauging in general G01B; controlling in general G05)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gauging in general	G01B
Controlling in general	G05

B24B 33/08

Honing tools [N: (for manufacturing gear teeth B23F21/03)]

References relevant to classification in this group

This subclass/group does not cover:

For manufacturing gear teeth	B23F 21/03
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B24B 35/00

Machines or devices designed for superfinishing surfaces on

work, i.e. by means of abrading blocks reciprocating with high frequency

Definition statement

This subclass/group covers:

Machines, devices or processes for superfinishing surfaces, or accessories therefor, i.e. for abrading by means of one or more fine grit abrading blocks or an abrasive band pressed by a shoe (bandfinishing) along a controlled path of combined movements. Typically, the block or shoe is oscillated with a short stroke and relatively high frequency while the work is rotated, in order to improve surface finish or produce a defined surface texture such as a cross-hatch pattern. Superfinishing is also referred to as microfinishing, or short-stroke honing, in the art.

Synonyms and Keywords

In patent documents the following expressions "superfinishing", "microfinishing" and "short-stroke honing" are often used as synonyms.

B24B 35/005

[N: for making three-dimensional objects (by electroerosion B23H5/04)]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electric discharge machining combined with mechanical working	B23H 5/04
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B24B 37/00

[N: IPC2012.01] Lapping machines or devices; Accessories (B24B3/00 takes precedence)

Definition statement

This subclass/group covers:

Lapping machines or devices and accessories for surface finishing by rubbing the surface of the work and the surface of a tool, e.g. a lapping plate or lapping pad, generally shaped corresponding to the work surface, against each other, mainly with loose abrasives rolling or sliding between the surfaces. The abrasives may be dispersed in a liquid medium, i.e. a slurry, or in a paste, or fixed to the lapping pad.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polishing compositions containing abrasives or grinding agents	C09G 1/02
Anti-slip materials; Abrasives	C09K 3/14
Processes and apparatus adapted for the manufacture or treatment of semiconductor devices, electric solid state devices not otherwise provided for	H01L 21/00

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Lapping	Surface finishing by rubbing the surface of the work and the surface of a lapping tool, e.g. a lapping plate or lapping pad, that is mostly shaped corresponding to the work surface, against each other, mainly with loose abrasives rolling and sliding between the surfaces; the abrasives may be dispersed in a liquid medium, i.e. a slurry, or in a paste, or fixed to the lapping pad.
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Synonyms and Keywords

In patent documents the following expressions "lapping" and "polishing" are often used as synonyms.

B24B 37/005

Control means for lapping machines or devices

Definition statement

This subclass/group covers:

Systems, devices or methods specially adapted for the control or regulation of

lapping machines or devices and operations performed by them.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Special adaptations of machines or devices for grinding controlled by patterns, drawings, magnetic tapes or the like	B24B 17/00
Measuring or gauging equipment for controlling the feed movement of the grinding tool or work; Arrangements of indicating or measuring equipment	B24B 49/00
Arrangements for automatic control of a series of individual steps in grinding a workpiece	B24B 51/00
Automatic control or regulation of feed movement or position of tool or work	B23Q 15/00
Control or regulating systems in general; Functional elements of such systems	G05B
Systems for controlling or regulating non-electric variables or for regulating electric or magnetic variables	G05D , G05F

B24B 37/013

Devices or means for detecting lapping completion

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring or gauging equipment for controlling the feed movement of the grinding tool or work according to the instantaneous size and required size of the workpiece acted upon	B24B 49/02
Measuring or gauging equipment for	B24B 49/10 , B24B 49/12 , B24B 49/16

controlling the feed movement of the grinding tool or work involving electrical or optical means, or taking regard of the load	
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B24B 37/015

Temperature control

Definition statement

This subclass/group covers:

Systems, devices or methods for cooling, or temperature control of, the work, a component of the lapping machine, the ambient air, or the slurry specially adapted for lapping purposes

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring or gauging equipment for controlling the feed movement of the grinding tool or work taking regard of the temperature during grinding	B24B 49/14
Accessory equipment fitted to grinding or polishing machines for cooling the grinding surfaces, including devices for feeding coolant	B24B 55/02
Methods or arrangements for maintaining a constant temperature in parts of machine tools in general	B23Q 11/14
Arrangements for cooling work, tools or parts of machine tools in general	B23Q 11/10 , B23Q 11/12

B24B 37/02

designed for working surfaces of revolution

Definition statement

This subclass/group covers:

Devices or methods for lapping surfaces or parts of surfaces of revolution, e.g. cylindrical surfaces, on a single work piece or on a plurality of work pieces. Typically, a plurality of work pieces, such as balls or cylinders are lapped by rolling the work pieces held between two lapping plates that are relatively rotating to each other. One lapping plate may be replaced by a holding structure, such as a holding plate or holding rollers.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Machines or devices designed for grinding spherical surfaces or parts of spherical surfaces on work, for grinding balls, involving grinding wheels acting by the front faces, e.g. of plane, grooved, or beveled shape	B24B 11/06
Machines or devices designed for grinding cylindrical surfaces, e.g. on bolts	B24B 5/225
Machines or devices designed for conical surfaces	B24B 5/245

Special rules of classification within this group

Lapping of edges of disk-shaped workpieces, e.g. of wafers, classify also in [B24B 9/065](#)

B24B 37/04

designed for working plane surfaces

Informative references

Attention is drawn to the following places, which may be of interest for search:

Machines or devices designed for grinding plane surfaces on work, including plane glass surfaces; Accessories therfor, for grinding thin, brittle parts, e.g. semiconductors, wafers	B24B 7/228
Apparatus specially adapted for the mechanical treatment of semiconductor devices or of parts	H01L 21/304

thereof to change the physical characteristics of their surfaces, or to change their shape, e.g. grinding or polishing	
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B24B 37/07

characterised by the movement of the work or lapping tool

Definition statement

This subclass/group covers:

Devices and methods defined by features that relate to the type of movement in the plane of contact of the work or its carrier and the lapping tool with respect to each other. Typically, the work or carrier can either be driven, e.g. rotatably or in a combined or superposed movement, or can be loosely arranged on the lapping tool without direct drive for movement in a quasi random manner.

B24B 37/12

Lapping plates for working plane surfaces

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Lapping plate	A lapping plate is a rigid, self-supporting structure used as the lapping tool itself or as a support for a lapping pad
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B24B 37/16

characterised by the shape of the lapping plate surface, e.g. grooved

Definition statement

This subclass/group covers:

Lapping plates characterised by the shape or geometry of the lapping plate surface contacting the work or lapping pad, e.g. provided with particular holes, grooves or recesses.

B24B 37/20

Lapping pads for working plane surfaces

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grinding or buffing wheels having flexibly-acting working parts acting by the front face	B24D 13/14
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Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Lapping pad	A lapping pad is made of relatively soft material, usually provided on a support structure, i.e. the lapping plate, for holding the loose abrasive temporarily during lapping or having the abrasive incorporated therein (fixed abrasive)
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Synonyms and Keywords

In patent documents the following expressions/words "lapping pad" and "polishing cloth" are often used as synonyms.

B24B 37/22

Characterised by a multi-layered structure

Definition statement

This subclass/group covers:

Lapping pads characterised by being composed of two or more layers

B24B 37/245

[N: Pads with fixed abrasives]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grinding thin, brittle parts, e.g. semiconductors, wafers	B24B 7/228
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B24B 37/26

characterised by the shape of the lapping pad surface, e.g. grooved

Definition statement

This subclass/group covers:

Lapping pads characterised by the shape or geometry of the lapping pad surface contacting the work, e.g. provided with grooves of particular cross section or location on the pad.

B24B 37/27

Work carriers

Informative references

Attention is drawn to the following places, which may be of interest for search:

Work supports, e.g. adjustable steadies, of grinding machines or devices	B24B 41/06
Apparatus specially adapted for handling wafers during manufacture or treatment of semiconductor or electric solid state devices or components thereof using specially adapted carriers	H01L 21/673

B24B 37/34

Accessories

References relevant to classification in this group

This subclass/group does not cover:

Devices or means for dressing, cleaning or otherwise conditioning	B24B 53/017
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lapping tools	
Devices for feeding, applying, grading or recovering grinding, polishing or lapping agents	B24B 57/00

B24B 37/345

[N: Feeding, loading or unloading work specially adapted to lapping]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Combinations or associations of metal-working machines comprising features relating to transfer of work between machines	B23Q 41/02
Apparatus specially adapted for handling wafers during manufacture or treatment of semiconductor or electric solid state devices or components thereof for conveying, e.g. between different work stations, for positioning, orientation or alignment, or for supporting or gripping	H01L 21/677 , H01L 21/68 , H01L 21/683

B24B 39/00

Burnishing machines or devices, i.e. requiring pressure members for compacting the surface zone (modifying the physical properties or structure of metal by burnishing C21D7/08, C22F1/00); Accessories therefor

Definition statement

This subclass/group covers:

Machines, devices or processes for burnishing, i.e. plastically deforming a work on a small scale by means of rubbing or rolling a tool, e.g. a roller or ball, on the work. Burnishing is not an abrading operation but used as an alternative to abrasive finishing operations in order to improve the surface finish or surface hardness of the work.

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Modifying the physical properties of iron or steel surfaces by burnishing or the like	C21D 7/08
Changing the physical structure of non-ferrous metals or alloys by cold working	C22F 1/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rolling grooves	B21H 7/18
Finishing surfaces by hammering or applying repeated pressure	B23P 9/04

B24B 39/006

[N: Peening and tools therefor]

Definition statement

This subclass/group covers:

Machines, devices or processes for burnishing by peening, whereby the peening media is guided on its path during peening action.

References relevant to classification in this group

This subclass/group does not cover:

Shot-peening	B24C 1/10 , C21D 7/06
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B24B 41/00

Component parts such as frames, beds, carriages, headstocks

Definition statement

This subclass/group covers:

Component parts specially adapted to grinding, polishing or finishing machines or devices, comprising component parts, such as frames, beds, carriages, headstocks or work supports

Informative references

Attention is drawn to the following places, which may be of interest for search:

Components of machine tools in general	B23Q
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B24B 41/005

[N: Feeding or manipulating devices specially adapted to grinding machines (feeding, loading or unloading work specially adapted to lapping machines B24B37/345)]

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Feeding, loading or unloading work specially adapted to lapping machines	B24B 37/345
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B24B 41/044

[N: Grinding spindles with magnetic or electromagnetic bearings; Features related thereto (electric motors with magnetic bearings H02K7/09)]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electric motors with magnetic	H02K 7/09
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bearings	
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B24B 41/066

[N: for supporting tools]

Definition statement

This subclass/group covers:

work supports for supporting workpieces in the form of tools, e.g. knives, chisels, drills.

B24B 45/00

Means for securing grinding wheels on rotary arbors (suppression of vibrations in systems F16F15/00; testing static or dynamic balancing of machines G01M1/00)

Definition statement

This subclass/group covers:

Means for securing grinding or polishing wheels on rotary arbors, e.g. quick mount or release means for power tools.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Suppression of vibrations in systems	F16F 15/00
Testing static or dynamic balancing of machines	G01M 1/00

B24B 47/00

Drives or gearings; Equipment therefor

Definition statement

This subclass/group covers:

Drives or gearings for performing movement of carriages or spindles, including equipment therefor, e.g. for the exact control of the position of the tool or work at the start of the operation or for preventing backlash.

B24B 49/00

Measuring or gauging equipment for controlling the feed movement of the grinding tool or work; Arrangements of indicating or measuring equipment, e.g. for indicating the start of the grinding operation (B24B33/06, B24B37/005 take precedence; if applicable to other machine tools, B23Q15/00 - B23Q17/00 take precedence)

Definition statement

This subclass/group covers:

Measuring or gauging equipment as well as arrangements of indicating or measuring equipment, adapted to grinding or polishing.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gauging instruments in general	G01B
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B24B 51/00

Arrangements for automatic control of a series of individual steps in grinding a workpiece (if applicable to other machine tools, G05B takes precedence)

Definition statement

This subclass/group covers:

Arrangements for automatic control of a series of individual steps in grinding or polishing a workpiece.

B24B 53/00

Devices or means for dressing or conditioning abrasive surfaces (compensation for grinding wheel abrasion resulting from dressing B24B47/25)

Definition statement

This subclass/group covers:

Means or methods for dressing or conditioning grinding or polishing surfaces, e.g. by truing by removing material from the abrasive tool to maintain tool geometry, e.g. concentricity, or to (re-) profile a form into the abrasive surface,

sharpening by removing small amounts of binding material from the abrasive surface to expose abrasive grains or by breaking abrasive grains to produce sharper cutting edges on the grain, or cleaning the surface of an abrasive tool or a lapping pad in order to remove debris from the space between the grains or pores of the pad.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compensation for grinding wheel abrasion resulting from dressing	B24B 47/25
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Synonyms and Keywords

In patent documents the following expressions/words "dressing" and "conditioning" are often used as synonyms.

B24B 53/095

Cooling or lubricating during dressing operation (cooling the grinding surfaces B24B55/02)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cooling the grinding surfaces	B24B 55/02
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B24B 55/00

**Safety devices for grinding or polishing machines;
Accessories fitted to grinding or polishing machines for keeping tools or parts of the machine in good working condition (of general applicability for machine tools B23Q11/00; in general F16P)**

Definition statement

This subclass/group covers:

Devices and accessories and processes adapted to grinding or polishing machines for ensuring working safety, e.g. tool protective covers, or for keeping tools or parts of the machine in good working condition, e.g. equipment for lubricating or cooling, as well as devices for collecting or recovering material of the workpiece removed by grinding or polishing.

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

For tumbling apparatus	B24B 31/12
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Of general applicability for machine tools	B23Q 11/00
Safety devices in general	F16P

B24B 55/02

Equipment for cooling the grinding surfaces, including devices for feeding coolant (cooling or lubricating during dressing operation B24B53/095; incorporated in grinding wheels B24D)

References relevant to classification in this group

This subclass/group does not cover:

Cooling equipment incorporated in grinding wheels	B24D
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Cooling or lubricating during dressing operation	B24B 53/095
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B24B 55/04

Protective covers for the grinding wheel

Informative references

Attention is drawn to the following places, which may be of interest for search:

For parts of machine tools in general	B23Q 11/08
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B24B 55/06

Dust extraction equipment on grinding or polishing machines (B24B31/12 takes precedence)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specially designed for sawing machines and devices	B23D 59/006
Devices for removing chips in machine tools in general	B23Q 11/0042

B24B 57/00

Devices for feeding, applying, grading or recovering grinding, polishing or lapping agents (for abrasive blasting B24C1/00, B24C7/00)

Definition statement

This subclass/group covers:

Means and methods for grading, supplying or recovering grinding, polishing or lapping agents in solid form, e.g. as wax or powder, or fluid form, e.g. as a liquid or spray.

Informative references

Attention is drawn to the following places, which may be of interest for search:

In conjunction with fine working of gems, jewels, crystals	B28D 5/007
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