B23C

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

Definition statement

This subclass/group covers:

Milling machines, milling tools, milling methods and milling devices able to be attached to a machine tool other than a milling machine for milling metal and metal-like workpieces.

Milling should be interpreted as the removal of material in teh form of chips from a workpiece by a rotating tool with a geometrically defined cutting edge wherein the main cutting force is generated as a result of the rotation of the tool in order to produce a shaped surface on the workpiece.

Relationship between large subject matter areas

Cutting inserts, which are suitable for both milling and turning or for which no particular application is given are classified in B23B 27/14.

Milling of threads and tools for milling threads are classified in B23G.

Milling of gears is classified in B23F. Some gear milling tools may be classified in B23C as well if the disclosure is relevant for the general field of milling.

There is overlap with the circular sawing field (B23D 61/02) as some tools can be used as either milling cutters or saws.

References relevant to classification in this subclass

This subclass/group does not cover:

Milling threads, tools for milling threads	B23G
Making particular items using non-specified or well-known milling techniques	B23P 15/00 or classed with product
Making milling tools other than by milling	B23P 15/28
Multi stage processes involving milling and also other operations classed in B23B, B23D, B23F and B23G, making particular items.	B23P 23/00

Details of machine tools and accessories not related to the operation being performed including: - evacuation of swarf, - guarding & protective coverings - conveying workpiece into and from machine - tool changing- measuring or sensing	B23Q B23Q 11/0042 B23Q 11/08 B23Q 7/00 B23Q 3/155 B23Q 17/00
Clamping systems for workpiece tables	B23Q 3/00& B25B
Adaptive control and/or computer controls for milling processes	B23Q 15/00 G05B 15/02
Milling of wood	B27C
Milling of stone and glass	B28D 1/18
Cutting inserts characterised only by the composition of the hard metal material	C22C
Cutting inserts characterised only by the composition of the diamond cutting material	C23C 16/00
Cutting inserts characterised only by the composition of the coating	C23C 30/00

Informative references

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

Turning/boring/drilling	B23B
Broaching/sawing/planing	B23D
Production of gears	B23F
Thread cutting	B23G
Making particular objects	B23P 15/00
Details of machine tools	B23Q

Copying mechanisms	B23Q 35/00
Grinding and production of lenses.	B24
Cutting of non-metals by severing	B26
Working of plastics	B29C
Cleaning	B08B
Production by reshaping	B21J
Sintering	B22F
Shearing of metals	B23D
Sawing	B23D
Making gears	B23F
Ceramic products	C04C
Hard metal, composition of CBN compacts	C22C
Diamonds	C23C 16/00
Coatings	C23C 30/00
Keys	E05B
Numerical control	G05B
Optical recognition system	G06K
Motors	H02K

Special rules of classification within this subclass

The use of Indexing Codes within the series B23C is widespread in the subclass. Indexing Codes should be allocated at every opportunity. When classifying milling cutters and milling inserts particular attention should be paid to the Indexing Codes. Indexing Codes should also be added routinely to give

details of the workpiece or tool configuration, when this is not implicit in the classification system. For example a document showing a particular tool using machining of a crankshaft may be given a class for inventive information only for the details of the milling cutter. Such a document should also be allocated Indexing Codes relating to the workpiece type, the method of milling and/or further details of the milling cutter itself to allow easy retrieval.

The number of 200 series Indexing Codes is too high to list individually. Where the allocation of Indexing Code is compulsory, this is indicated in the templates for the main-group at the sub-group level.

- An set of drawings is provided under the definition statement for each main group. These drawings illustrate by example the content of the most widely used groups in this sub-class. Each of the drawings is taken from a document within from the group.

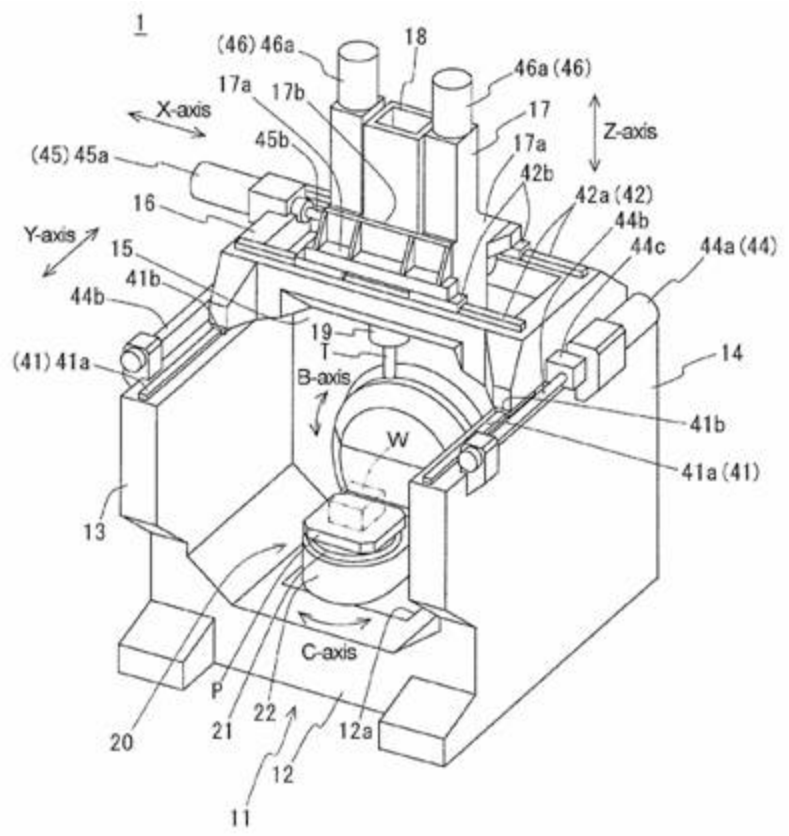
B23C 1/00

Milling machines not designed for particular work or special operations

Definition statement

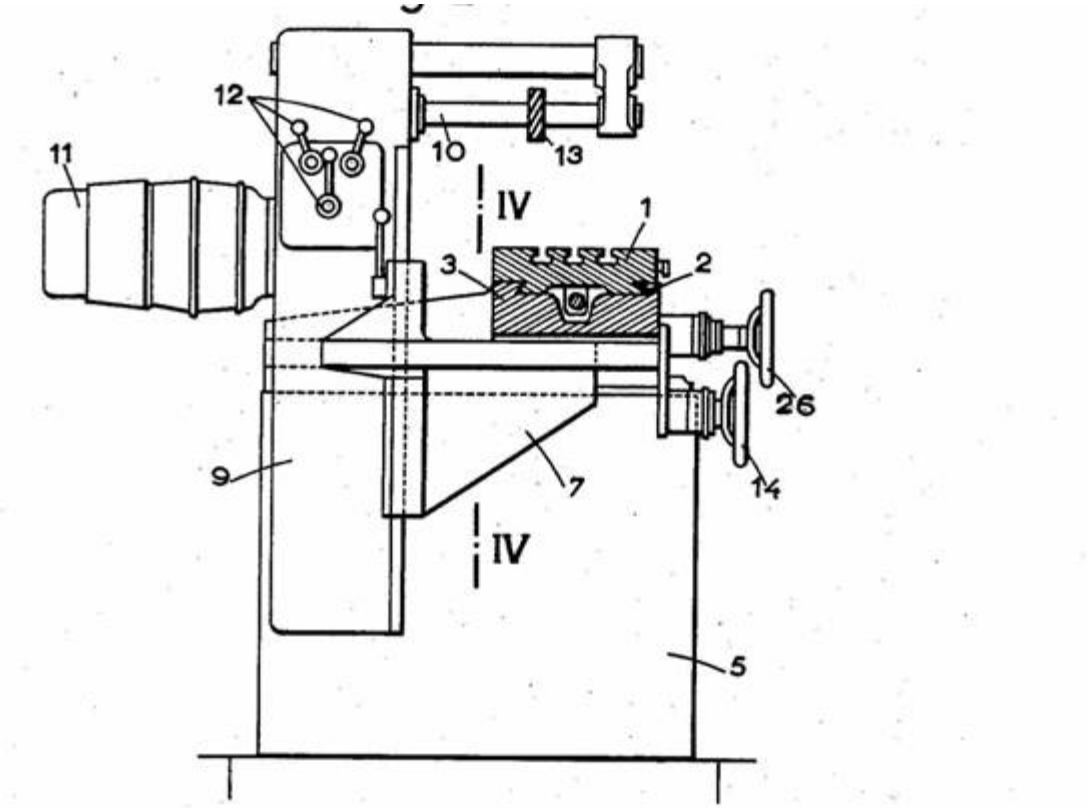
This subclass/group covers:

machines designed primarily for milling metallic materials.



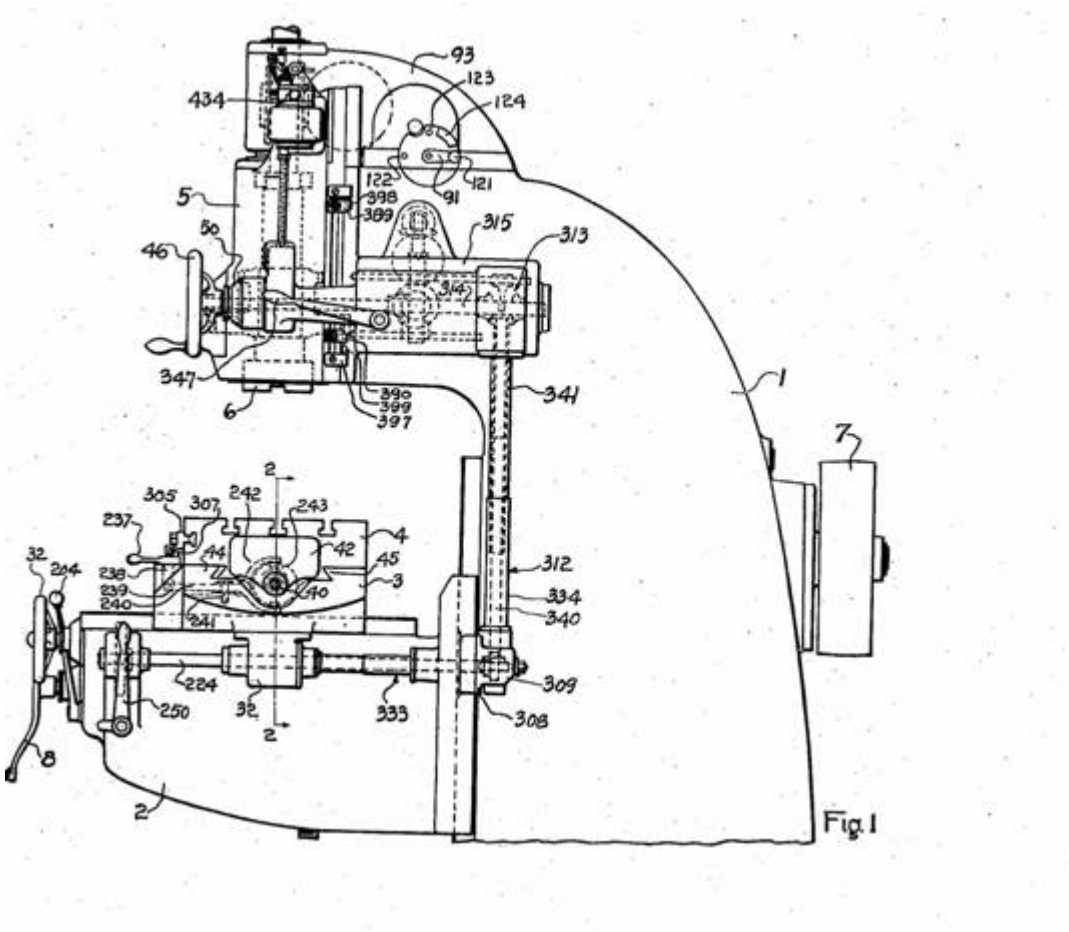
B23C 1/002

Gantry milling device (note also B23Q 1/012 portal machines)



B23C 1/027

Milling machine with adjustable working spindle



B23C 1/06

vertical milling machine

Relationship between large subject matter areas

This group does not cover multi-purpose machines (e.g. jig borers, horizontal borers etc) that can perform drilling, milling and other operations. These types of machine are classified in B23Q with details of their constructional details.

Special rules of classification within this group

Classification is generally per literal interpretation of the group and sub-group headings.

Further details of subgroups

Subgroup B23C 1/14 is not used. Refer to B23Q 1/00

Subgroups B23C 1/16 and B23C 1/18 are not used. Refer to B23Q 35/00

B23C 1/20 refers to portable milling devices. Note routers (which may be translated from German as "milling machines") are classed in B27C 5/10.

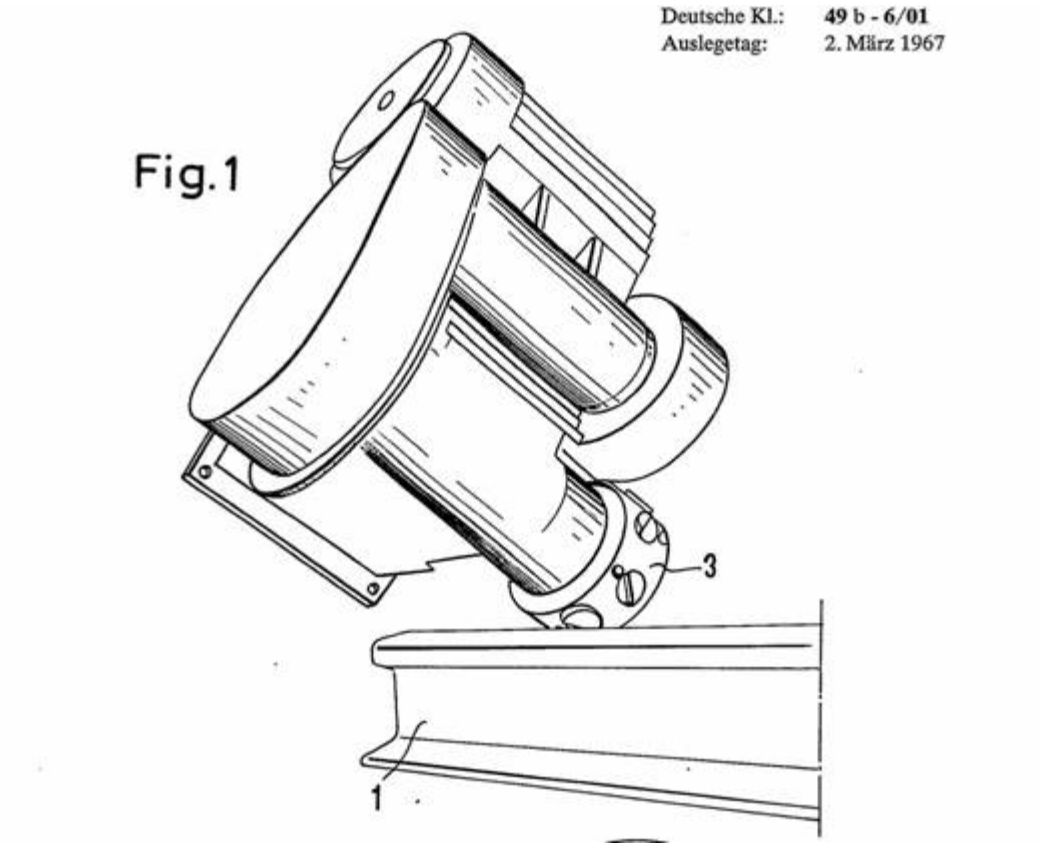
B23C 3/00

Milling particular work; Special milling operations; Machines therefor (milling gear-teeth B23F, [N: heat assisted machining B23P25/00])

Definition statement

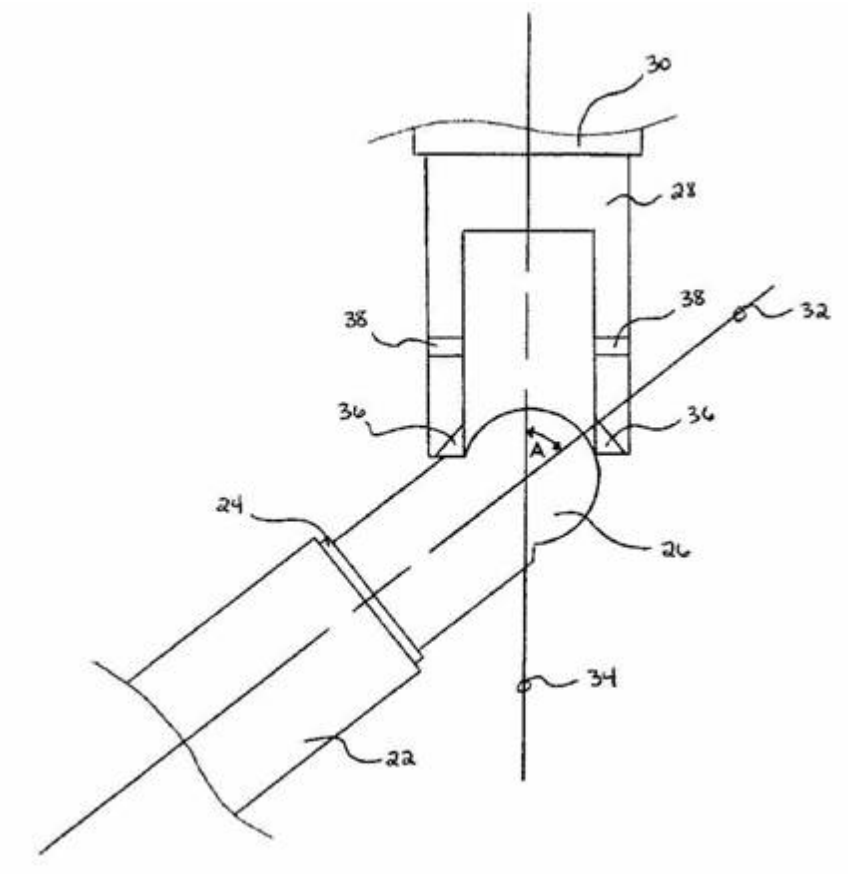
This subclass/group covers:

Milling particular work.



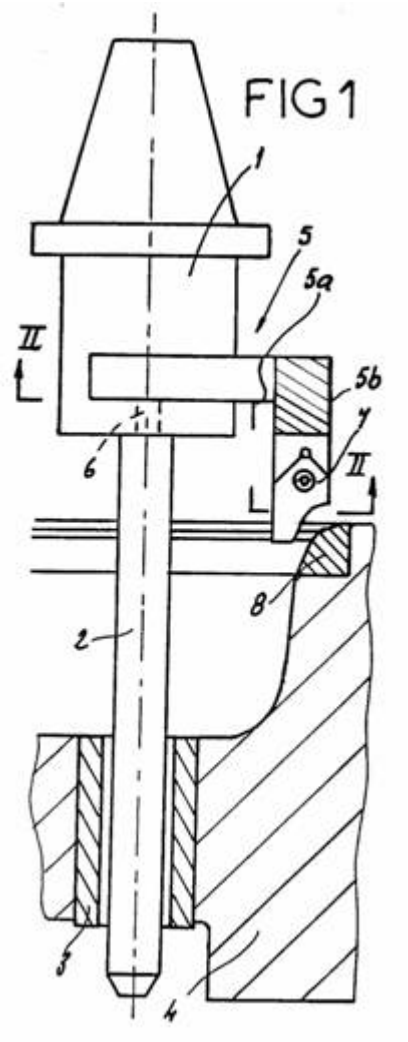
B23C 3/005

Rail milling device



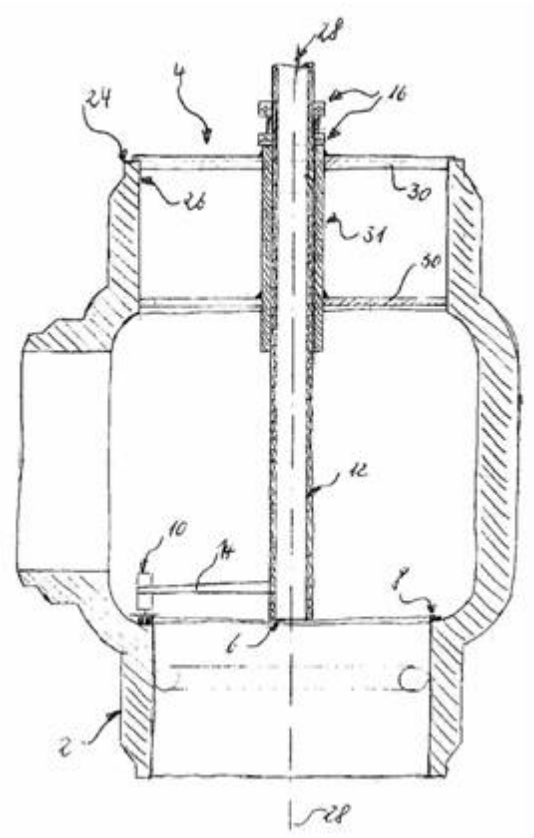
B23C 3/023

Milling spherical surfaces



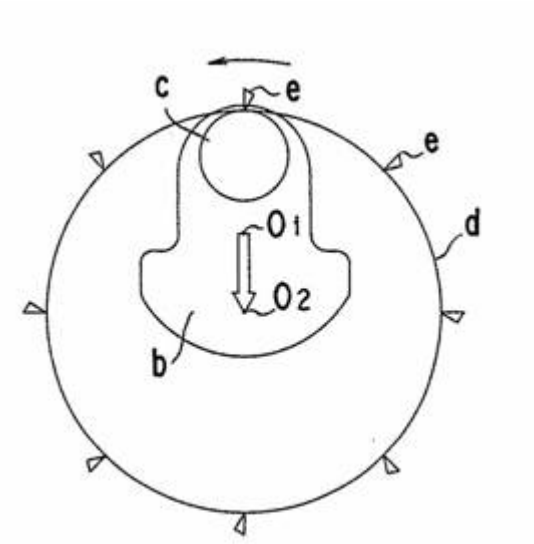
B23C 3/055

Engine valve seat milling tool



B23C 3/056

Seat milling tool for valve seat in a valve



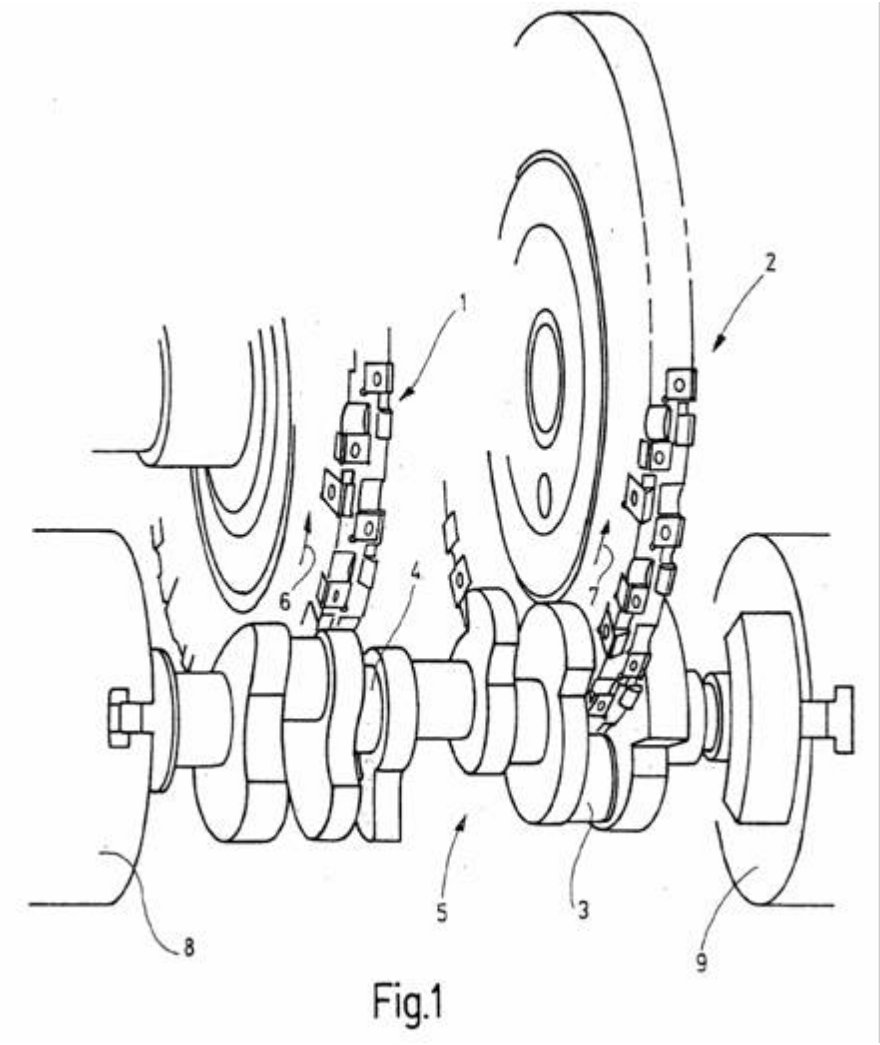
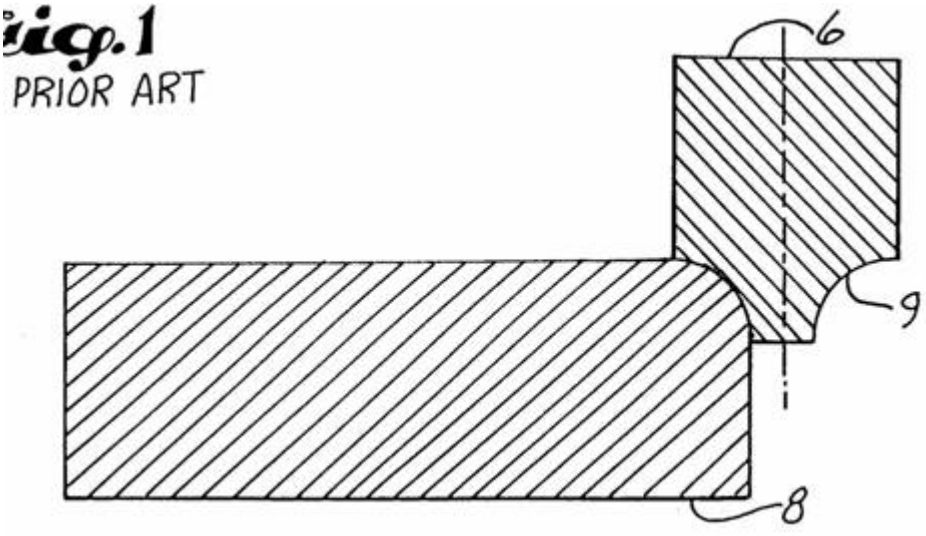


Fig.1

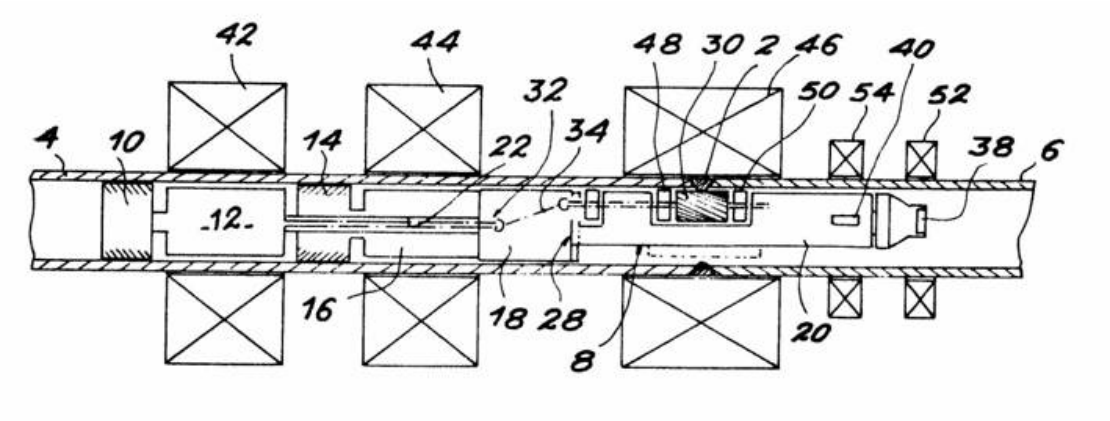
B23C 3/06

Milling crankshafts



B23C 3/12

Finishing or trimming edges includes deburring by milling



B23C 3/124

Milling edges off inside of pipe

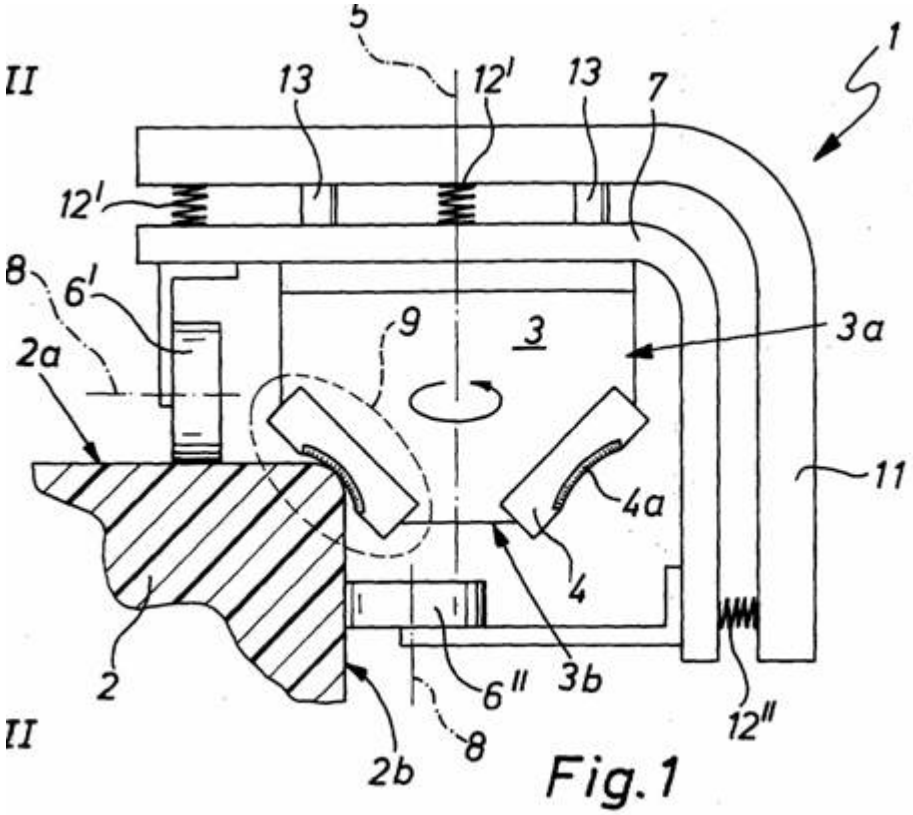


Fig. 1

B23C 3/126

Portable device for chamfering edges

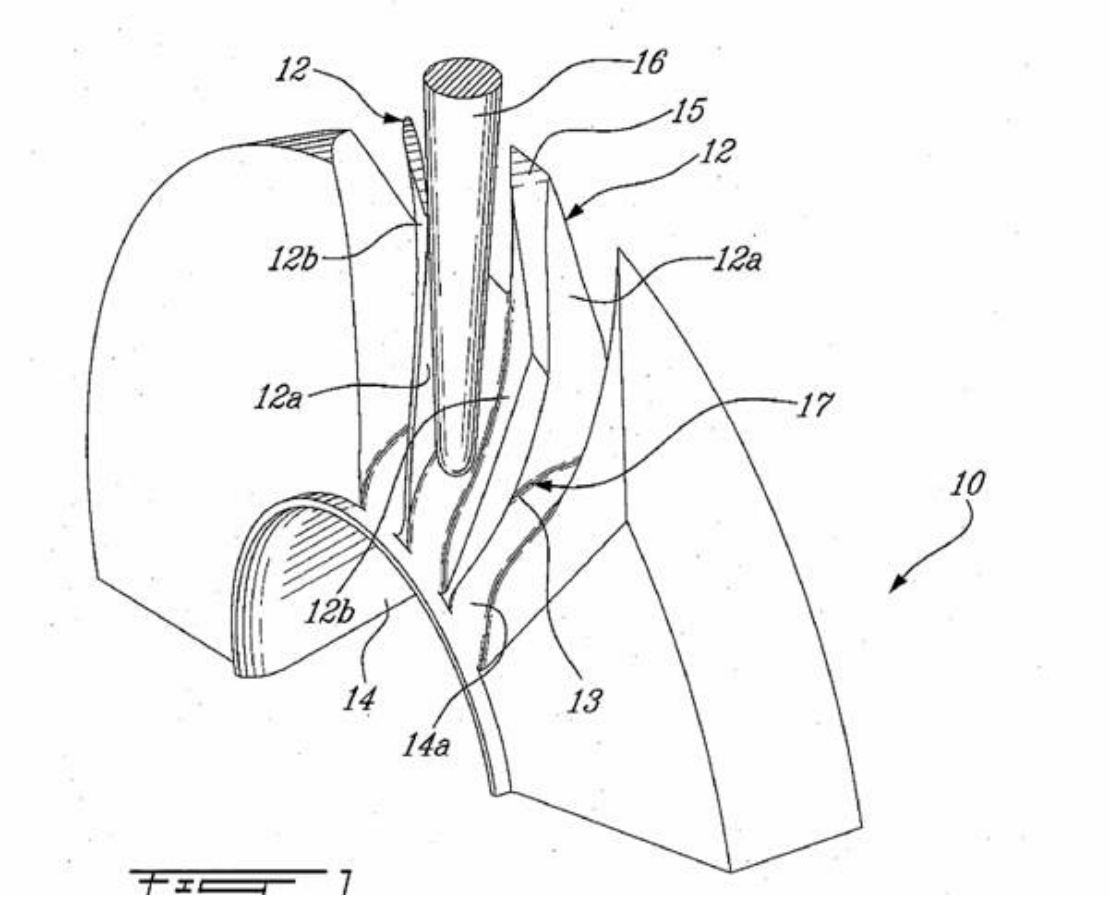
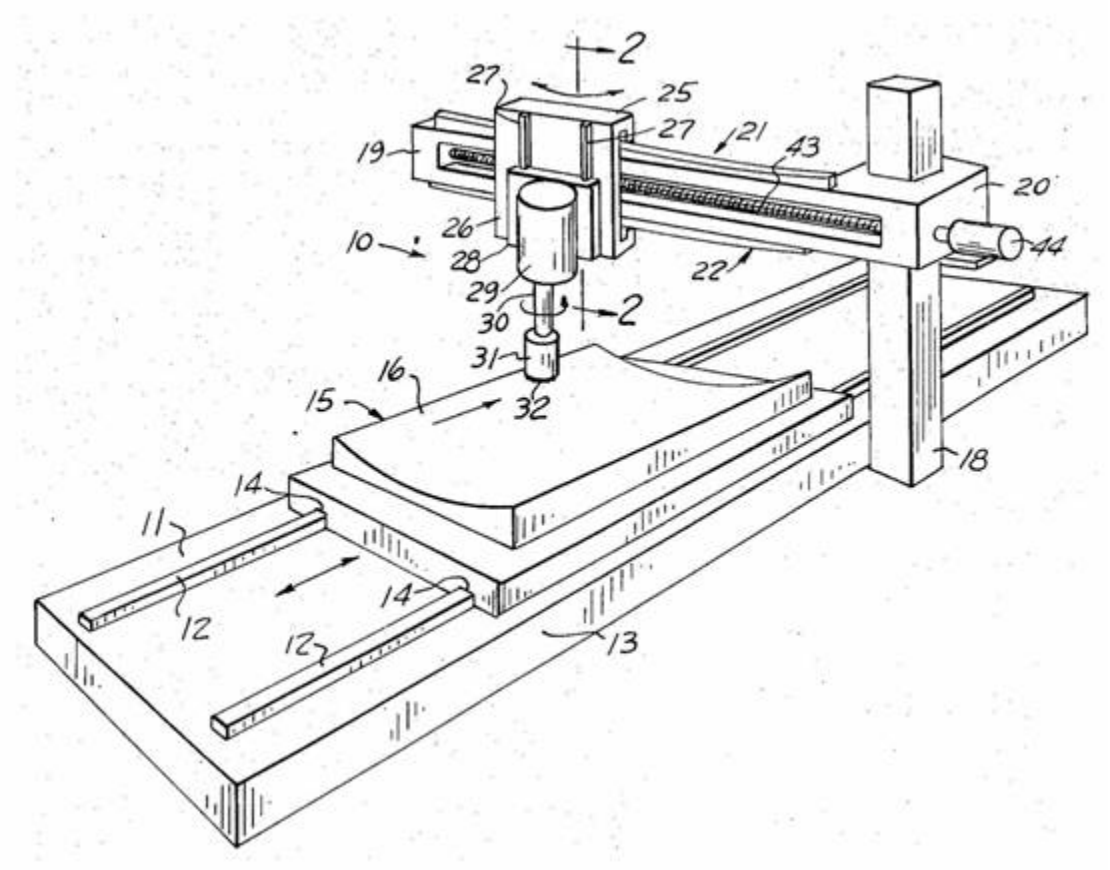


Fig. 1

B23C 3/18 (and B23C 2215/44)

Milling turbine blades



B23C 3/20

Milling dies

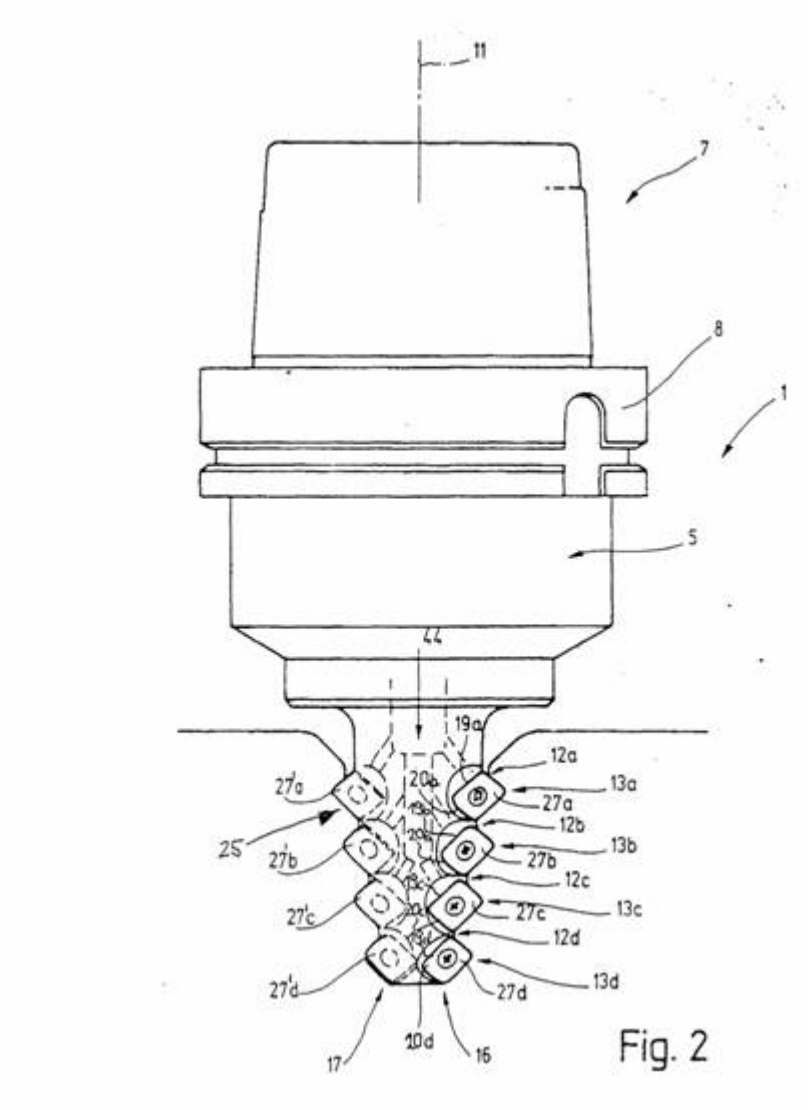
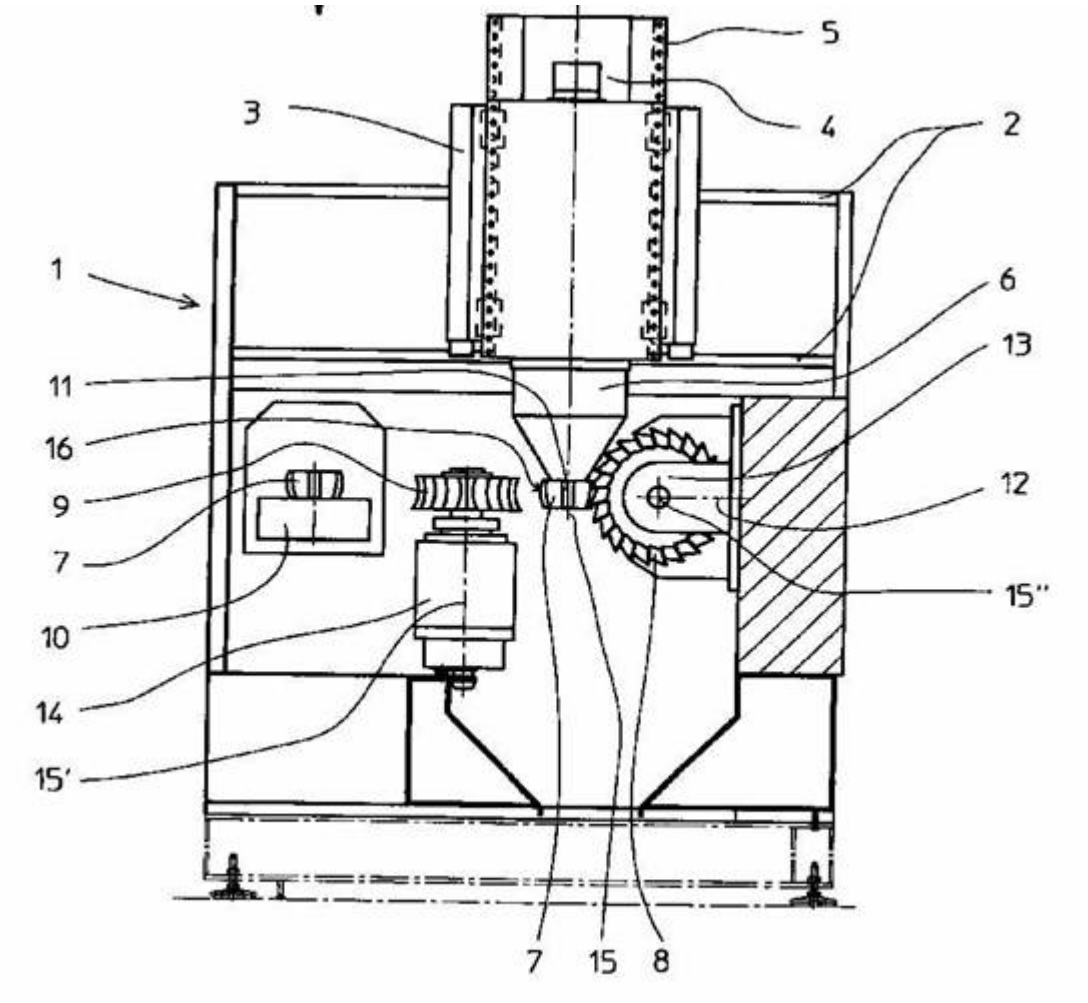


Fig. 2

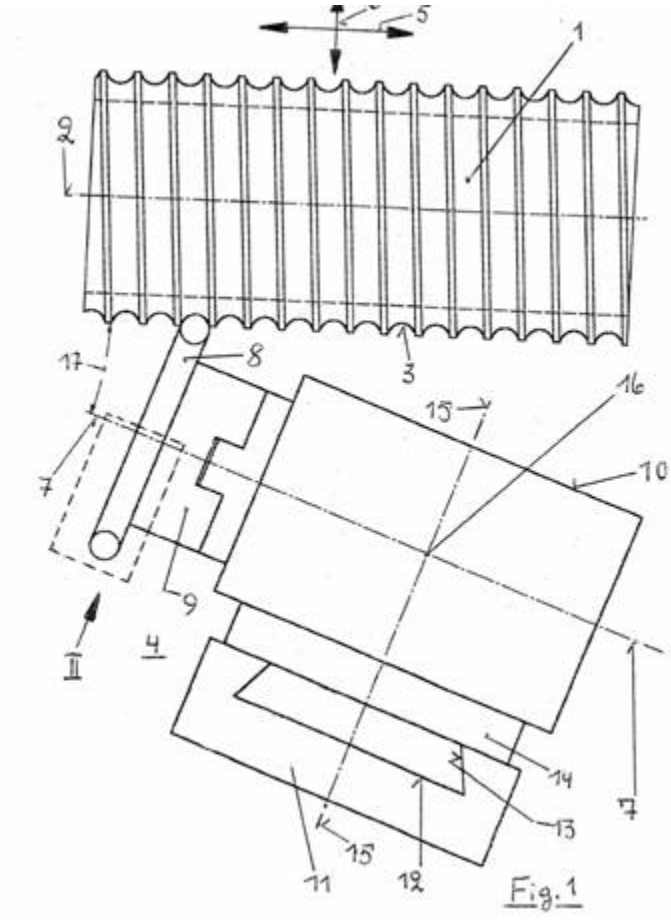
B23C 3/28 (and B23C 2220/366)

Milling grooves for turbine blades



B23C 3/30

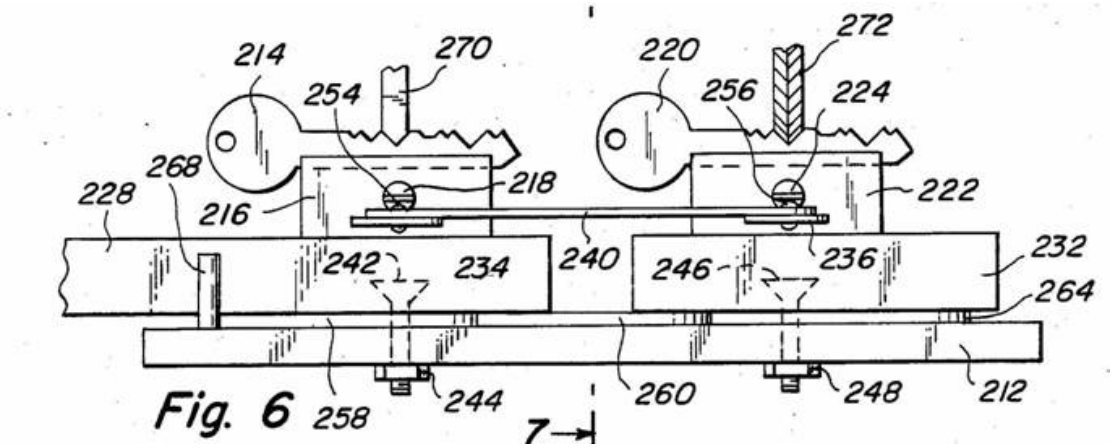
Milling straight grooves in CV joint hub (7)



B23C 3/32

Milling helical grooves in cable drum.

Note B23G 1/32 threading by milling.



B23C 3/35

Milling of keys

References relevant to classification in this group

This subclass/group does not cover:

The production of items by the use of milling techniques which are known per se.	B23P

Special rules of classification within this group

Classification is generally per literal interpretation of the group and subgroup headings. The following should be noted:

Further details of subgroups

- B23C 3/00: Miscellaneous milling operations for operations not provided in subgroups but where the milling process per se is relevant.

- B23C 3/02: Milling surfaces of revolution including orbital drilling. For orbital drilling, also allocate the Indexing Code B23C 2220/52.

- B23C 3/05: Milling valve seats, includes boring units.

- B23C 3/06, B23C 3/08: Milling crankshafts or camshafts. See also B23B 5/18 (turning) and B23D 37/005 (broaching).

- B23C 3/10: Milling of relief surfaces, including the milling of relief surfaces on tools

- B23C 3/12: Trimming edges (deburring by milling). Note deburring by grinding is classified in B24, deburring by scraping in B23D 79/00, deburring by chamfering drilled hole in B23B 51/10.

- B23C 3/18: Milling curved surfaces of turbine blades etc. Note production of turbine blades B23P 15/02 and B23P 15/04.

- B23C 3/28: Milling grooves, including retaining grooves in turbine blades etc.

- B23C 3/35: Milling keys. Keys in this groups are the devices that fit in locks, not devices to prevent rotation between two objects. Optical recognition systems G06K. Keys per se E05B 19/00. Note the particular Indexing Codes B23C 2235/00 to B23C 2235/48.

B23C 3/355 should be interpreted as holders for both the master key and the key forming the workpiece being cut.

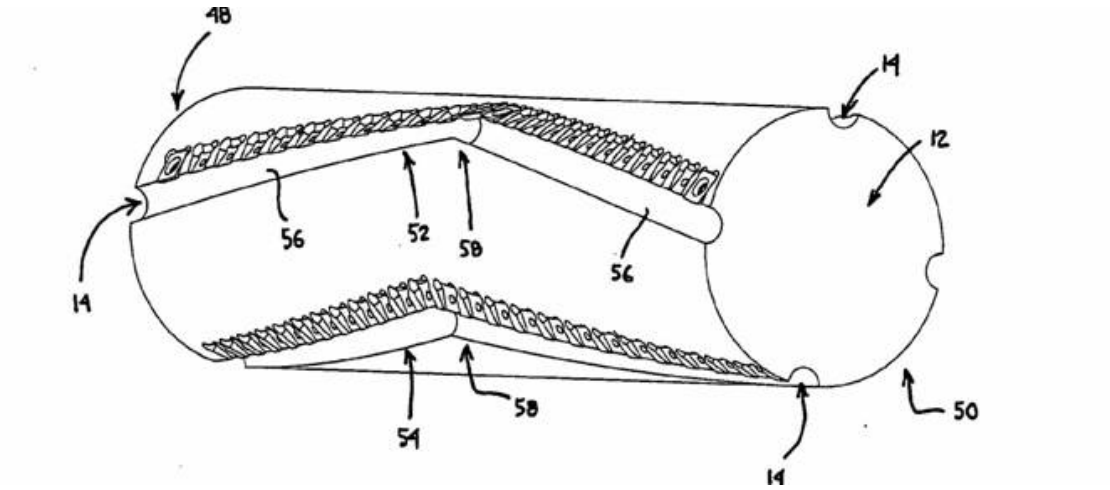
B23C 3/36 milling of milling cutters. Note that making of milling cutters by multi-stage processes (whether or not including milling) is classed in B23P 15/34. B23C 3/36 relates to the details of the process of milling milling cutters wherein the milling in itself is of interest.

B23C 5/00

Milling cutters (for cutting gear-teeth B23F21/12)

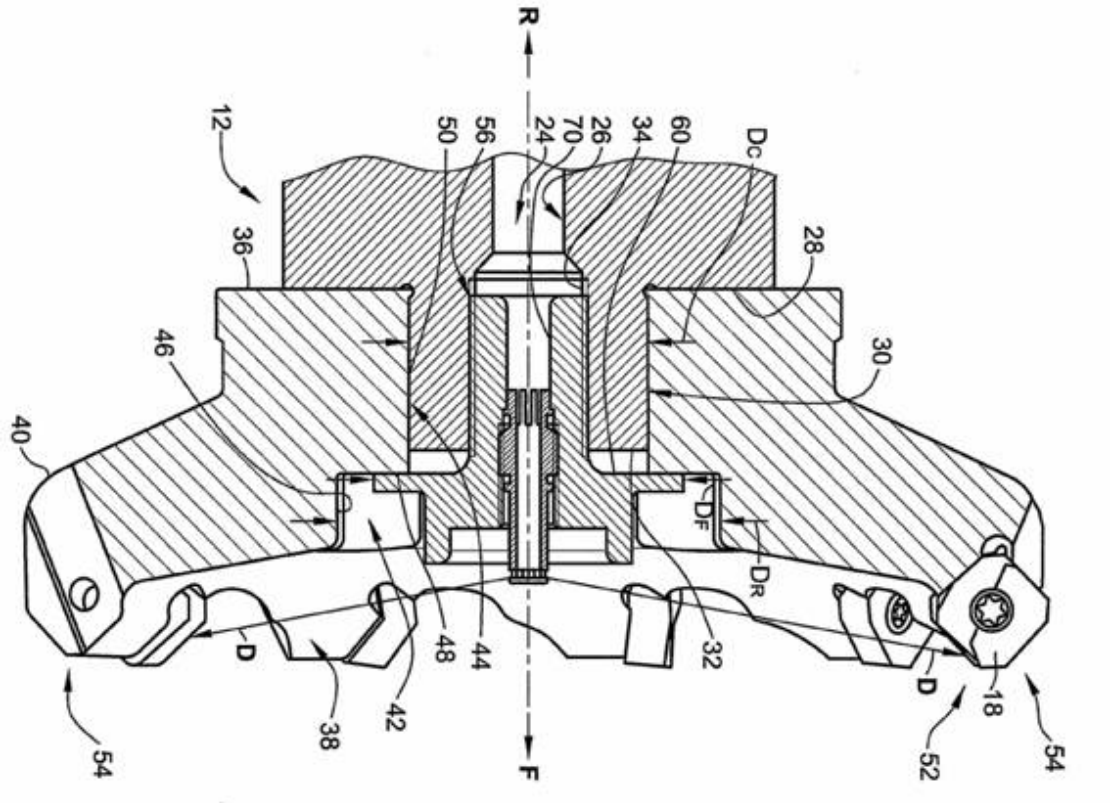
Definition statement

This subclass/group covers:
Milling cutters.

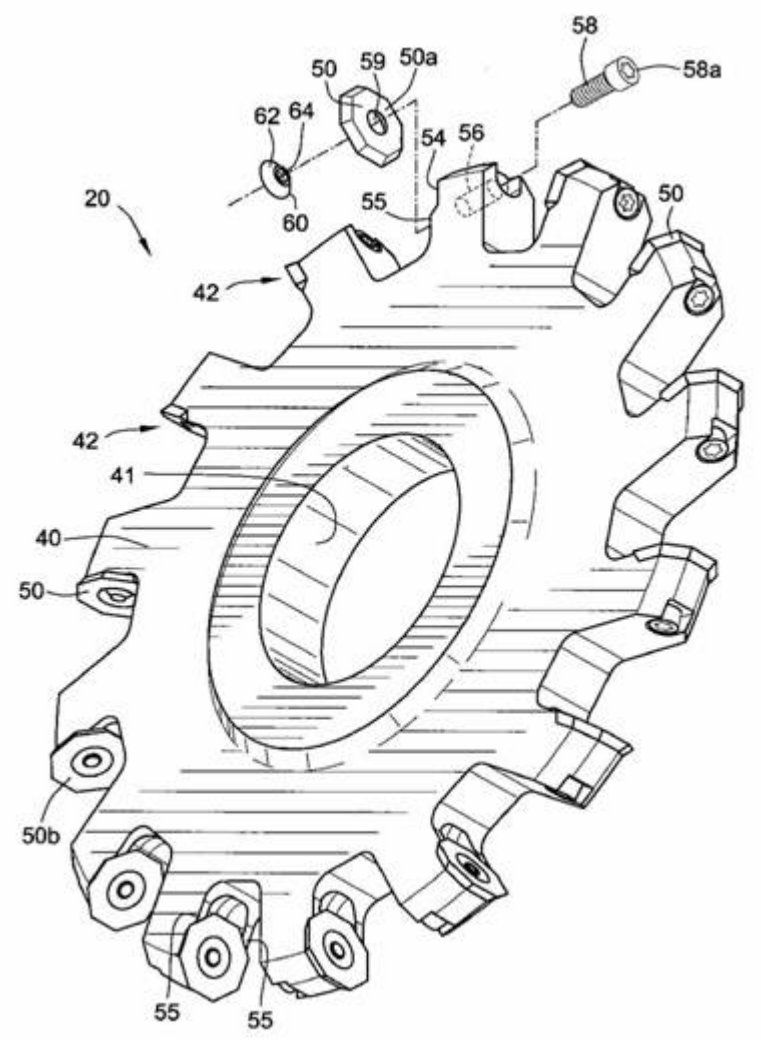


B23C 5/04

plain milling cutter

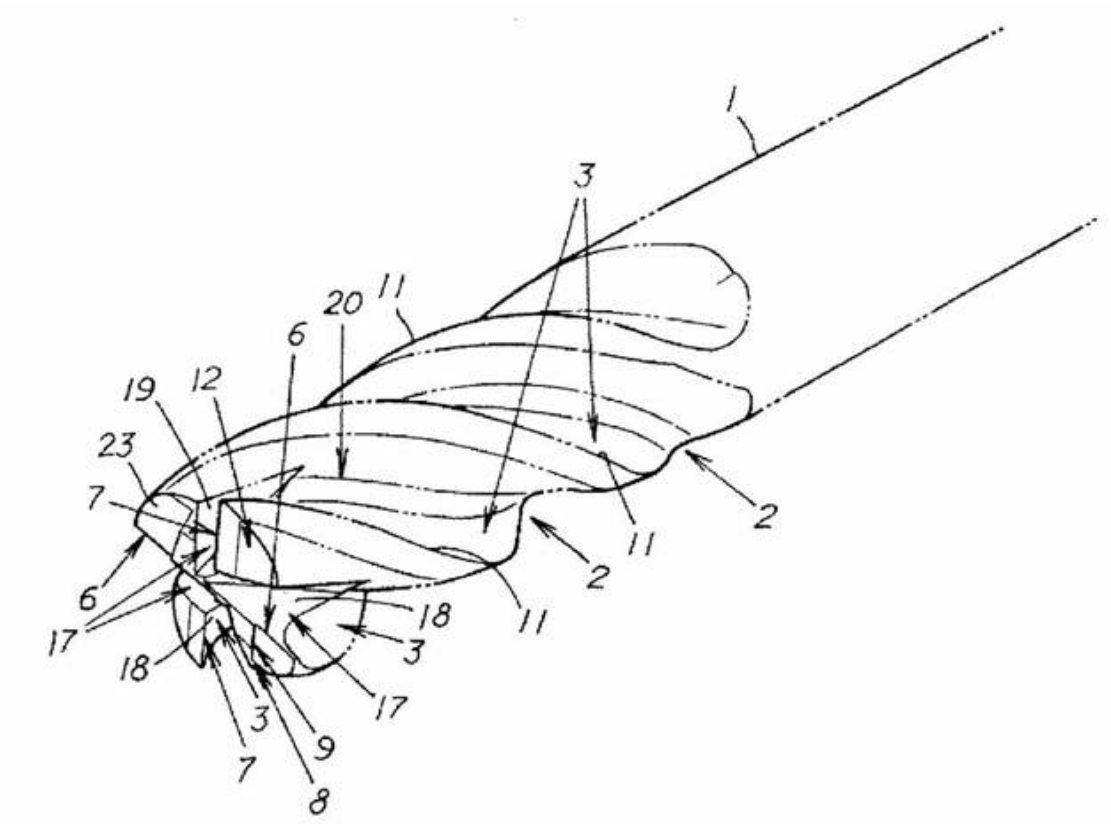


B23C 5/06 face milling cutter



B23C 5/08

Disc milling cutter (side and face cutter)



B23C 5/10

Milling cutter (slot drill) with shank having end cutters extending to cutter axis to enable axial feed

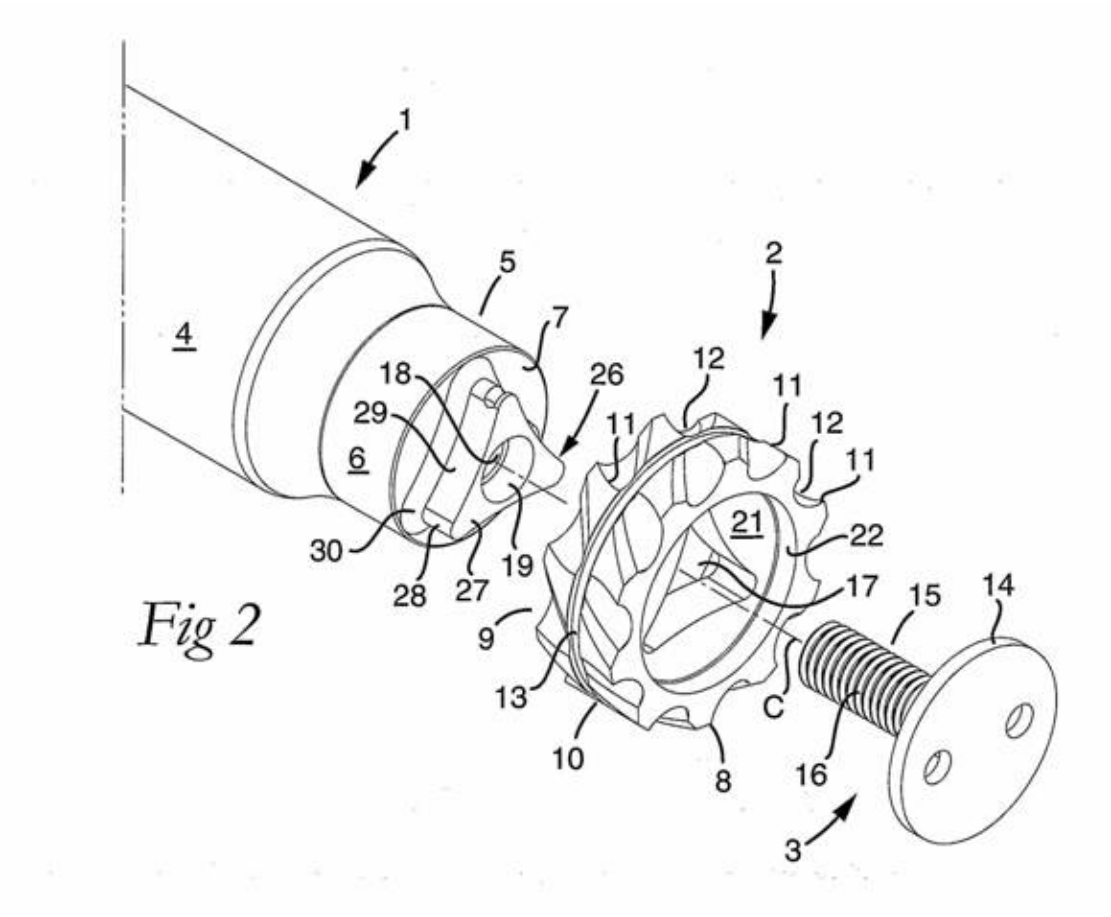
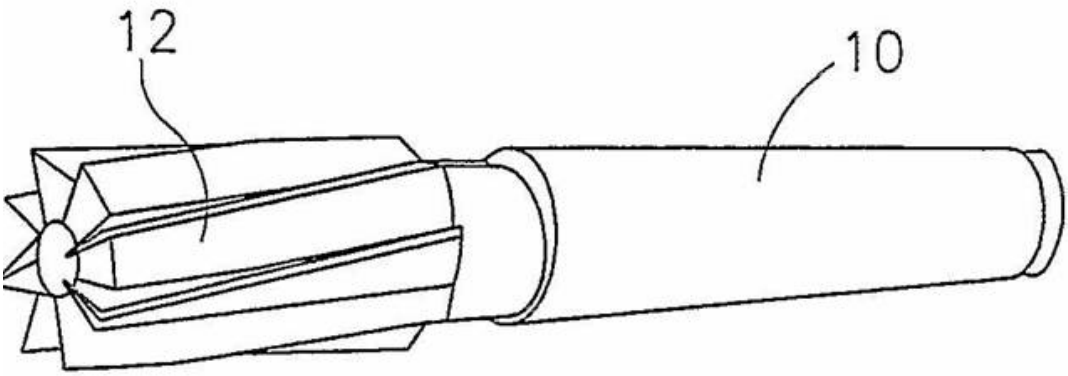


Fig 2

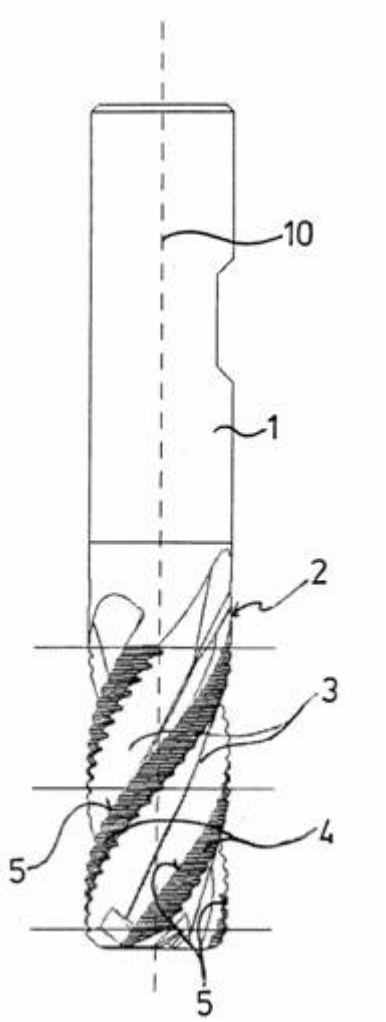
B23C 5/10 (and B23C 2210/02, B23C 2210/03, B23C 2240/24)

Milling cutter with head detachable from shaft (note shafted milling cutters with inserts B23C 5/109)



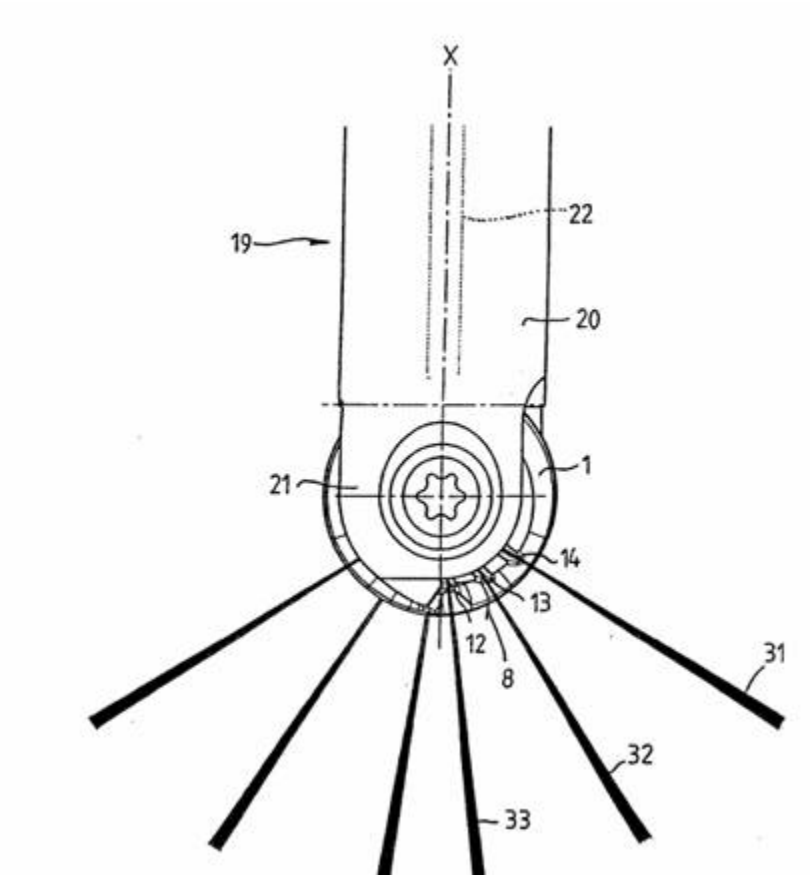
B23C 5/10

Milling cutter (end mill) with shank



B23C 5/10 (and B23C 2210/088 or B23C 2220/60)

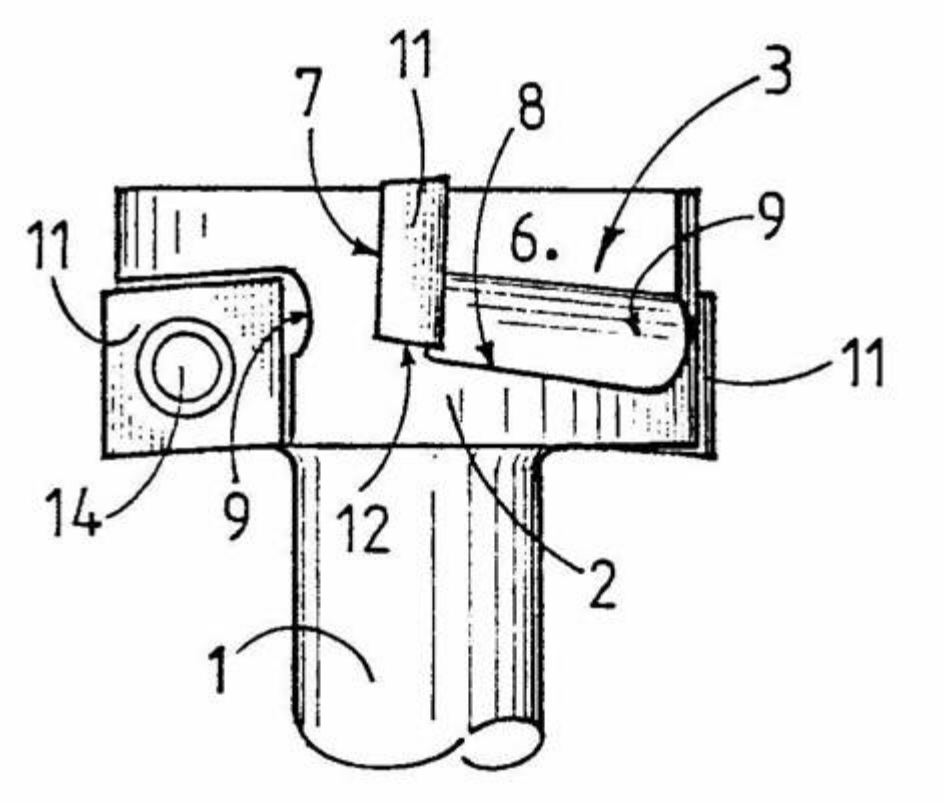
Milling cutter with shaft for roughing



B23C 5/1027

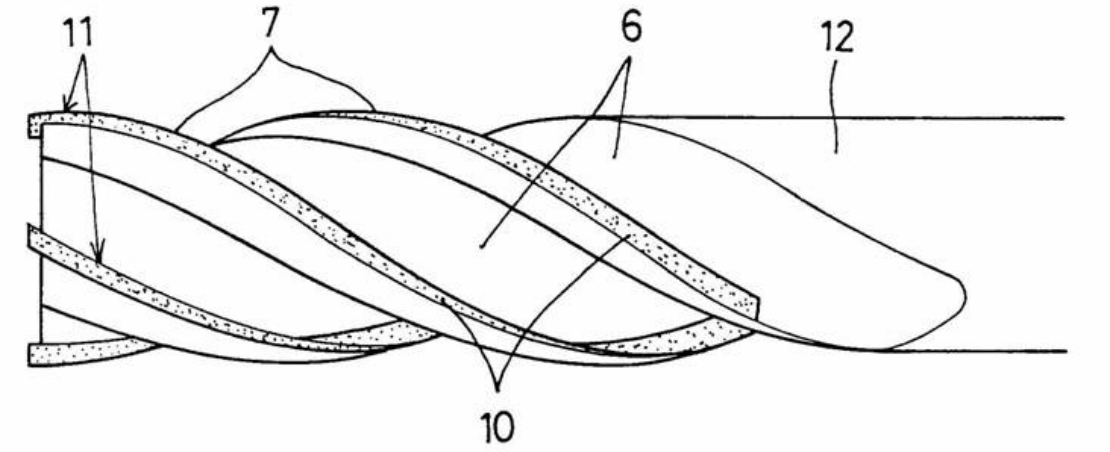
Ball nosed milling cutter with removable insert

and provision for cooling (B23C 5/28)



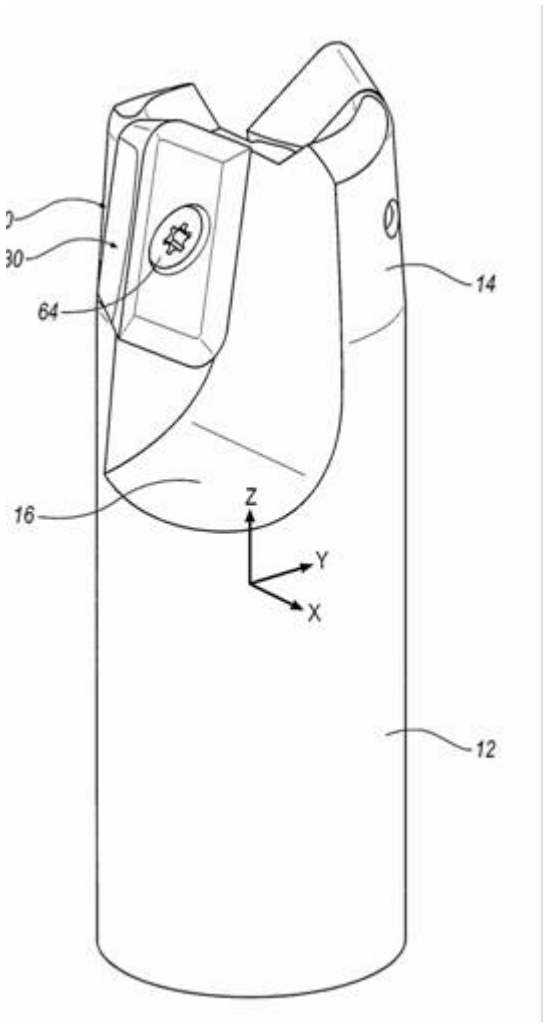
B23C 5/1054

T-Slot milling cutter



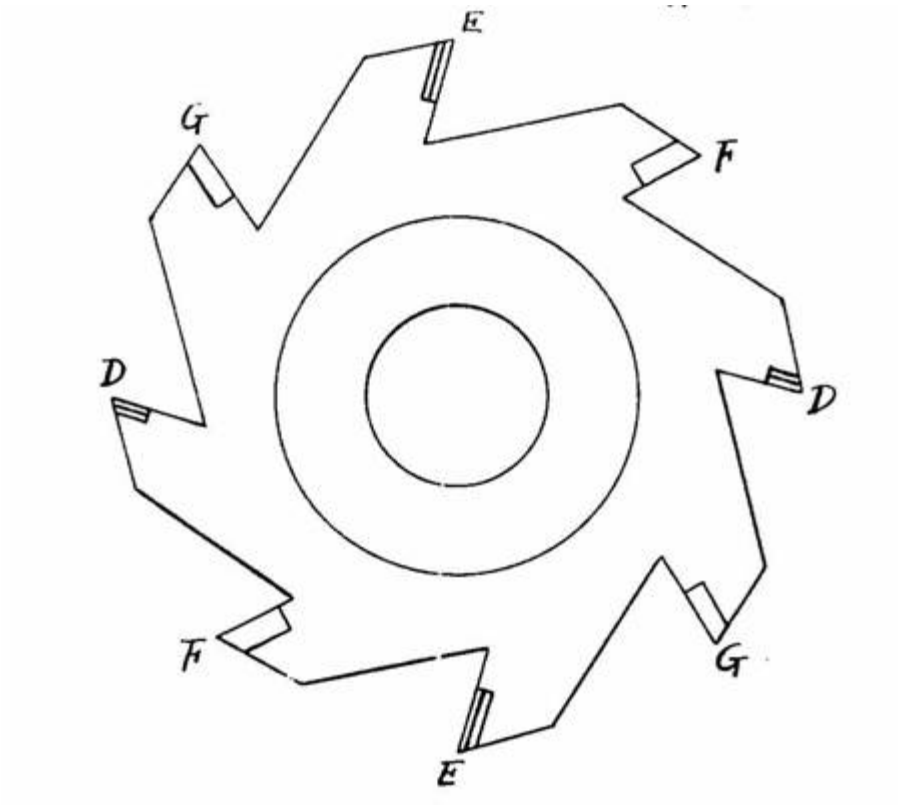
B23C 5/1081 (and B23C 2226/315 for PCD or B23C 2226/125 for CBN)

Milling cutter with shaft and permanently attached inserts



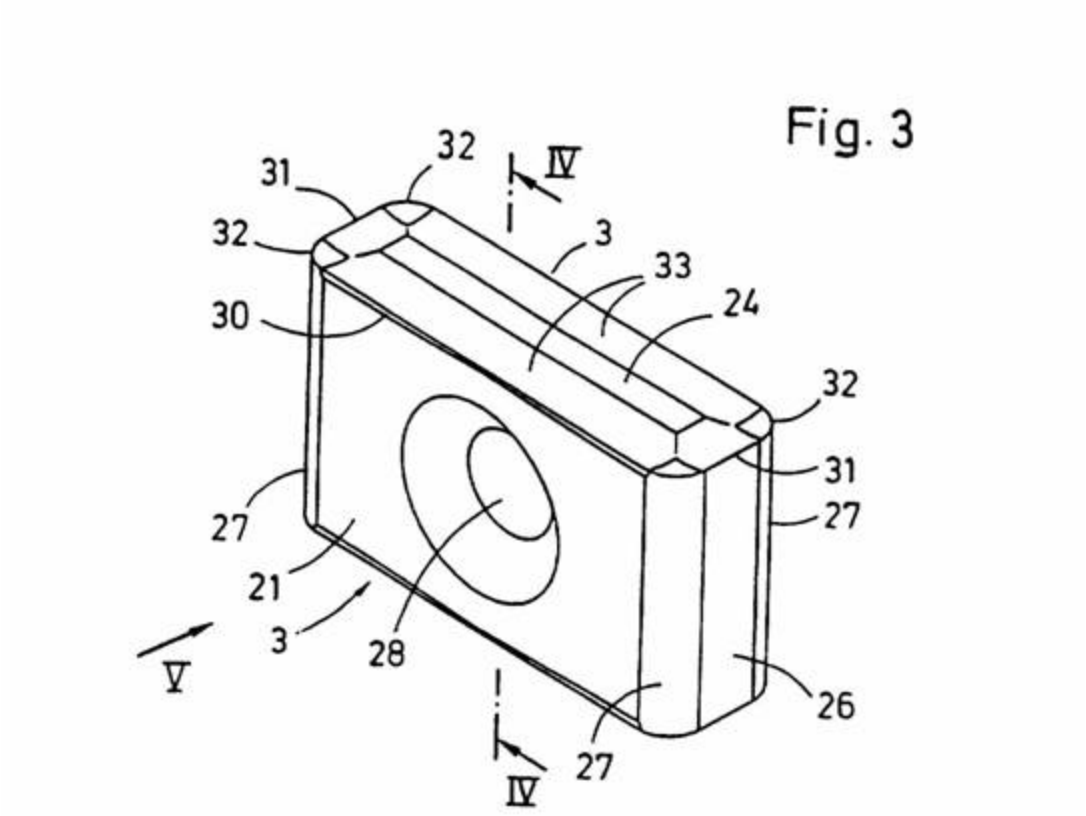
B23C 5/109

Milling cutter with shaft and removable inserts



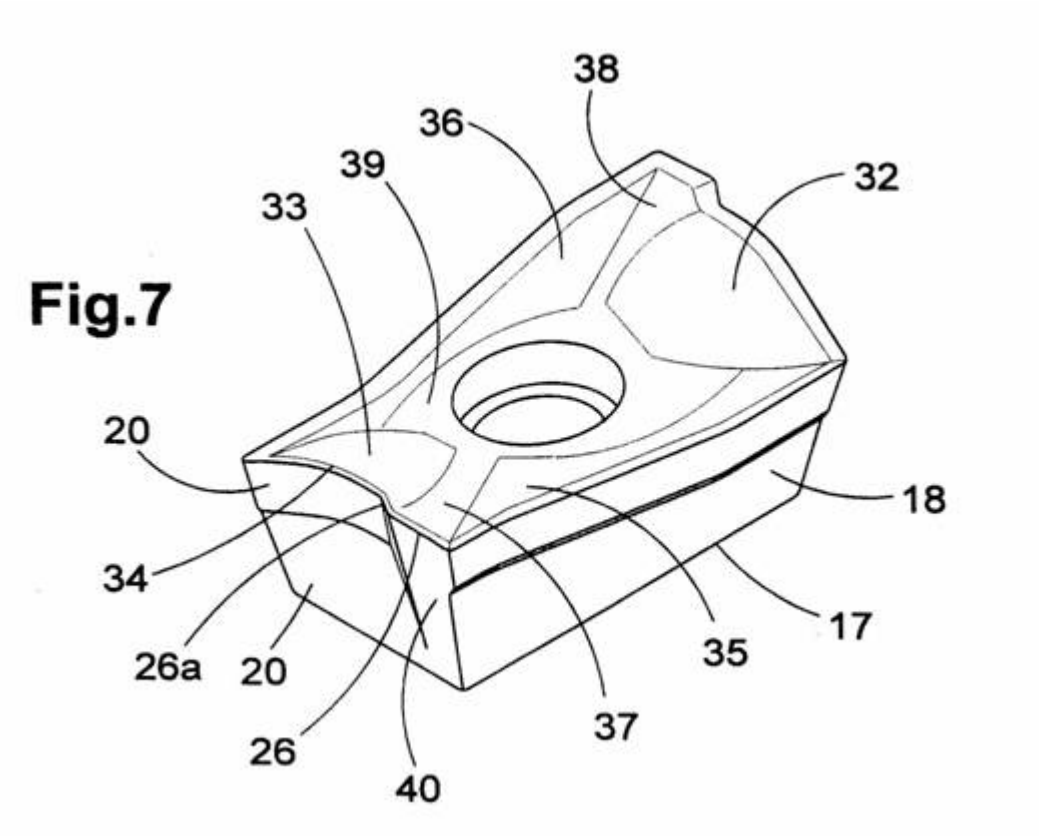
B23C 5/18

milling cutter with permanently fixed inserts (see also B23C 5/1081)



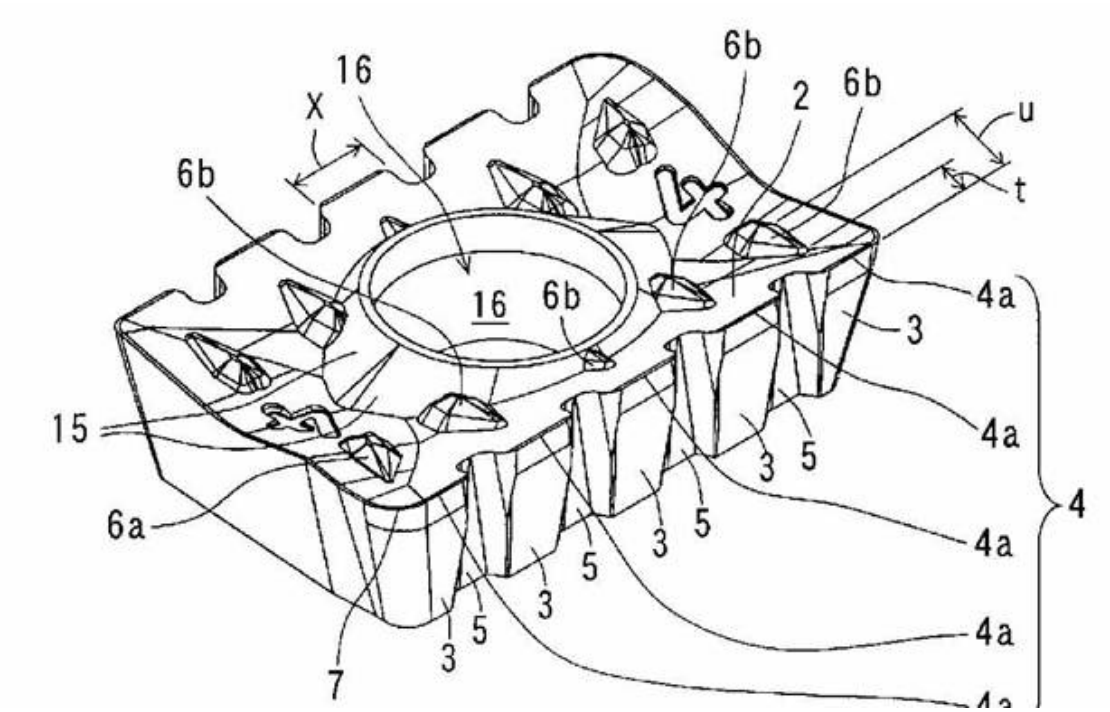
B23C 5/202 (and B23C 2200/367)

Tangentially mounted milling insert



B23C 5/202 (and B23C 2200/203, B23C 2200/208)

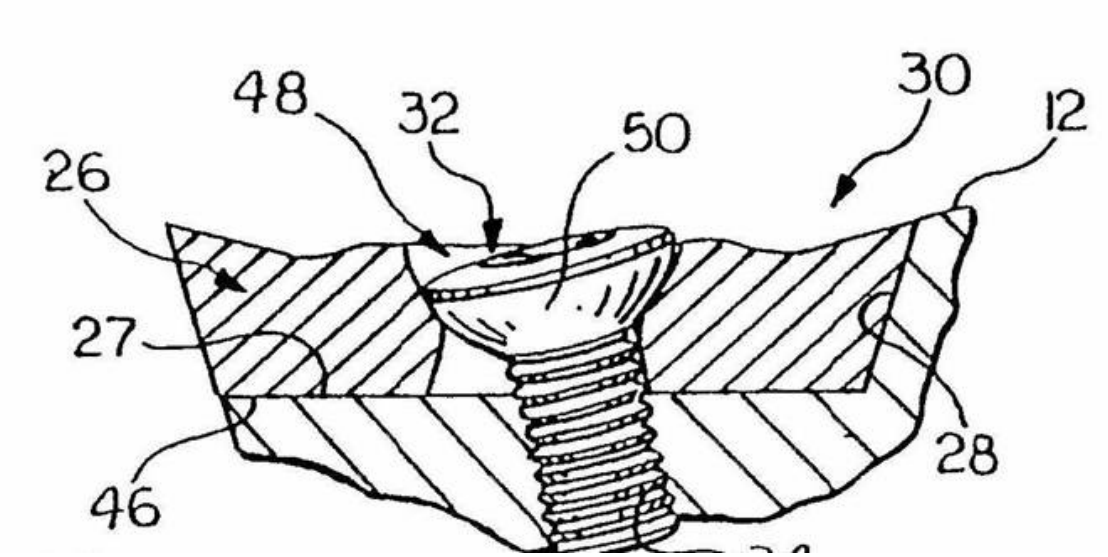
Milling insert with curved cutting edge and wiper



B23C 5/202 (and B23C 2200/205, B23C 2200/081)

Milling insert with interrupted cutting edge and

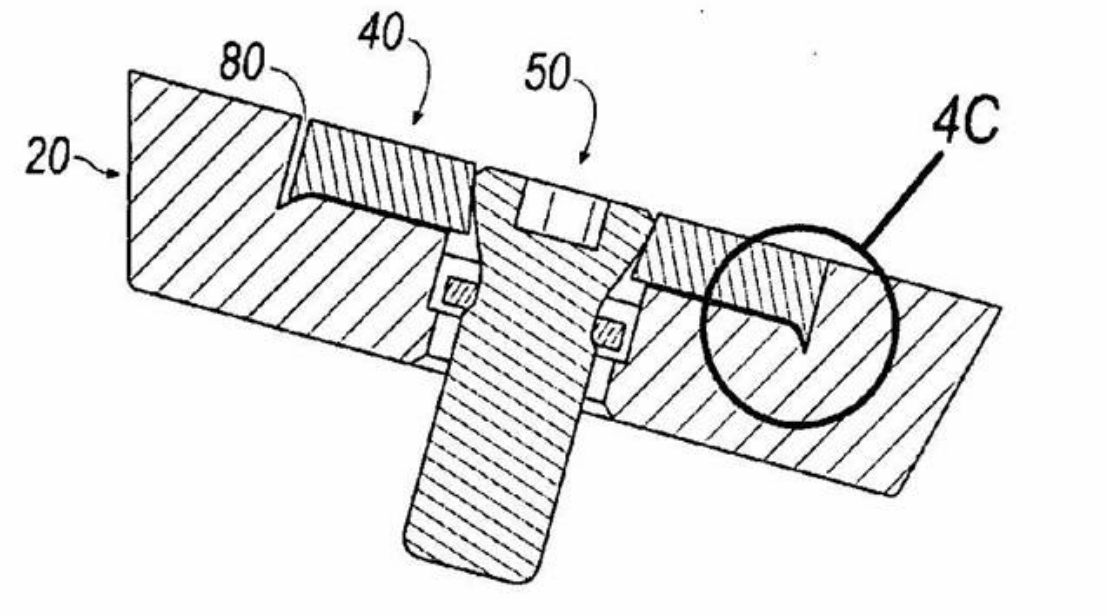
chipbreaking projections on the top surface



B23C 5/2213

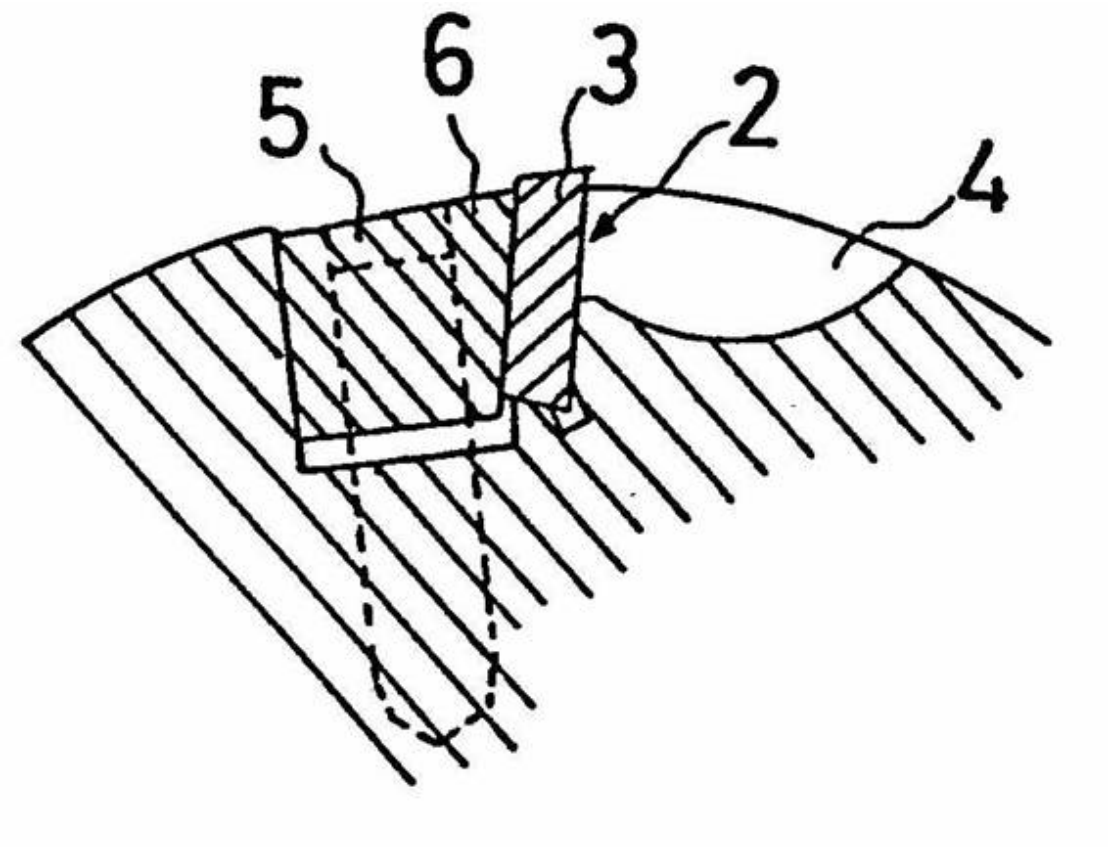
Milling insert of special shape (in this case because of the fixation hole) and where clamping against the walls of a pocket by means of something acting on the hole in the insert is also important.

Note: specially shaped screw B23C 2210/165



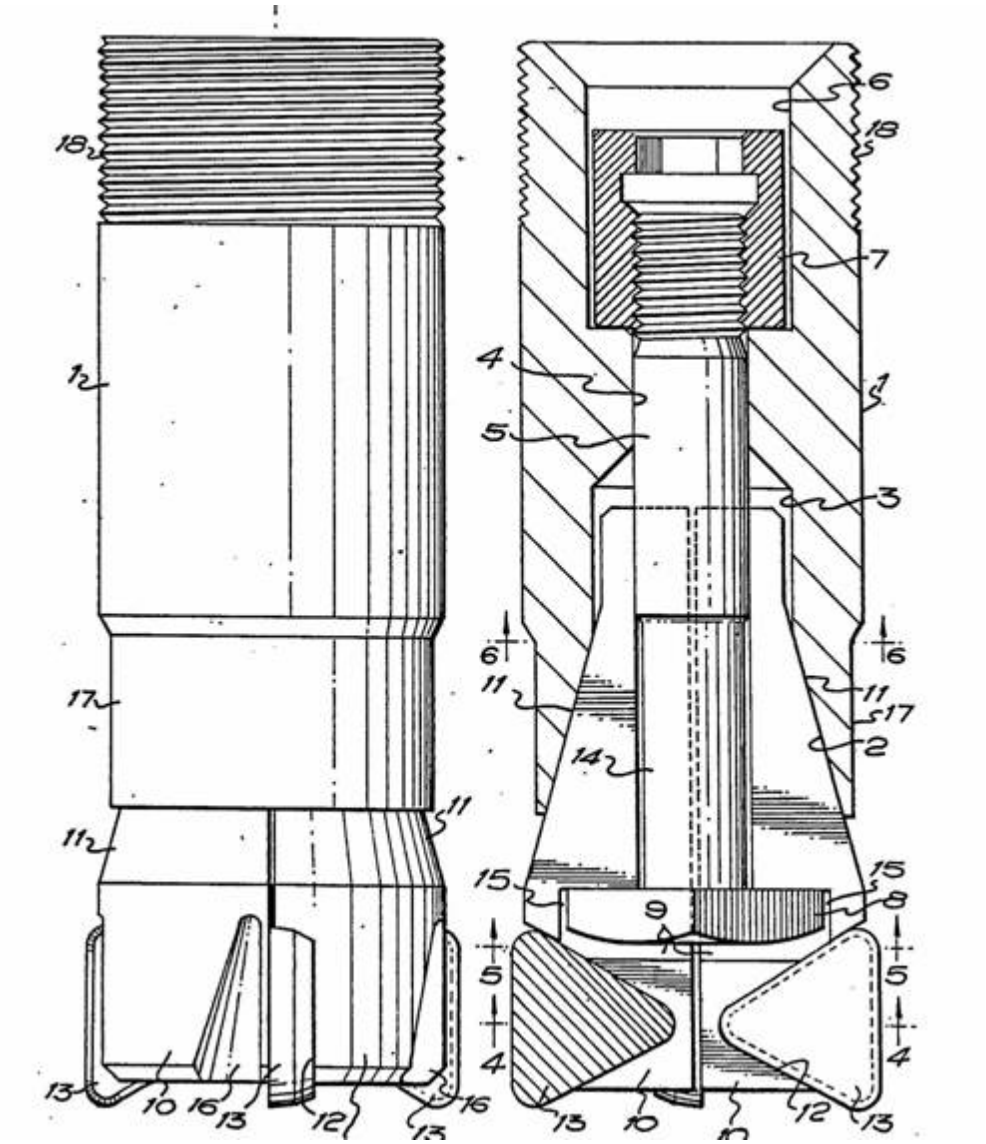
B23C 5/2247

Milling inserts of special shape clamped by member acting on top surface



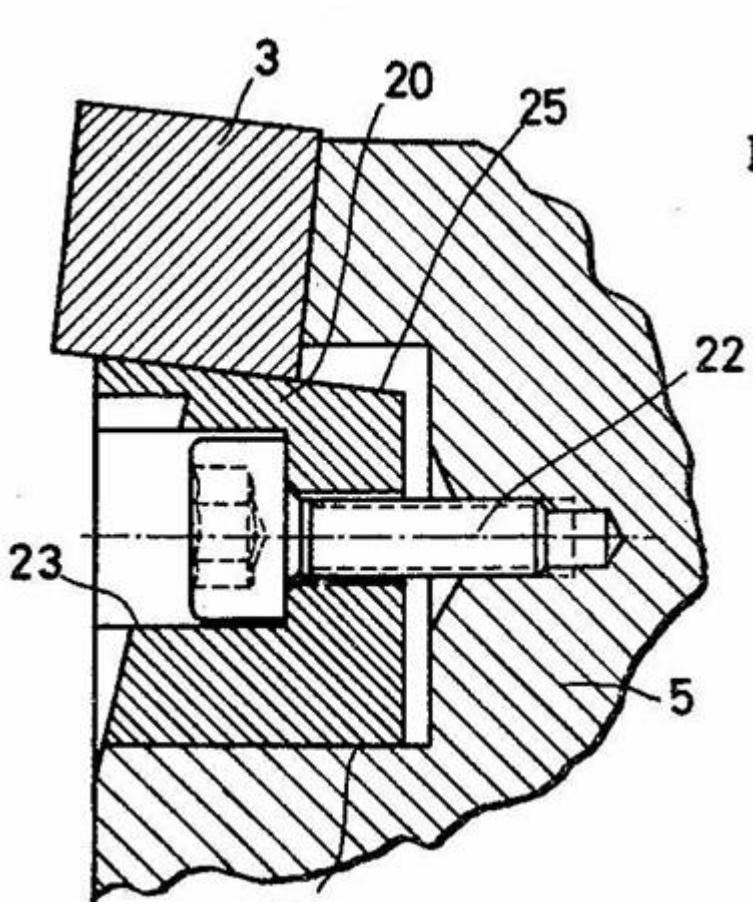
B23C 5/2269

Milling insert of standard form clamped by wedge



B23C 5/2295

Simultaneous clamping of all cutting inserts



B23C 5/2462

Adjustment of insert position by oblique surfaces

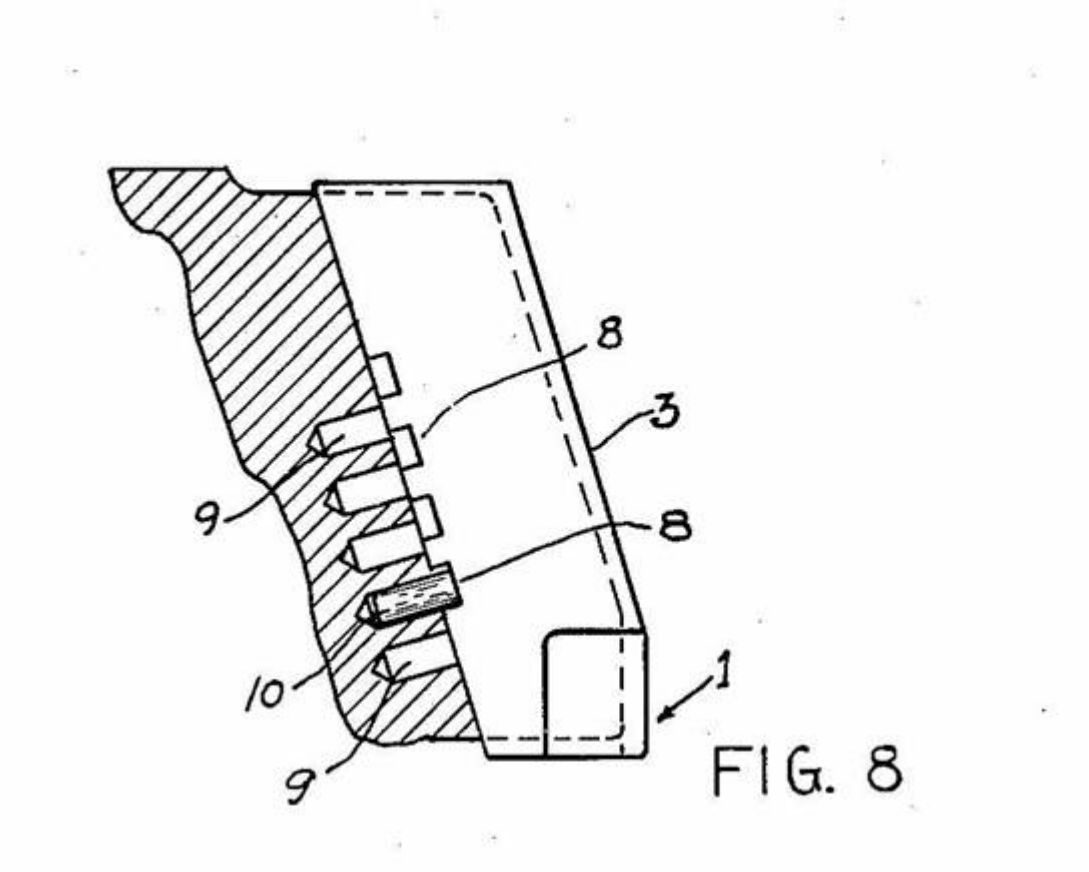
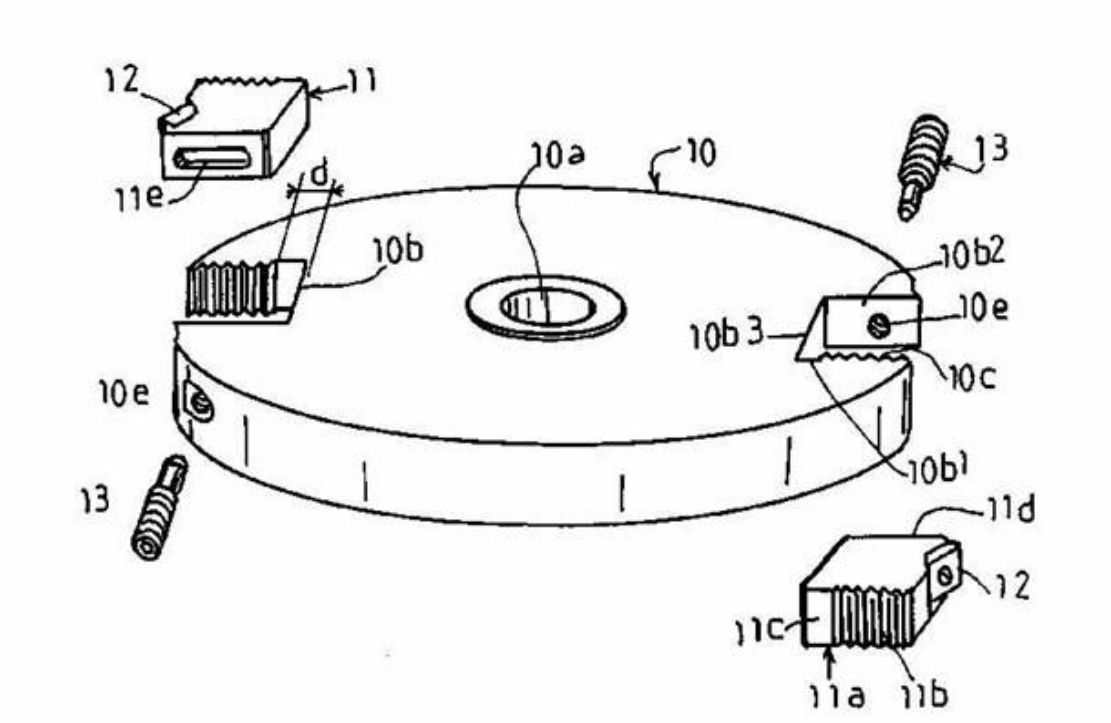


FIG. 8

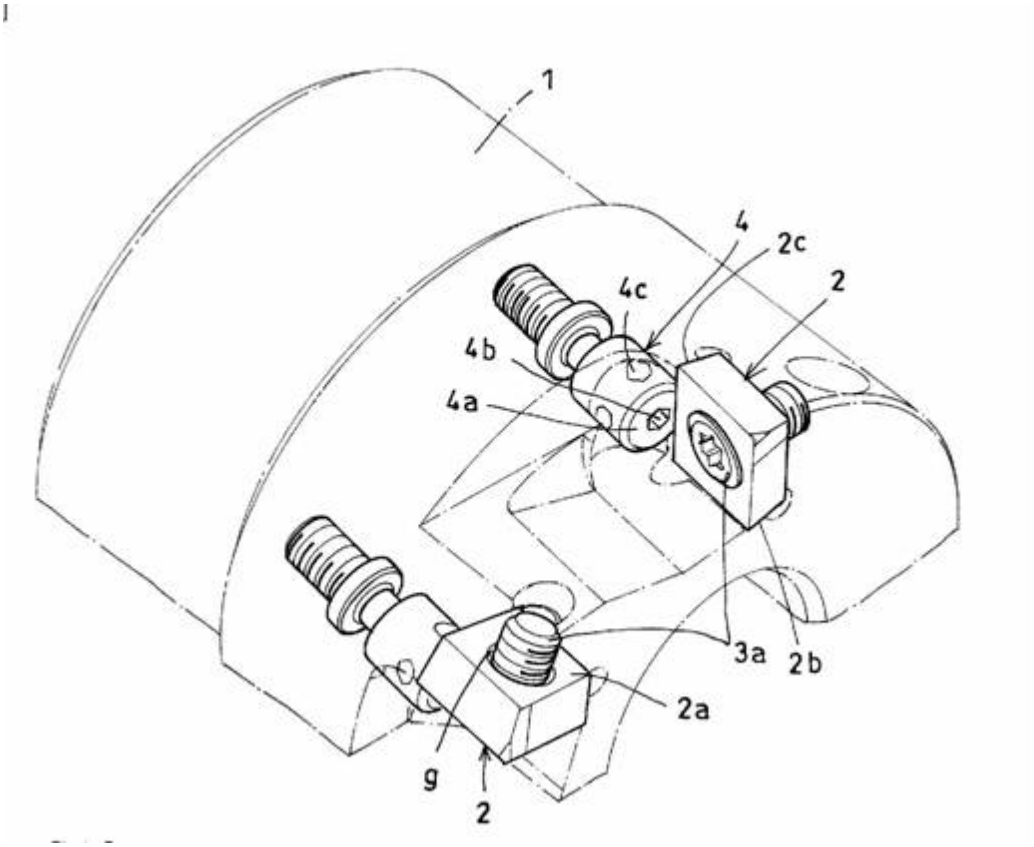
B23C 5/2465

adjustment of position of insert by notches



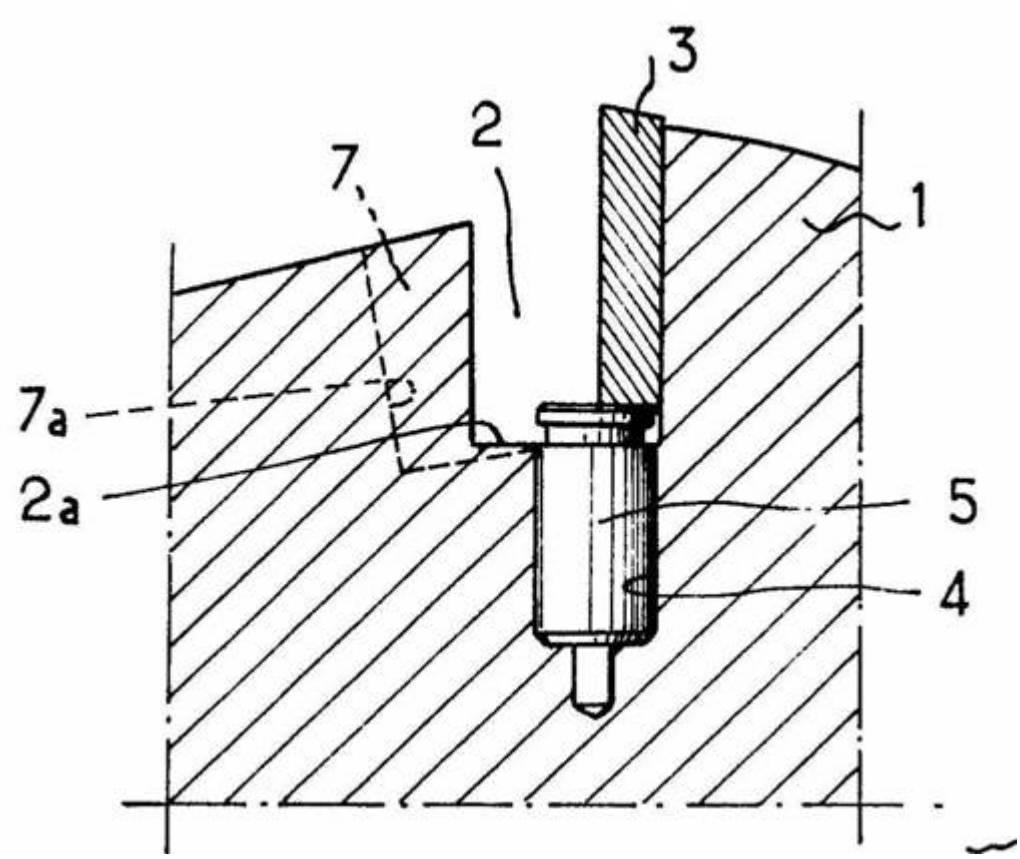
B23C 5/2468

adjustment of insert position by means of serrations



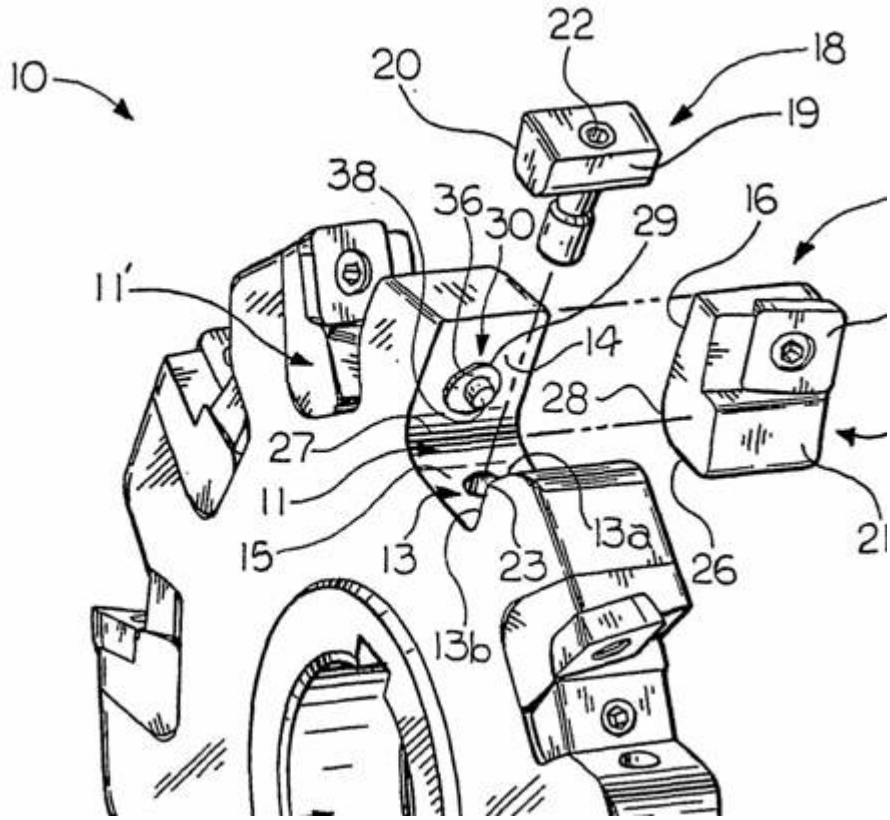
B23C 5/2472

adjustment of insert position by means of screws



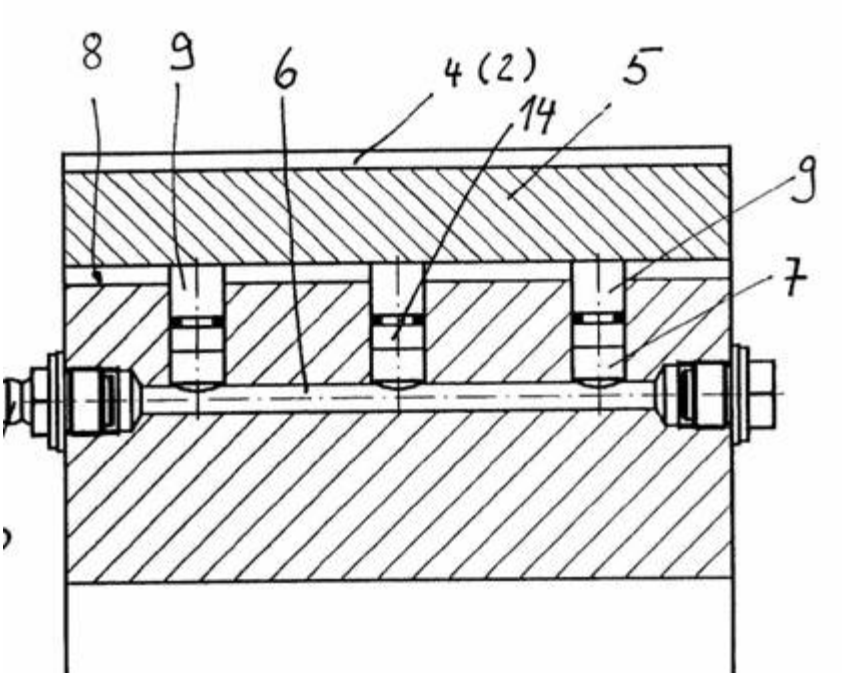
B23C 5/2475

adjustment of insert position by means of spacers (5)



B23C 5/2479 and B23C 5/241

adjustment of insert position by eccentric where insert is clamped using hole and fitted on intermediate carrier



B23C 5/2482

adjustment of insert position by hydraulics

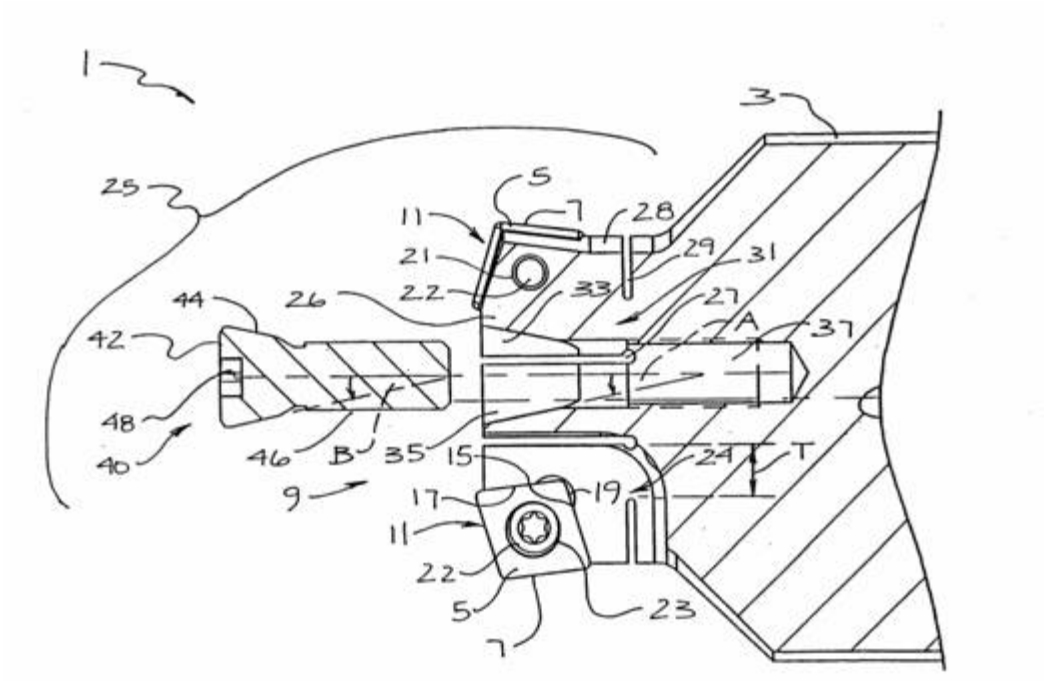


Fig. 3A

B23C 5/2486

Adjustment by "balancing" by elastically deforming the tool carriers

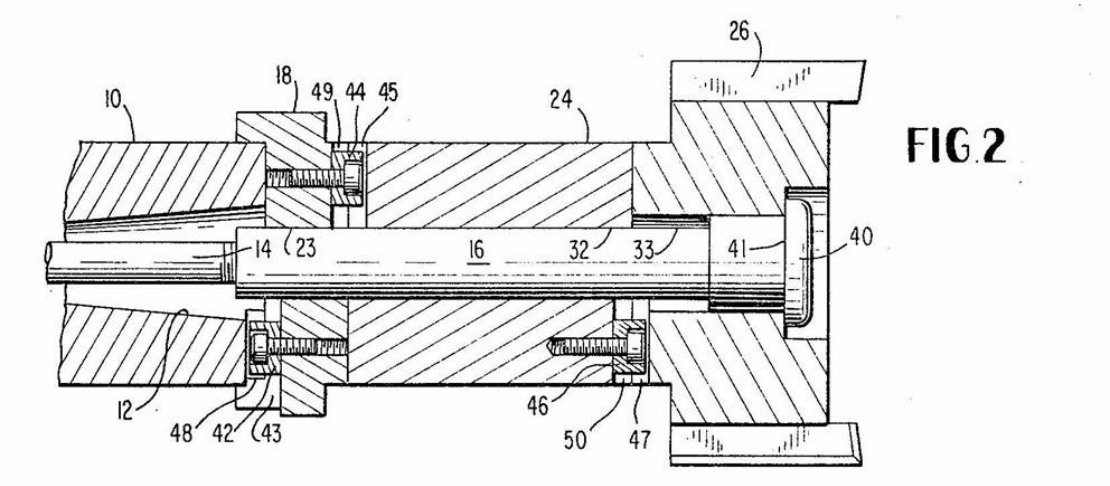


FIG.2

B23C 5/26

securing milling cutter (26) to spindle (10) e.g. arbours

Special rules of classification within this group

Classification is generally per literal interpretation of the group and subgroup headings.

Allocation of Indexing Codes from the section "Details of milling cutters", B23C 2210/00 is mandatory in B23C 5/00.

Further details of subgroups

The following should be noted:

- B23C 5/04: Plain cutters having a generally long (in relation to diameter) circumferential cutting surface. Generally no cutting on end surfaces

- B23C 5/06: Facemills - i.e. generally larger diameter milling cutters generally cutting for a limited depth on the circumferential surface used for producing flat surfaces. May have auxiliary cutting edges in the plane of the produced surface to improve surface finish.

- B23C 5/08: Disk milling cutters - also known as side and face cutters. Such cutters can sometimes can be regarded as sawing tools. In this case circulation to B23D is appropriate.

- B23C 5/10: An end mill cuts using its axial end surface as well as its circumferential surface. End mills capable of axial cutting movement (i.e. slot drills) are also classed here. Note that milling cutters with shafts, where the detail of the shaft is important (i.e. where the special features are not related to the milling process but to the clamping) are classed in B23B 31/005 or

B23B 31/006, accompanied by Indexing Codes from B23B 2231/02 and subgroups.

- B23C 5/109: Note that milling cutters with detachable heads are not classed in B23C 5/109 but in B23C 5/10 with the allocation of Indexing Codes B23C 2210/02 and/or B23C 2210/03 as appropriate. A detachable head is generally seen as being something attached to the end of the shank that covers the whole of the cross section of the shank.

- B23C 5/202 to B23C 5/2291: Cutting inserts and securing arrangements for cutting inserts . Indexing Code allocation from the Indexing Code group B23C 2200/00 entitled "Details of milling inserts" is mandatory in B23C 5/20, B23C 5/22 and B23C 5/24. Indexing Codes should be allocated only for special features of the insert. For example, if the insert has a fixation hole of a special shape, the appropriate Indexing Code (B23C 2200/361) should be given. This Indexing Code should not, however, be given to every insert having a fixation hole. An Indexing Code from the group B23C 2200/00 entitled "Details of cutting inserts" takes precedence over an Indexing Code from other groups. For example, an insert with a curved cutting edge should be allocated the Indexing Code B23C 2200/203. The allocation of B23C 2210/084 is not necessary or desired.

- B23C 5/202,B23C 5/205 and B23C 5/207: Cutting tools where the shape of cutting insert is of special importance. This is not limited to the overall shape of the insert. The shape may be of special importance by virtue of the geometry of inter alia the chip-breakers, the fixation hole, the overall shape, the wiper, areas of coating or the cross section of the cutting edge. Inserts in this subgroup are not classed for composition of inserts (C22C or C04C) or merely for the composition of the coating (see C23C). However inserts where the coating is selectively applied to areas of the insert or having a particular material and a special shape will be classed here. Note that end mills with detachable heads are not classified as end mills with cutting inserts in B23C 5/202, but in B23C 5/10 with the Indexing Codes B23C 2210/02 or B23C 2210/03 as appropriate. B23C 5/202 has plate-like inserts having a special shape and chip-breakers. Insert having a special shape but not chip-breaker details are classed in B23C 5/207. Inserts having a special shape by virtue only of the chip-breakers are classed in B23C 5/205. Thus search in at least two of these three sub-groups is always necessary. B23B 27/141, B23B 27/143 and B23B 27/145 are the equivalent subgroups for turning or general-purpose inserts. If the insert can be used for turning and milling only a class in B23B 27/141, B23B 27/143 or B23B 27/145 is given. If the method of clamping the insert in the tool-holder is also important, no class is given in B23C 5/202, only in B23C 5/22.

- B23C 5/22 and subgroups: Securing arrangements for milling inserts. If insert is special shape and the mechanism securing the insert in the milling cutter is also of importance, the document should be classed in B23C 5/20B1B or subgroups, B23C 5/2247 or B23C 5/2273, according to the clamping mechanism. B23C 5/2213 has milling cutters with plate-like inserts having a special shape and chip-breakers, where the securing mechanism is of importance. Milling cutters having important securing mechanisms for inserts having a special shape but where no chip-breaker details have been

given are classed in B23C 5/2221. Milling cutters having important securing mechanisms for inserts having a special shape by virtue only of the chip-breakers are classed in B23C 5/2217. Thus search in at least two of B23C 5/2213, B23C 5/2217 and B23C 5/2221 is always necessary. Milling cutters having important securing mechanisms for cutting inserts of known shape should be classified in B23C 5/22, B23C 5/2204, B23C 5/2208, B23C 5/2239, B23C 5/2243, B23C 5/2265, B23C 5/2269 and B23C 5/2295 according to the clamping mechanism.

- B23C 5/2295: Simultaneous clamping of inserts (hydraulics etc).

- B23C 5/24: Adjustment of position of the insert.

Within this subgroup two classes should usually be allocated - one for the clamping mechanism in B23C 5/2403 to B23C 5/2458 and another for the adjusting mechanism in B23C 5/2462 to B23C 5/2496.

- B23C 5/26: Securing cutters to spindle. Note: if a chuck is involved B23B 31/00.

- B23C 5/28: Cooling arrangements. Features concerned with cooling must be in the tool to be classed here. See also B23B 27/10, B23B 51/06 and B23D 77/006 for equivalents in turning, drilling & reaming respectively. Note: B23Q 11/10 for cooling/lubricating on machine tools in general. Note also the Indexing Code relating to cooling (B23C 2250/12) for non-invention information.

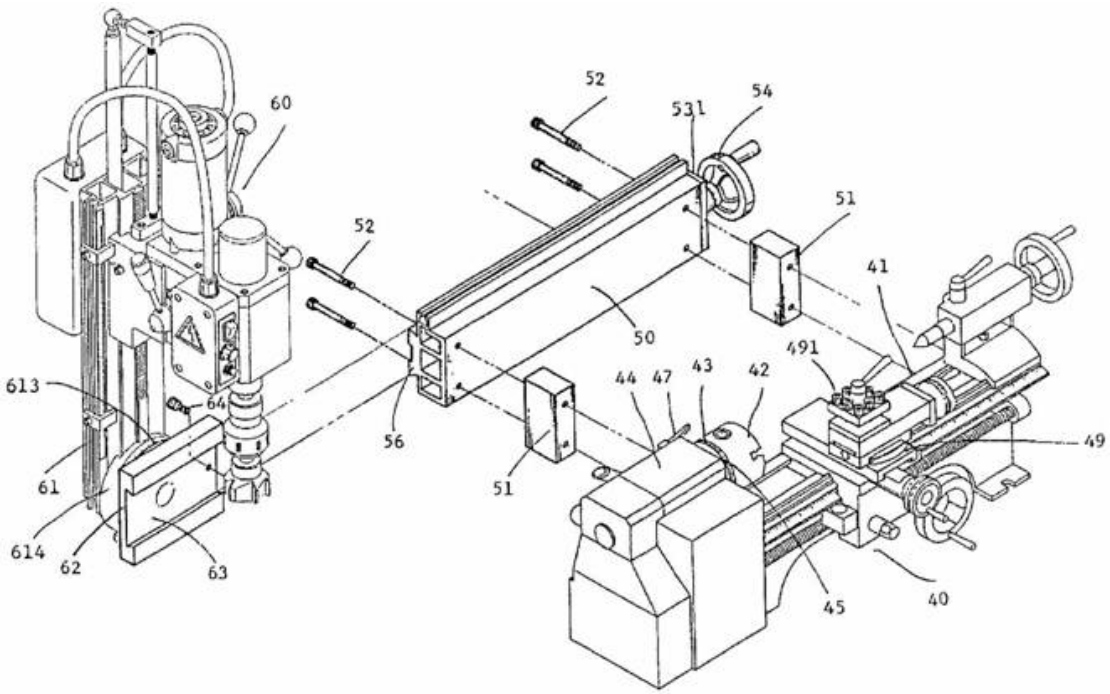
B23C 7/00

Milling devices able to be attached to machine tools; whether or not replacing an operative portion of the machine tool

Definition statement

This subclass/group covers:

Milling devices able to be attached to a machine tool



B23C 7/02

Device attached to a lathe to allow milling

Special rules of classification within this group

Classification is per literal interpretation of the group and subgroup headings. The term "machine tool" should be interpreted as a machine tool not normally capable of performing milling. Devices for attachment into the spindle (speed changers, angled heads, offset heads) are classified in B23Q 5/04. The term "device" should be interpreted as a discrete device, so lathes with provision for performing milling as a result of integrated features will not be classed here.

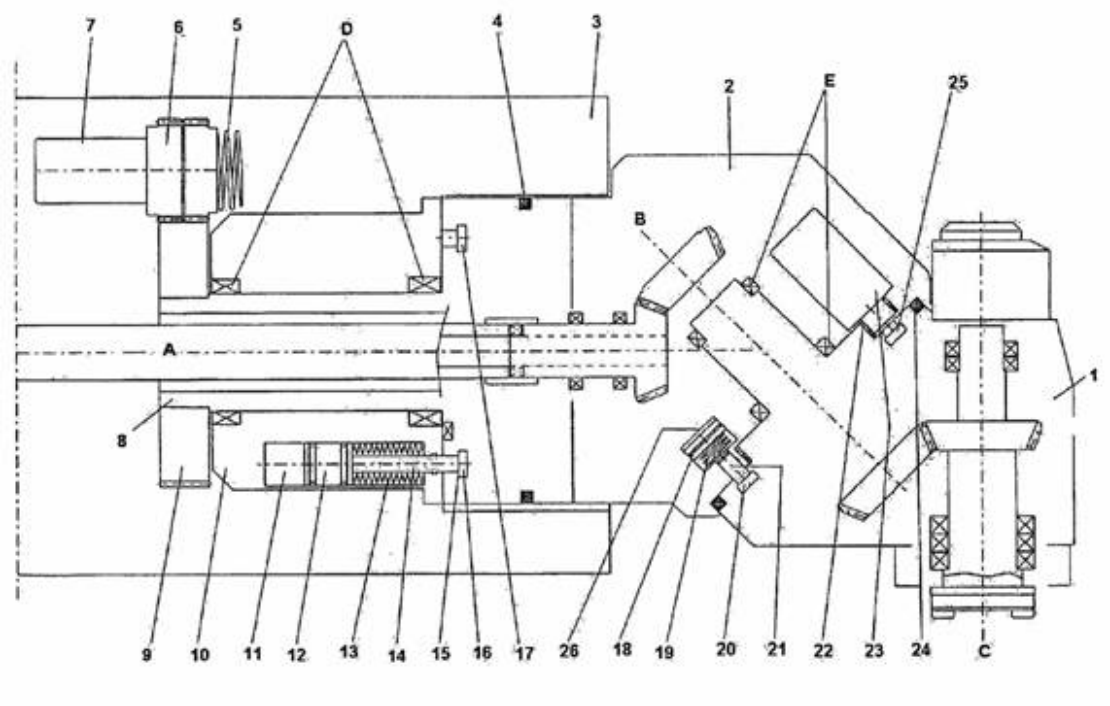
B23C 9/00

Details or accessories so far as specially adapted to milling machines or cutters (drives, control devices, or accessories, in general B23Q)

Definition statement

This subclass/group covers:

Details or accessories so far as specially adapted to milling machines or cutters



B23C 9/005

Milling head.

Special rules of classification within this group

Classification is generally per literal interpretation of the group and subgroup headings.

The term "specially adapted to milling machines" should be interpreted narrowly as adapted to machines specifically designed for performing milling operations. Details of machines performing milling and other operations should be classified in B23Q. This group includes milling templates. Obviously with the move towards multi-function machine tools, this group has become less well-used.

Details or accessories of machine tools in general & copying devices are classified in B23Q.

B23C 9/005 Milling heads may mean details of the heads of milling machines including the main spindle of a machine tool or a head able to be attached to a machine tool for the specific purpose of milling. Machining heads used on gantry machines with multiple axes or movement are classified in the relevant subgroup of B23Q 1/25. Machining heads characterised by the mechanisms for driving the spindle or for providing feeding motion ar classified in B23Q 5/00. Detachable heads including speed changers, offset drives or right angled drives for general work are classed in B23Q 5/04.