

CPC COOPERATIVE PATENT CLASSIFICATION

B PERFORMING OPERATIONS; TRANSPORTING

(NOTES omitted)

SHAPING

B23 MACHINE TOOLS; METAL-WORKING NOT OTHERWISE PROVIDED FOR

(NOTES omitted)

B23C MILLING (broaching [B23D](#); broach-milling in making gears [B23F](#); arrangement for copying or controlling [B23Q](#))

WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00	Milling machines not designed for particular work or special operations	3/053	. . . . {having means for guiding the tool carrying spindle}
1/002	. {Gantry-type milling machines}	3/055	. . . . . {for engines}
1/005	. {with a tool moving in a closed path around the workpiece}	3/056	. . . . . {for taps or valves}
1/007	. {movable milling machines, e.g. on rails}	3/058	. . . {Reconditioning of valves}
1/02	. with one horizontal working-spindle	3/06	. Milling crankshafts
1/025	. . with working-spindle movable in a fixed position	3/08	. Milling cams, camshafts, or the like
1/027	. . with working-spindle movable in a vertical direction	3/10	. Relieving by milling
1/04	. with a plurality of horizontal working-spindles	3/12	. Trimming or finishing edges, e.g. deburring welded corners
1/045	. . {Opposed - spindle machines}	3/122	. . {of pipes or cylinders}
1/06	. with one vertical working-spindle	3/124	. . . {internally}
1/08	. with a plurality of vertical working-spindles	3/126	. . {Portable devices or machines for chamfering edges}
1/10	. with both horizontal and vertical working-spindles	3/128	. . {Trimming or finishing edges of doors and windows}
1/12	. with spindle adjustable to different angles, e.g. either horizontal or vertical	3/13	. Surface milling of plates, sheets or strips
1/14	. with rotary work-carrying table (work tables for machine tools in general B23Q 1/00)	3/14	. Scrubbing or peeling ingots or similar workpieces
1/16	. specially designed for control by copying devices { (not used; see B23Q 35/00) }	3/16	. Working surfaces curved in two directions
1/18	. . for milling while revolving the work	3/18	. . for shaping screw-propellers, turbine blades, or impellers
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	3/20	. . for shaping dies
3/00	Milling particular work; Special milling operations; Machines therefor (milling gear-teeth B23F, heat assisted machining B23P 25/00)	3/22	. Forming overlapped joints, e.g. of the ends of piston-rings
3/002	. {Milling elongated workpieces}	3/24	. Making square or polygonal ends on workpieces, e.g. key studs on tools
3/005	. . {Rails}	3/26	. Making square or polygonal holes in workpieces, e.g. key holes in tools
3/007	. {Milling end surfaces of nuts or tubes}	3/28	. Grooving workpieces (tread-cutting by milling B23G 1/32)
3/02	. Milling surfaces of revolution (B23C 3/06 , B23C 3/08 take precedence)	3/30	. . Milling straight grooves, e.g. keyways
3/023	. . {Milling spherical surfaces}	3/305	. . . {in which more than one milling tool is used simultaneously, e.g. for sheet material}
3/026	. . . {Milling balls}	3/32	. . Milling helical grooves, e.g. in making twist-drills
3/04	. . while revolving the work	3/34	. . Milling grooves of other forms, e.g. circumferential
3/05	. . Finishing valves or valve seats {(machines for grinding seat surfaces, e.g. in valve housings, B24B 15/00)}	3/35	. . Milling grooves in keys
3/051	. . . {Reconditioning of valve seats}	3/355	. . . {Holders for the template keys}
		3/36	. Milling milling-cutters (B23C 3/28 takes precedence)
		5/00	Milling-cutters (for cutting gear-teeth B23F 21/12)
		5/003	. {with vibration suppressing means}

5/006	. {Details of the milling cutter body}	5/2243	. . . . . {for plate-like cutting inserts (B23C 5/2252 , B23C 5/2256 , B23C 5/226 take precedence)}
5/02	. characterised by the shape of the cutter	5/2247	. . . . . {having a special shape}
5/04	. . Plain cutters, i.e. having essentially a cylindrical or tapered cutting surface of substantial length (B23C 5/10 takes precedence)	5/2252	. . . . . {for plate-like cutting inserts fitted on an intermediate carrier}
5/06	. . Face-milling cutters, i.e. having only or primarily a substantially flat cutting surface	5/2256	. . . . . {for plate-like cutting inserts fitted on a shank, fixed in the cutter body}
5/08	. . Disc-type cutters	5/226	. . . . . {for plate-like cutting inserts fitted on a ring or ring segment}
5/10	. . Shank-type cutters, i.e. with an integral shaft	5/2265	. . . . . {by means of a wedge}
5/1009	. . . {Ball nose end mills}	5/2269	. . . . . {for plate-like cutting inserts (B23C 5/2278 , B23C 5/2286 , B23C 5/2291 take precedence)}
5/1018	. . . . {with permanently fixed cutting inserts}	5/2273	. . . . . {having a special shape}
5/1027	. . . . {with one or more removable cutting inserts}	5/2278	. . . . . {for plate-like cutting inserts fitted on an intermediate carrier}
5/1036	. . . . . {having a single cutting insert, the cutting edges of which subtend 180 degrees}	5/2282	. . . . . {having a special shape}
5/1045	. . . . . {having a cutting insert, the cutting edge of which subtends substantially 90 degrees}	5/2286	. . . . . {for plate-like cutting inserts fitted on a shank, fixed in the cutter body}
5/1054	. . . {T slot cutters}	5/2291	. . . . . {for plate-like cutting inserts fitted on a ring or ring segment}
5/1063	. . . . {with permanently fixed cutting inserts}	5/2295	. . . . . {the cutting elements being clamped simultaneously}
5/1072	. . . . {with removable cutting inserts}	5/24	. . . . . adjustable
5/1081	. . . {with permanently fixed cutting inserts (B23C 5/1054 and B23C 5/1081 take precedence)}	5/2403	. . . . . {with cutting inserts clamped against the walls of the recess in the shank by a clamping member acting upon the wall of a hole in the insert}
5/109	. . . {with removable cutting inserts}	5/2406	. . . . . {for plate-like cutting inserts (B23C 5/241 , B23C 5/2413 , B23C 5/2417 take precedence)}
5/12	. . Cutters specially designed for producing particular profiles (B23C 5/10 takes precedence)	5/241	. . . . . {for plate-like cutting inserts fitted on an intermediate carrier}
5/14	. . . essentially comprising curves (B23C 5/1009 takes precedence)}	5/2413	. . . . . {for plate-like cutting inserts fitted on a shank, fixed in the cutter body}
5/16	. characterised by physical features other than shape	5/2417	. . . . . {for plate-like cutting inserts fitted on a ring or ring segment}
5/165	. . {with chipbreaking or chipdividing equipment (for turning machines B23B 25/02 ; turning tools B23B 27/00 ; drilling machines B23B 47/34)}	5/242	. . . . . {with cutting inserts clamped by a clamping member acting almost perpendicularly on the cutting face}
5/18	. . with permanently-fixed cutter-bits or teeth	5/2424	. . . . . {for plate-like cutting inserts (B23C 5/2427 , B23C 5/2431 , B23C 5/2434 take precedence)}
5/20	. . with removable cutter bits or teeth {or cutting inserts}	5/2427	. . . . . {for plate-like cutting inserts fitted on an intermediate carrier}
5/202	. . . {Special by shaped plate-like cutting inserts, i.e. length greater than or equal to width, width greater than or equal to thickness (with removable plate-like turning cutting inserts of special form B23B 27/141)}	5/2431	. . . . . {for plate-like cutting inserts fitted on a shank, fixed in the cutter body}
5/205	. . . . {having chip-breakers}	5/2434	. . . . . {for plate-like cutting inserts fitted on a ring or ring segment}
5/207	. . . . {having a special shape}	5/2437	. . . . . {clamping by means of a wedge}
5/22	. . . Securing arrangements for bits or teeth {or cutting inserts}	5/2441	. . . . . {for plate-like cutting inserts (B23C 5/2444 , B23C 5/2448 , B23C 5/2451 take precedence)}
5/2204	. . . . {with cutting inserts clamped against the walls of the recess in the shank by a clamping member acting upon the wall of a hole in the insert}	5/2444	. . . . . {for plate-like cutting inserts fitted on an intermediate carrier}
5/2208	. . . . . {for plate-like cutting inserts (B23C 5/2226 , B23C 5/223 , B23C 5/2234 take precedence)}	5/2448	. . . . . {for plate-like cutting inserts fitted on a shank, fixed in the cutter body}
5/2213	. . . . . {Special by shaped cutting inserts}	5/2451	. . . . . {for plate-like cutting inserts fitted on a ring or ring segment}
5/2217	. . . . . {having chip-breakers}	5/2455	. . . . . {The adjusting means being serrated teeth on the cutter and the cutting insert}
5/2221	. . . . . {having a special shape}	5/2458	. . . . . {the cutting elements being clamped or adjusted simultaneously}
5/2226	. . . . . {for plate-like cutting inserts fitted on an intermediate carrier}		
5/223	. . . . . {for plate-like cutting inserts fitted on a shank, fixed in the cutter body}		
5/2234	. . . . . {for plate-like cutting inserts fitted on a ring or ring segment}		
5/2239	. . . . {with cutting inserts clamped by a clamping member acting almost perpendicular on the cutting face}		

5/2462	. . . . . {the adjusting means being oblique surfaces}	2200/123	. . curved
5/2465	. . . . . {the adjusting means being notches}	2200/125	. . discontinuous
5/2468	. . . . . {the adjusting means being serrations}	2200/126	. . . stepped
5/2472	. . . . . {the adjusting means being screws}	2200/128	. . with one or more grooves
5/2475	. . . . . {the adjusting means being distance elements, e.g. shims or washers}	2200/16	. Supporting or bottom surfaces
5/2479	. . . . . {the adjusting means being eccentrics}	2200/161	. . with projections
5/2482	. . . . . {the adjusting means being hydraulic cylinders}	2200/162	. . curved
5/2486	. . . . . {where the adjustment is made by balancing the toolholders}	2200/164	. . discontinuous
5/2489	. . . . . {where the adjustment is made by changing the inclination of the inserts}	2200/165	. . with one or more grooves
5/2493	. . . . . {where the adjustment is made by deforming the seating surfaces}	2200/167	. . star form
5/2496	. . . . . {where the adjusting means are gears and racks}	2200/168	. . with features related to indexing (with lines to permit indexing of round inserts B23C 2200/363)
5/26	. Securing milling cutters to the driving spindle	2200/20	. Top or side views of the cutting edge
5/265	. . {by fluid pressure means}	2200/201	. . Details of the nose radius and immediately surrounding areas
5/28	. Features relating to lubricating or cooling	2200/203	. . Curved cutting edges
7/00	Milling devices able to be attached to a machine tool, whether or not replacing an operative portion of the machine tool	2200/205	. . Discontinuous cutting edges
7/02	. to lathes	2200/206	. . Cutting edges having a wave-form
7/04	. to planing or slotting machines	2200/208	. . Wiper, i.e. an auxiliary cutting edge to improve surface finish
9/00	Details or accessories so far as specially adapted to milling machines or cutter (drives, control devices, or accessories, in general B23Q)	2200/24	. Cross section of the cutting edge
9/005	. {milling heads}	2200/243	. . bevelled or chamfered
2200/00	Details of milling cutting inserts	2200/246	. . rounded
2200/04	. Overall shape	2200/28	. Angles
2200/0405	. . Hexagonal	2200/283	. . Negative cutting angles
2200/0411	. . . irregular	2200/286	. . Positive cutting angles
2200/0416	. . Irregular	2200/32	. Chip breaking or chip evacuation
2200/0422	. . Octagonal	2200/323	. . by chip-breaking projections (with projection on top surface B23C 2200/081)
2200/0427	. . . rounded	2200/326	. . by chip breaking grooves (with grooves on top surface for chip-breaking B23C 2200/087)
2200/0433	. . Parallelogram	2200/36	. Other features of the milling insert not covered by B23C 2200/04 - B23C 2200/32
2200/0438	. . . rounded	2200/361	. . Fixation holes
2200/0444	. . Pentagonal	2200/362	. . . Having two fixation holes
2200/045	. . Round	2200/363	. . Lines to permit indexing of round insert (bottom surface with features relating to indexing B23C 2200/168)
2200/0455	. . Square	2200/365	. . Lands, i.e. the outer peripheral section of rake faces
2200/0461	. . . rounded	2200/366	. . . Variable
2200/0466	. . Star form	2200/367	. . Mounted tangentially, i.e. where the rake face is not the face with largest area
2200/0472	. . Trapezium	2200/368	. . Roughened surfaces
2200/0477	. . Triangular	2210/00	Details of milling cutters
2200/0483	. . . rounded	2210/02	. Connections between the shanks and detachable cutting heads
2200/0488	. . Heptagonal	2210/03	. Cutting heads comprised of different material than the shank irrespective of whether the head is detachable from the shank
2200/0494	. . Rectangular	2210/04	. Angles
2200/08	. Rake or top surfaces	2210/0407	. . Cutting angles
2200/081	. . with projections (chip breaking projections in general B23C 2200/323)	2210/0414	. . . different
2200/082	. . with an elevated clamping surface	2210/0421	. . . negative
2200/083	. . curved	2210/0428	. . . . axial rake angle
2200/085	. . discontinuous	2210/0435	. . . . radial rake angle
2200/086	. . with one or more grooves	2210/0442	. . . positive
2200/087	. . . for chip-breaking (with chip-breaking grooves in general B23C 2200/326)	2210/045	. . . . axial rake angle
2200/088	. . spherical	2210/0457	. . . . radial rake angle
2200/12	. Side or flank surfaces	2210/0464	. . . neutral
2200/121	. . with projections	2210/0471	. . . . axial rake angle
		2210/0478	. . . . radial rake angle

2210/0485	. . Helix angles	2210/40	. Flutes, i.e. chip conveying grooves
2210/0492	. . . different	2210/402	. . of variable depth
2210/08	. Side or top views of the cutting edge	2210/405	. . . having decreasing depth in the direction of the shank from the tip of the tool
2210/082	. . Details of the corner region between axial and radial cutting edges	2210/407	. . . having increasing depth in the direction of the shank from the tip of the tool
2210/084	. . Curved cutting edges	2210/44	. Margins, i.e. the part of the peripheral surface immediately adjacent the cutting edge
2210/086	. . Discontinuous or interrupted cutting edges	2210/445	. . variable
2210/088	. . Cutting edges with a wave form	2210/48	. Chip breakers
2210/12	. Cross section of the cutting edge	2210/483	. . Chip breaking projections
2210/123	. . Bevelled cutting edges	2210/486	. . Chip breaking grooves or depressions
2210/126	. . Rounded cutting edges	2210/50	. Cutting inserts
2210/16	. Fixation of inserts or cutting bits in the tool (details of connections B23C 2240/00)	2210/503	. . mounted internally on the cutter
2210/161	. . Elastically deformable clamping members	2210/506	. . mounted so as to be able to rotate freely
2210/163	. . Indexing	2210/52	. Bushings
2210/165	. . Fixation bolts	2210/54	. Configuration of the cutting part
2210/166	. . Shims	2210/56	. Supporting or guiding sections located on the periphery of the tool
2210/168	. . Seats for cutting inserts, supports for replaceable cutting bits	2210/58	. Brushes
2210/20	. Number of cutting edges	2210/60	. Axis of the cutter inclined with respect to the axis of rotation
2210/201	. . one	2210/62	. Selectable cutting diameters
2210/202	. . three	2210/64	. End milling cutters having a groove in the end cutting face, the groove not being present so as to provide a cutting edge
2210/203	. . four	2210/66	. Markings, i.e. symbols or indicating marks
2210/204	. . five	2210/68	. Reground to nominal diameter by removal of material from both the front of the insert and the back of insert carrier
2210/205	. . six	2210/70	. Pilots
2210/206	. . seven	2210/72	. Rotatable in both directions
2210/207	. . eight	2210/74	. Slits
2210/208	. . ten		
2210/209	. . twelve		
2210/24	. Overall form of the milling cutter (angles B23C 2210/04 ; top or side views of cutting edges B23C 2210/08 ; cross sections of cutting edges B23C 2210/12)	2215/00	Details of workpieces
2210/241	. . Cross sections of the whole milling cutter	2215/04	. Aircraft components
2210/242	. . Form tools, i.e. cutting edges profiles to generate a particular form	2215/045	. . Propellers
2210/243	. . Cutting parts at both ends	2215/08	. Automotive parts (B23C 2215/16 , B23C 2215/20 and B23C 2215/24 take precedence)
2210/244	. . Milling cutters comprised of disc-shaped modules or multiple disc-like cutters	2215/085	. . Wheels
2210/245	. . Milling cutters comprising a disc having a wave form	2215/12	. Propellers for boats
2210/246	. . Milling cutters comprising a hole or hollow in the end face or between the cutting edges	2215/16	. Camshafts
2210/247	. . Stepped milling cutters	2215/20	. Crankshafts
2210/248	. . . with enlarged cutting heads	2215/24	. Components of internal combustion engines
2210/28	. Arrangement of teeth	2215/242	. . Combustion chambers
2210/282	. . Unequal angles between the cutting edges, i.e. cutting edges unequally spaced in the circumferential direction	2215/245	. . Connecting rods
2210/285	. . Cutting edges arranged at different diameters	2215/247	. . Components of diesel engines
2210/287	. . Cutting edges arranged at different axial positions or having different lengths in the axial direction	2215/28	. Nipples
2210/32	. Details of teeth	2215/32	. Railway tracks
2210/321	. . Lands, i.e. the area on the rake face in the immediate vicinity of the cutting edge	2215/36	. Railway wheels
2210/323	. . Separate teeth, i.e. discrete profiled teeth similar to those of a hob	2215/40	. Spectacles
2210/325	. . Different teeth, i.e. one tooth having a different configuration to a tooth on the opposite side of the flute	2215/44	. Turbine blades
2210/326	. . File like cutting teeth, e.g. the teeth of cutting burrs	2215/48	. Kaplan turbines
2210/328	. . Treated cutting edges	2215/52	. Axial turbine wheels
		2215/56	. Radial turbine wheels
		2215/60	. Valve guides in combination with the neighbouring valve seat
		2215/64	. Well pipe windows, i.e. windows in tubings or casings for wells
		2220/00	Details of milling processes
		2220/04	. Milling with the axis of the cutter inclined to the surface being machined

2220/08	• Milling with the axis of the tool perpendicular to the workpiece axis	2226/315	• . polycrystalline [PCD]
2220/12	• Cutting off, i.e. producing multiple discrete components from a single piece of material	2226/33	• Elastomers, e.g. rubber
2220/16	• Chamferring	2226/37	• Fibreglass
2220/20	• Deburring	2226/41	• Gypsum
2220/24	• Production of elliptical holes	2226/42	• Gem, i.e. precious stone
2220/28	• Finishing (roughing and finishing B23C 2220/605)	2226/45	• Glass (milling glass B28D 1/18)
2220/32	• Five-axis	2226/54	• Paper
2220/36	• Production of grooves	2226/61	• Plastics not otherwise provided for, e.g. nylon
2220/363	• . Spiral grooves	2226/62	• Polystyrene foam
2220/366	• . Turbine blade grooves	2226/72	• Silicon carbide
2220/40	• Using guiding means	2226/73	• Silicon nitride
2220/44	• High speed milling	2226/75	• Stone, rock or concrete (milling stone or like materials B28D 1/18)
2220/48	• Methods of milling not otherwise provided for		
2220/52	• Orbital drilling, i.e. use of a milling cutter moved in a spiral path to produce a hole	2228/00	Properties of materials of tools or workpieces, materials of tools or workpieces applied in a specific manner
2220/56	• Plunge milling	2228/04	• applied by chemical vapour deposition [CVD]
2220/60	• Roughing	2228/08	• applied by physical vapour deposition [PVD]
2220/605	• . Roughing and finishing	2228/10	• Coating
2220/64	• Using an endmill, i.e. a shaft milling cutter, to generate profile of a crankshaft or camshaft	2228/12	• Cast, i.e. in the form of a casting
2220/68	• Whirling	2228/14	• Flexible
		2228/24	• Hard, i.e. after being hardened
		2228/25	• Honeycomb
2222/00	Materials of tools or workpieces composed of metals, alloys or metal matrices	2228/26	• Hot
2222/04	• Aluminium	2228/49	• Sintered
2222/06	• Babbitt metal	2228/50	• Soft metal
2222/12	• Brass		
2222/14	• Cast iron	2230/00	Details of chip evacuation (chip evacuation in cutting inserts B23C 2200/32)
2222/16	• Cermet	2230/04	• Transport of chips
2222/28	• Details of hard metal, i.e. cemented carbide	2230/045	• . to the middle of the cutter or in the middle of a hollow cutter
2222/32	• Details of high speed steel (steel B23C 2222/84)	2230/08	• Using suction
2222/52	• Magnesium		
2222/61	• Metal matrices with metallic or non-metallic particles or fibres	2235/00	Details of milling keys
2222/64	• Nickel	2235/04	• Keys with blind holes
2222/76	• Silver	2235/08	• Brushes
2222/78	• Sodium	2235/12	• Using a database to store details of the key, the information in the database being used for the generation of the profile of the key
2222/84	• Steel (details of high speed steel B23C 2222/32)		
2222/88	• Titanium	2235/16	• Dial indicators
2222/98	• Zinc	2235/21	• Calibration by electronic detection of position of probes and cutting wheels
		2235/24	• Electronic sensors
2224/00	Materials of tools or workpieces composed of a compound including a metal	2235/28	• Key blanks
2224/04	• Aluminium oxide	2235/32	• Measurement systems
2224/13	• Chromium nitride	2235/36	• Ring keys
2224/14	• Chromium aluminium nitride (CrAlN)	2235/41	• Scanning systems
2224/20	• Tantalum carbide	2235/44	• Templates for the simulation of keys
2224/22	• Titanium aluminium carbide nitride (TiAlCN)	2235/48	• Tracers, probes or styli
2224/24	• Titanium aluminium nitride (TiAlN)		
2224/28	• Titanium carbide	2240/00	Details of connections of tools or workpieces (fixation of the cutting insert or bit in the tool B23C 2210/16)
2224/32	• Titanium carbide nitride (TiCN)	2240/04	• Bayonet connections
2224/36	• Titanium nitride	2240/08	• Brazed connections
2224/56	• Vanadium aluminium nitride (VAlN)	2240/12	• Connections using captive nuts
		2240/16	• Welded connections
2226/00	Materials of tools or workpieces not comprising a metal	2240/21	• Glued connections
2226/12	• Boron nitride	2240/24	• Connections using screws
2226/125	• . cubic [CBN]	2240/245	• . hollow screws, e.g. for the transmission of coolant
2226/18	• Ceramic	2240/32	• Connections using screw threads
2226/27	• Composites, e.g. fibre reinforced composites		
2226/31	• Diamond		

2245/00 Details of adjusting inserts or bits in the milling cutter

- 2245/04 . Adjustable wedge surfaces
- 2245/08 . Setting gauges
- 2245/12 . Spiral discs

2250/00 Compensating adverse effects during milling

- 2250/04 . Balancing the cutter ([vibration damping B23C 2250/16](#))
- 2250/08 . compensating centrifugal force
- 2250/12 . Cooling and lubrication
- 2250/16 . Damping vibrations ([balancing B23C 2250/04](#))
- 2250/21 . compensating wear of parts not designed to be exchanged as wear parts

2255/00 Regulation of depth of cut

- 2255/04 . Depth indicators
- 2255/08 . Limitation of depth of cut
- 2255/12 . Depth stops

2260/00 Details of constructional elements

- 2260/04 . Adjustable elements
- 2260/08 . Bearings
- 2260/12 . Cams
- 2260/28 . Differential screw threads
- 2260/40 . Harmonic gearboxes, i.e. reduction gearing including a wave generator, a flex spline or a circular spline
- 2260/48 . Indication scales
- 2260/52 . Keys, e.g. spanners or Allen keys, especially for assembling or disassembling tooling
- 2260/56 . Lasers ([improving machinability with laser whilst milling B23P 25/003](#))
- 2260/68 . Rings
- 2260/72 . Seals
- 2260/76 . Sensors
- 2260/80 . Serrations
- 2260/84 . Springs
- 2260/88 . Steadies

2265/00 Details of general geometric configurations

- 2265/08 . Conical
- 2265/12 . Eccentric
- 2265/16 . Elliptical
- 2265/32 . Polygonal
- 2265/36 . Spherical
- 2265/40 . Spiral

2270/00 Details of milling machines, milling processes or milling tools not otherwise provided for

- 2270/02 . Use of a particular power source
- 2270/022 . . Electricity
- 2270/025 . . Hydraulics
- 2270/027 . . Pneumatics
- 2270/04 . Use of centrifugal force ([compensation of effect of centrifugal force B23C 2250/08](#))
- 2270/06 . Use of elastic or plastic deformation ([B23C 2210/161 takes precedence](#))
- 2270/08 . Clamping mechanisms or provision for clamping ([B23C 2210/16 takes precedence](#))
- 2270/10 . Use of ultrasound
- 2270/12 . Centering of two elements relative to one another
- 2270/14 . Constructions comprising exactly two similar components

- 2270/16 . Constructions comprising three or more similar components

- 2270/18 . Milling internal areas of components
- 2270/20 . Milling external areas of components