March 31, 1953 E. C. KAPNICK 2,632,983

DRILL END SHARPENING MEANS

Filed Oct. 29, 1949 2 SHEETS—SHEET 1

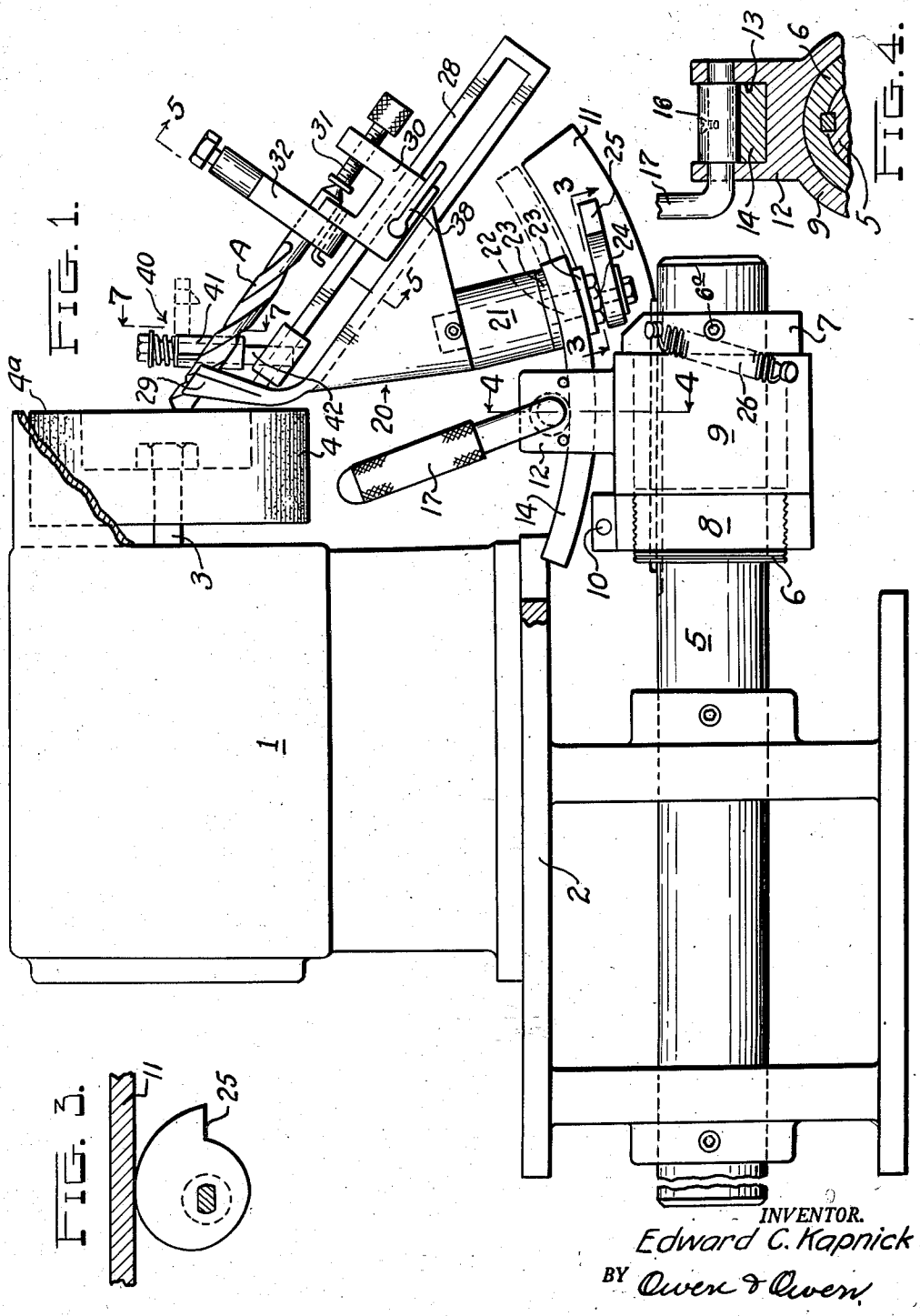

FIG. 1.

FIG. 3.

FIG. 4.

INVENTOR.
Edward C. Kapnick
BY Owen & Owen

ATTORNEYS

March 31, 1953 E. C. KAPNICK 2,632,983

DRILL END SHARPENING MEANS

Filed Oct. 29, 1949 2 SHEETS—SHEET 2

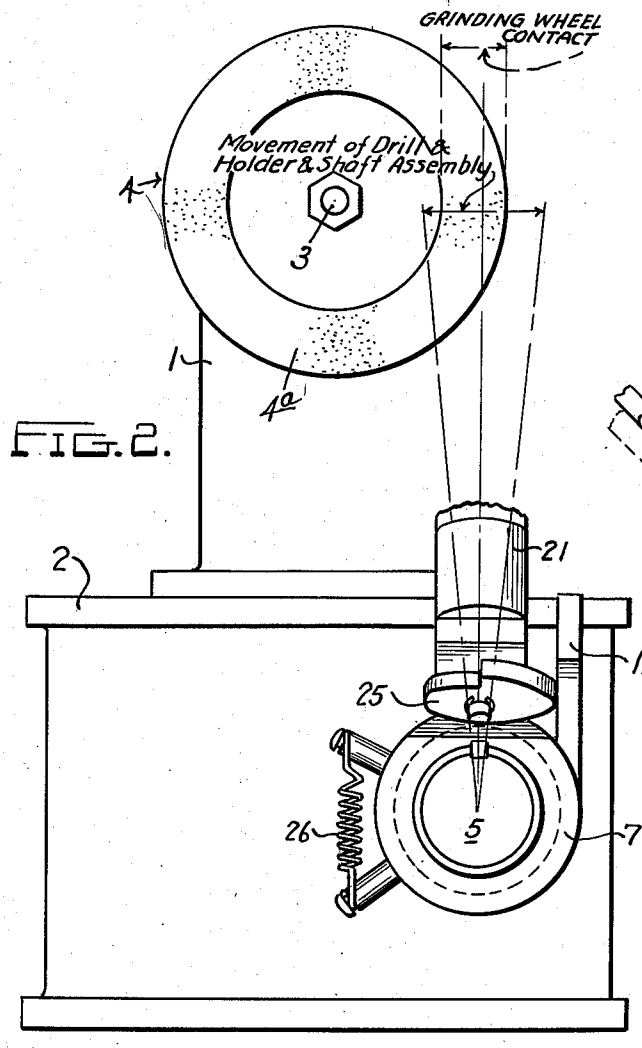

FIG. 2.

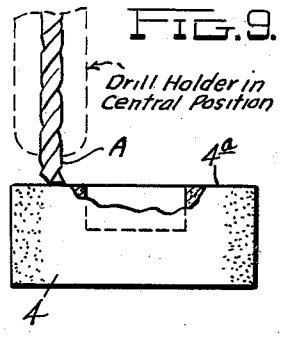

FIG. 9.

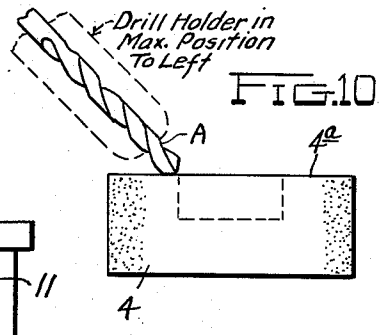

FIG. 10

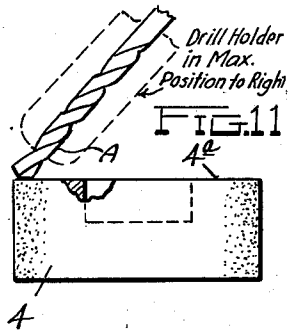

FIG. 11

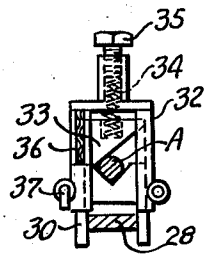

FIG. 5.

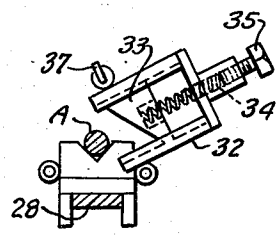

FIG. 6.

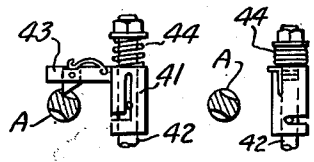

FIG. 7. FIG. 8.

INVENTOR.
Edward C. Kapnick
BY Owen & Owen,

ATTORNEYS

Patented Mar. 31, 1953 2,632,983

UNITED STATES PATENT OFFICE

2,632,983

DRILL END SHARPENING MEANS

Edward C. Kapnick, Adrian, Mich.

Application October 29, 1949, Serial No. 124,350

10 Claims. (Cl. 51—219)

1

This invention relates particularly to machines for grinding and sharpening cutting ends of drills.

The primary object of the invention is to simplify and improve on the operation and construction of the drill end sharpening means described and claimed in my application for United States Letters Patent filed January 28, 1949, Serial No. 73,240.

Further objects and advantages of the invention will be apparent from the following detailed description and from the accompanying drawings illustrating one embodiment of the invention, in which—

Fig. 1 is a side elevation of a machine embodying the invention, with parts broken away, and with a drill held thereby in sharpening engagement with a grinding wheel; Fig. 2 is a different side elevation of the machine looking toward the face of the grinding wheel, and with parts broken away; Figs. 3 and 4 are enlarged sections, respectively, on the lines 3—3 and 4—4 in Fig. 1; Figs. 5 and 6 are reduced sections on the line 5—5 in Fig. 1, with the work clamp in closed and open positions, respectively; Fig. 7 is a section on the line 7—7 in Fig. 1; Fig. 8 is a similar section with the parts in dotted line position, and Figs. 9, 10 and 11 are diagrammatical views showing different positions of a drill in relation to the grinding face of the grinding wheel.

Referring to the drawings, 1 designates the frame of a grinding machine that is mounted on a base 2 and includes a power motor (not shown) having a shaft 3 projecting therefrom and carrying a grinding wheel 4 for rotation in a vertical plane and, in the present instance, presenting an annular working face 4a at its outer side.

A shaft 5 is mounted in the base 2 below and in parallel relation to the shaft 3. This shaft is fixed against axial and rotary movement and has one end projecting below the grinding wheel and carrying mechanism for holding a drill A in grinding relation to the wheel 4 and in which the present invention resides.

Mounted on the projecting end of the shaft 5 below the wheel 4 is a bearing bushing 6 that is keyed to the shaft to prevent turning and has a shoulder 7 at one end and a collar 8 threaded thereon at the other. A set-screw 6a prevents axial movements of the bushing 6 on the shaft. A bearing sleeve 9 is mounted for free rocking movements on the bushing 6 between the shoulder 7 and collar 8 by which it is held against axial movements. The collar 8 is split to permit it to be drawn into binding or locking relation to the bushing by a bolt or screw 10. The

2

shoulder 7 has a longitudinally disposed arm 11, in the present instance of arcuate form, extending outwardly and upwardly from a side thereof and presenting a flat face at its inner side, or the side thereof adjacent to the shoulder axis. This face is parallel to a vertical plane longitudinal to and intersecting the axis of the shaft 5.

The sleeve 9 has a boss 12 projecting upward therefrom and formed with a cross opening 13 longitudinal to the shaft axis and this opening is longitudinally curved to receive and form a holder for a correspondingly curved slide-bar 14 the bow of which is downward. The boss 12 has an eccentric 16 mounted therein above the bar 14 and serving when turned to either lock the bar against movement in the boss or to permit such movement. This eccentric has a lever arm 17 projecting therefrom. The arcs of the arm 11 and the bar 14 are concentric with an overhead center which preferably falls on the face 4a of the grinding wheel in substantially the horizontal plane of the wheel axis.

The holder 20 for a drill A being sharpened is mounted on the outer end of the bar 14 and extends upward therefrom at the outer side of and in adjacent relation to the grinding wheel 4. This holder has a boss 21 extending downwardly from its lower inner edge portion and this boss has a stub shaft 22 projecting downward from its lower end through the bar 14 near its outer end for rotary movements relative thereto with its axis radial to the arc of the bar. The shaft carries washers 23 at each side of the bar 14 and these are drawn to the bar by a nut 24 on the shaft. A cam 25 is mounted on the lower end of the shaft to turn therewith and bears at its periphery against the inner face of the arm 11 so that when the shaft and holder are turned in one direction the cam acts against said arm to turn the holder and its carrying sleeve 9 in one direction from neutral, and when turned in the other direction will permit a turning of the holder and sleeve in the other direction from neutral, as indicated in dotted lines in Fig. 2. A coiled contractile spring 26 connects the shoulder 7 and sleeve 9 and acts to normally hold the face of the cam against the bar 11.

The drill holder 20 is provided on its top with a cradle 28 adapted to hold a drill A in predetermined inclined relation to the axis of rotation of the holder, which of course is the axis of the shaft 22. This cradle comprises a forked upstanding drill seat 29 at the upper or front end thereof and a drill seat 30 rearwardly of said front seat and adjustable toward and away from the front seat in the plane of desired inclination

of the drill. Each of these seats is provided in its top with aligned V-grooves for receiving the drill. The drill seat **30** is provided at its rear end with an adjusting screw stop **31** for the drill and at its forward end with a hinged clamp frame **32**. This frame has a drill engaging jaw **33** (Figs. 5 and 6) that is inclined so as to have camming engagement with a drill when clamped down thereon. The jaw **33** is slidable lengthwise in the frame **32** and is urged toward the work by a spring **34**, the tension of which is adjusted by a screw **35**. The jaw **33** is urged sidewise in the frame by a flat corrugated spring **36** in the side of the frame. The frame **32** is held in clamped position by a pin **37** inserted into registering lapping portions of the parts **30** and **32**. The tool seat **30** is held in adjusted position on the shoulder **28** by a suitable screw means operated by a handle **38**.

A front drill clamp **40** is attached to the holder adjacent to the drill seat **29**. This clamp comprises a sleeve **41** axially and rotatably movable on a stem **42** and having a finger **43** for projecting over and engaging in a groove of the drill. Downward axial movement of the sleeve is urged by a spring **44** and such movement and the rotary movements of the sleeve are directed by a pin on the stem engaging in an L slot in the sleeve. The drill clamping and holding parts per se are the same as shown and described in my said former application and nothing novel is claimed for them in the present application.

In an operation of the apparatus, a drill A, preparatory to having its end sharpened, is clamped in the holder seats **29** and **30** with its forward end projected a desired distance from the former for engagement with the grinding wheel. Adjustment of the stop screw **31** in engagement with the rear end of the drill determines the extent of projection of the end of the drill beyond the axial line of the holder shaft **22**. The bushing **6** is adjusted axially on the mounting shaft **5** to properly position the drill holder assembly with respect to the face of the grinding wheel to cause the drill end to be ground with the desired lip clearance, and the holder arc bar **14** is adjusted in the sleeve boss **12** to set the inclination of the drill axis to suit the angle at which the drill end is to be ground. In the grinding operation, the operator grasps the holder **20** and slowly swings it backward and forward about the inclined axis of the shaft **22**, thus causing the cam **25** to turn in engagement with the stationary arm **11**, which in turn causes the holder assembly to swing backward and forward on the bearing bushing **6** aided by the action of the spring **26**. It is thus apparent that a compound movement is imparted to the drill end by which it is not only rocked about the axis of the shaft **22** to impart a rolling action to the conical drill end on the face of the grinding wheel, but is also rocked about the axis of the shaft **5** to swing the drill end, during its rolling action, across the face of the wheel, as indicated by the diagram in Fig. 2. This avoids the forming of pits and furrows in the wheel face so that necessity of frequent dressing of the wheel surface is obviated. This also results in an arcuate grinding of the conical drill end and in the grinding of a keener and more uniform cutting edge on the work. When one arc on the conical end surface of the drill has been ground, the drill is rotatably shifted in the holder to bring successive arcs into grinding position, and the grinding operation is repeated for each such adjustment.

During the end sharpening of a drill, the washers **23** are intended to engage the arcuate bar **14** with sufficient freeness to permit oscillating movements of the holder **20** relative to said bar. For the purpose of dressing the grinding wheel, the holder shaft **22** may be locked against turning on the bar **14** by tightening the nut **24**, and a conventional dressing diamond may be substituted for a drill on the holder **20**. The holder **20** may then be swung backward and forward about the axis of the shaft **5** to move the dressing diamond across the face of the wheel. Such a locking of the holder **20** on the bar **14** also permits the grinding of reamers.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent, is:

1. In a tool grinding machine of the class described having a rotatable grinding wheel with a radial grinding face, a mounting means, a member on said means rockable about an axis transverse to the plane of the grinding face of the wheel, means for holding a tool with its end in grinding position, said last means being carried by said member for rocking movements about an axis in angular relation to said first axis which is angled to the tool axis, whereby a rocking of the tool holding means will cause the tool end to have rolling coaction with the wheel, and cam means connecting said mounting means and holding means and operable to rock said member and tool holding means on the mounting means when the tool holding means is rocked on its axis, whereby the point of contact of the tool with the wheel is arcuately shifted across the wheel face.

2. In a machine of the class described having a grinding wheel with a radial grinding face, together with a shaft, means for mounting the shaft at a side of the periphery of said wheel in parallel relation to its axis, a member rockable on said shaft, biasing means for urging a rocking movement of the member in one direction, arcuate means carried by said member for longitudinal adjustment axially of the member and with its concaved side facing the wheel, means for holding a tool in inclined relation to the grinding face of said wheel with its end in grinding engagement therewith, said last means being mounted on said arcuate means for adjusting movements therewith to vary the inclination of a held tool to the wheel axis and having pivotal connection with said arcuate means for relative rocking movements about an axis substantially radial to the arc of the arcuate means with such axis intersecting the tool adjacent to the grinding facing of the wheel, and means having cooperating parts one rockable with said holding means and another fixed relative to said shaft and operable by rocking movements of the holding means in one direction to impart rocking movements to said member against said biasing means and by rocking movements of the holding means in the opposite direction to permit biasing means actuated movements of said member.

3. A combination as called for in claim 2 wherein said cooperating parts comprise a cam attached to and rockable with the holding means and a fixed projecting portion on the shaft.

4. A combination as called for in claim 3, together with means to lock said tool holding means to said arcuate means to prevent relative turning thereof.

5. In a drill grinding machine having a grinding wheel with a radial grinding face, means for holding a drill in end grinding engagement with said face of the wheel with its axis inclined to the coacting grinding face, means mounting said holding means for rocking movements about two relatively angled axes with one intersecting a drill being ground adjacent to the point of grinding and with the other axis substantially parallel to the wheel axis, means automatically operable to rock the holding means about one axis when it is rocked about the other axis, and means for locking said first means against rocking movements on said intersecting axis.

6. In a machine of the class described, having a grinding wheel with a radial grinding face, a mounting member, means mounted for rocking movements on said member at a side of the grinding wheel periphery with its rocking axis substantially parallel to the wheel axis, biasing means to rock said means in one direction, a tool holder carried by said means in position to hold a tool and in grinding relation to the grinding face of the wheel with its axis inclined to the wheel axis, means for varying the inclination of the tool axis, said tool holder being rockable relative to said first means about an axis angularly disposed to the rocking axis of such first means, and means having parts carried, respectively, by said mounting member and tool holder and operable to cooperate to impart predetermined rocking movements to the first means and tool holder about the rocking axis of the first means when the tool holder is rocked about its rocking axis.

7. In a machine of the class described having a grinding wheel with a radial grinding face, a fixed shaft substantially parallel to the grinding wheel axis, a collar mounted for limited rocking movements on said shaft, biasing means to rock said collar in one direction on the shaft, a member in fixed relation to said shaft, a mount carried by said collar for movements therewith, a tool holder carried by said mount in position to hold a tool end in grinding relation to the grinding face of said wheel with its axis inclined to the wheel axis, said tool holder being rockable on said mount about an axis angularly disposed to the axis of said shaft, and means rockable with said tool holder about its rocking axis and when rocked in one direction cooperating with said member to rock said tool holder and collar on said shaft against the action of said biasing means.

8. A combination as called for in claim 7, together with means connecting said collar and mount and shiftable to vary the angle of the tool holder rocking axis to the collar axis.

9. In a tool grinding machine having a grinding wheel with a radial grinding face, means

for holding a tool with its cutting end in engagement with said face of the wheel, a mount carrying said tool holding means for rocking movements about an axis intersecting the tool near its cutting end, means carrying said mount for rocking movements on an axis that is angled with respect to said first rocking axis, means connecting said last means and tool holding means and operable to impart predetermined rocking movements to the mount when the tool holding means is rocked, and means for transversely shifting the rocking axis of said holding means relative to the mount to change the angular relation of the tool to the wheel.

10. In a machine of the class described having a grinding wheel with a radial grinding face, a member mounted for rocking movements at one side of the grinding wheel periphery with its rocking axis substantially parallel to the wheel axis, a mount for said member, biasing means to rock said member in one direction, a tool holder carried by said member in position to hold a tool end in grinding relation to the grinding face of the wheel with its axis inclined to the wheel axis, means for varying the inclination of the tool axis, said tool holder being rockable relative to said member about an axis angularly disposed to the rocking axis of the member, means having parts carried, respectively, by said tool holder and mount and operable to cooperate to impart predetermined rocking movements to the member and tool holder about the rocking axis of the member when the tool holder is rocked about its angularly disposed axis, and means for locking said tool holder against rocking movements on said angularly disposed axis.

EDWARD C. KAPNICK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
153,401	Van Haagen	July 21, 1874
411,845	Walker	Oct. 1, 1889
497,095	Hall	May 9, 1893
523,897	Kenyon	July 31, 1894
571,336	Budlong	Nov. 17, 1896
584,114	Hill	June 8, 1897
611,323	Johnston	Sept. 27, 1898
614,092	Eames	Nov. 15, 1898
643,703	White	Feb. 20, 1900
707,549	Chandler	Aug. 26, 1902
821,849	Benicke	May 29, 1906
1,481,260	Hemenway	Jan. 22, 1924
2,098,267	Weishampel	Nov. 9, 1937
2,142,923	Stocking	Jan. 3, 1939
2,144,095	Zwick	Jan. 17, 1939
2,202,587	Kitchen	May 28, 1940
2,328,549	Eich et al.	Sept. 7, 1943
2,486,335	Smith et al.	Oct. 25, 1949
2,498,701	Munro	Feb. 28, 1950