Oct. 30, 1956 E. C. CLARKE 2,768,485

DRILL GRINDING FIXTURE

Filed April 3, 1953 2 Sheets-Sheet 1

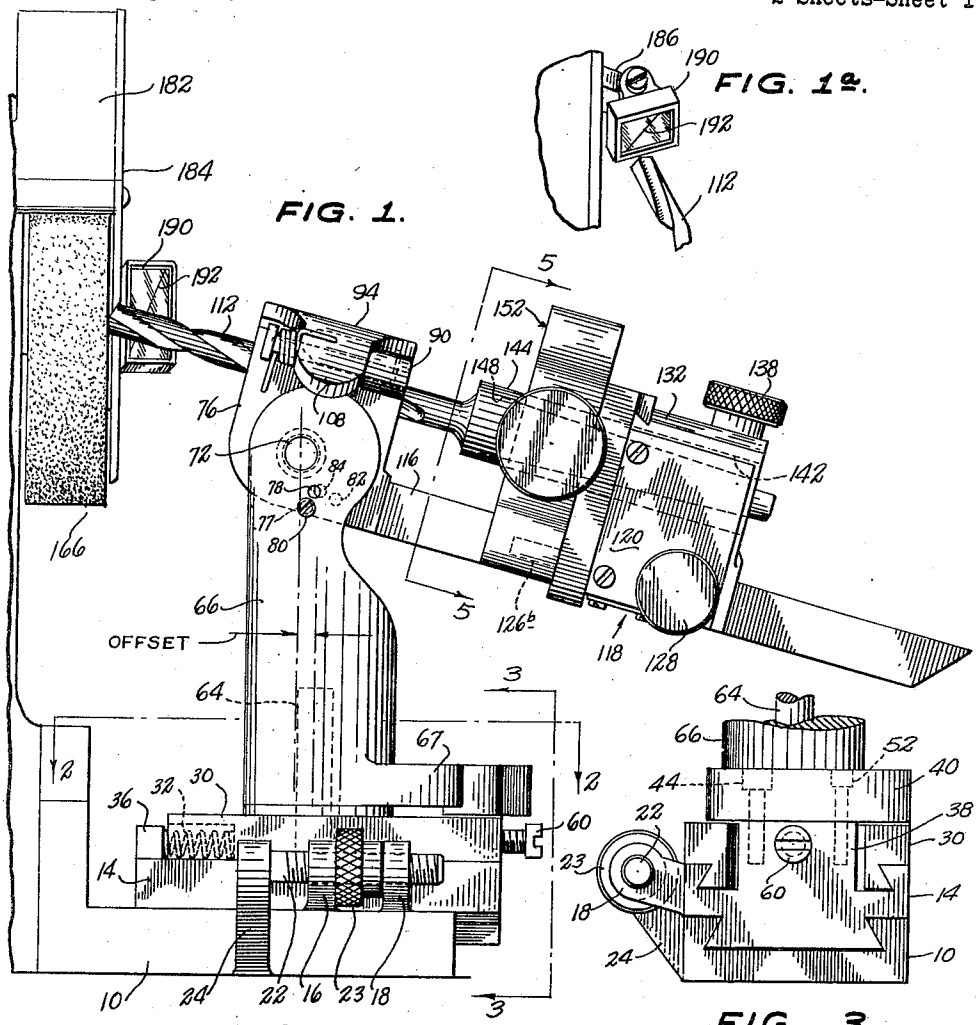


FIG. 1a.

FIG. 3.

FIG. 2.

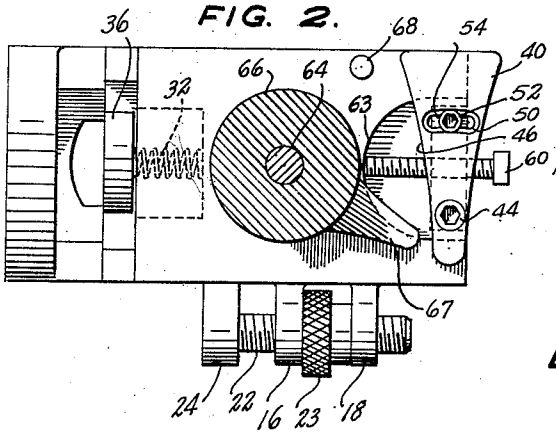
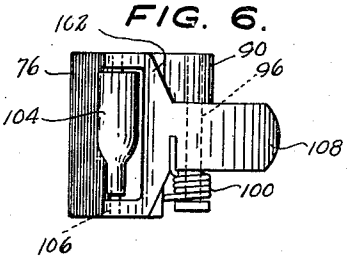


FIG. 6.



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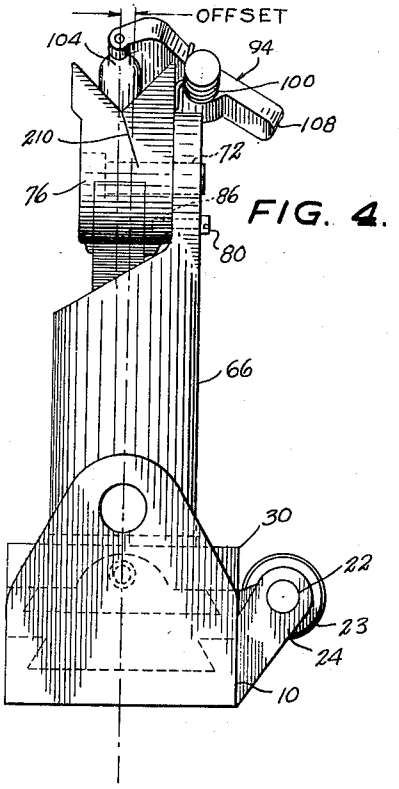


FIG. 4.

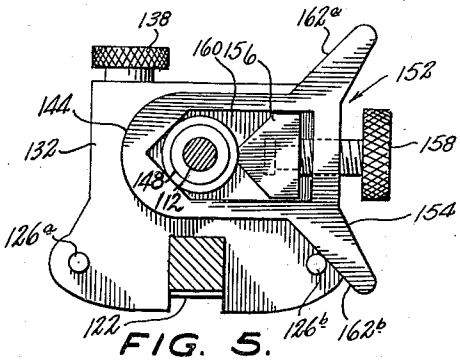


FIG. 5.

FIG. 7.

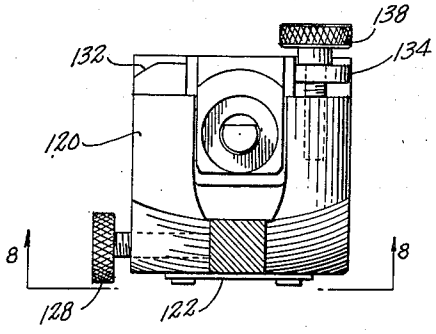


FIG. 9.

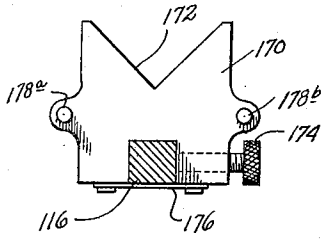


FIG. 8.

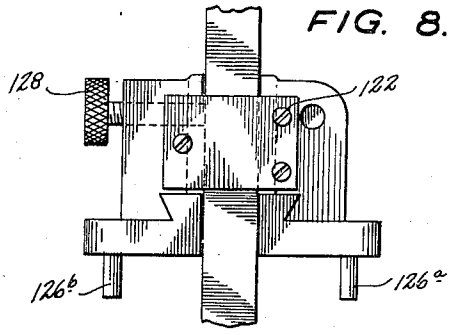
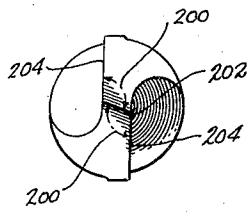


FIG. 10.



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2,768,485

DRILL GRINDING FIXTURE

Edmund C. Clarke, Orange Park, Fla.

Application April 3, 1953, Serial No. 346,682

18 Claims. (Cl. 51—219)

This invention relates to drill grinding fixtures and more particularly to a fixture of an adjustable nature to accommodate various sizes of drills and for grinding taper shank drills.

Among the objects of my invention are to provide a relatively simple and durable fixture having a high degree of versatility for grinding either ordinary or taper shank drills and for grinding them with a minimum of skill required on the part of the operator. A further object of my invention is to provide a fixture which will accurately grind a drill point and which will automatically effect a motion of the drill being ground so as to differentially grind the point whereby more material is removed from the heels of the drill point than from the surface near the web so that suitable clearance is effected while at the same time a full body directly back of each lip is maintained to strengthen it. Additional objects of my invention are to furnish uniformity of grinding of the lips and also to provide the proper angle between the lips and the drill web or point.

The present invention is a further development and improvement of the subject matter of my patent application S. N. 112,930, filed August 29, 1949, which issued as Patent No. 7,723,510, dated November 15, 1955, for Drill Grinding Fixture Combination.

In brief, the present invention provides an eccentrically mounted drill holding cradle arranged for oscillatory movement and provided with cam elements which reciprocate the cradle bodily toward and away from the grinding wheel simultaneously with oscillation. This combination of motion effects a differential grinding of the surface of the point so as to leave a desirable clearance for the respective lips. I also provide various means for positioning the drill point with respect to the grinding wheel whereby a predetermined angle of grinding engagement is effected so that the lips are ground at the proper angle with respect to the web. One such means consists of a mirror with a scratch mark on it permanently secured in position adjacent the surface of the wheel, the scratch mark being used to set the angle of the drill lip; another means consisting of a mark on the drill holding cradle disposed in a predetermined manner.

My invention also embraces an adjustable length cradle for holding a drill, in conjunction with a stop means for positioning of the drill lips alternately for engagement with the grinding wheel in the manner set forth in my above-mentioned prior patent. Further a portion of the cradle is adapted to take taper shank drills. A means for holding down and steadying the drill point during grinding is also provided.

The invention will now be described in detail in conjunction with the appended drawing in which:

Fig. 1 is an elevation of one side of my invention showing the fixture in position relative a grinding wheel.

Fig. 1*a* is a plan view showing the relationship between the drill point and the mirror.

Fig. 2 is a section through 2—2 of Fig. 1.

Fig. 3 is a view in the direction 3—3 of Figure 1.

Fig. 4 is an elevation of the front of the fixture.

Fig. 5 is a view in the direction 5—5 of Figure 1.

Fig. 6 is a plan view of the hold-down element.

Fig. 7 is a rear view of the adjustable portion of the cradle.

Fig. 8 is a bottom view taken in direction 8—8 of Fig. 7.

Fig. 9 is a modification of the adjustable portion of the cradle.

Fig. 10 shows a magnified drill point.

With reference to the drawing, my invention comprises a base **10** having an adjustable slidable plate **14** there being dovetail ways between the base **10** and plate **14** as shown. Plate **14** has lugs **16** and **18** having bores through which passes an adjusting screw **22** having an end carried in a lug **24** of base **10**. Thus it will be understood that rotation of a nut **23** on the screw **22** will effect reciprocal motion of the plate **14** by virtue of abutment of nut **23** against either of lugs **16** and **18**. A slidable plate **30** is carried by means of dovetail ways on the plate **14**. A spring **32** recessed for the most part in the plate **30** and abutting a flange **36** of plate **14** serves to bias plate **30** rearwardly, i. e., to the right as viewed on Figs. 1 and 2. On the opposite end of plate **14** a flange **38** is formed having a top surface which carries a cam **40**. The cam **40** is pivotally connected to the top surface of flange **38** by means of a pivot **44** and has a cam surface **46** and a slot **50** which accommodates a screw **52** passing through the slot and threaded in the plate **14**. The screw **52** extends through the thickness of plate **30** by virtue of an arcuate cut out **54** provided in that plate. Thus the cam may be adjusted to or fro about pivot **44** to any desired position and held in that position by means of the screw **52**. A limit screw **60** is provided, having threaded engagement in the flange **38** and abuttable against the arcuate surface **63**, to limit rearward motion of plate **30**.

An upright pin **64** is carried by the plate **30** in any suitable manner and rotatably secured by the pin is a post **66** having a cam follower **67** which is engageable with cam surface **46**. Thus it will be appreciated from Fig. 2 that if the post is rotated counterclockwise, it will be forced to translate forwardly by virtue of the slidability of plate **30**, due to abutment of the follower and the cam surface. On reverse rotation spring **32** will propel plate **30** rearwardly. A limit stud **68** is utilized for abutment with follower **67** to limit the amount of counterclockwise rotation, while limit screw **60** is suitably set to limit rearward motion of plate **30** so that the follower **67** will have its nose at the proper point on cam surface **46** prior to swinging post **66** counterclockwise. Thus, as the cam surface is adjusted by virtue of the screw and slot arrangement **50—52**, it may be necessary to readjust screw **60** so that the follower and the cam surface **46** will be properly arranged with respect to each other.

At the upper end of the post is secured a pivot pin **72** to pivotally secure a front element **76** of a drill cradle. The structure provides a conventional offset to the side and forwardly as indicated by "Offset" in Figures 1 and 4. The angularity of element **76** may be adjusted to the standard angles of 49°, 59°, and 68° by means of a removable screw **80** which is selectively engageable through bores **77** and **78** in post **66** with any one of three threaded holes **82**, **84**, or **86** laid out as shown in element **76**. Thus, an accurate and fixed setting for grinding any of the three standard angles may be rapidly and accurately effected.

Front element **76** carries by means of lug **90** a hold-down member **94** pivotally supported by a pin **96** passing through lug **90** and biased by means of a spring **100**. The hold-down member comprises a bracket **102** and a bottle-shaped roller **104** rotatably carried by means of a pin **106** supported in the bracket arms as shown in Fig. 6. The outer end of the bracket terminates in a small handle **108** which may be depressed to raise the roller or released to

permit it to bear against a drill **112**. The shape of the roller is to preclude its riding into the drill flutes or bouncing on the lands.

Front element **76** has a square shaft **116** secured thereto on which is slidably mounted a carriage **118** consisting of a base member **120**, secured slidably to shaft **116** by means of a clamp plate **122** bolted in place as shown in Figs. 5 and 8. Base member **120** has secured in the front face thereof a pair of studs 126*a* and 126*b* for a purpose hereinafter described. The side of the base member has a holding screw **128** threadably carried therein which can be rotated to abut the side of shaft **116** for the purpose of holding the base member at any selected position thereon, depending on the length of drill.

A drill holding element **132** is carried by means of dovetail ways, as shown, in the base element **120** and has a flange **134** which carries an adjusting screw **138** having its lower end threadably engaged in base **120**. Thus rotation of the screw **138** serves to raise or lower the drill holder element **132** in a direction normal to shaft **116**, depending upon the diameter of drill to be ground. A bore **142** is provided within the drill holder element for accommodating a sleeve **144** having an internal taper bore **148** for securing frictionally the taper shank of drill **112**. Sleeve **144** is smoothly rotative within bore **142**, and arranged to be clamped on the sleeve is a rotation limiting device **152**, such as is shown and described in the prior application hereinbefore referred to. Thus the limiting device consists of a chuck member **154** having a chuck jaw **156** reciprocal by means of an adjusting screw **158** so as to clamp sleeve **144** within the opening **160**. Element **154** is shaped with shoulders **162***a* and **162***b* for engagement with respective studs **126***a* and **126***b* to limit the amount of clockwise and counterclockwise rotation of the limit element **154** to substantially 180° in either direction. When the chuck is clamped to sleeve **144** it provides a handle by means of which the sleeve and drill may be oscillated to bring either lip of the drill into position for grinding engagement with a wheel **166** in a manner explained in detail in my above mentioned prior patent.

The chuck device **152** likewise serves as a means for properly positioning sleeve **144** axially with respect to drill holder element **132** and holding it in that position, a smooth finish engagement between the front surface of holder element **132** and the rear surface of the element **152** being provided so as not to impede rotation.

Thus, in operation of the device, it will be appreciated that as post **66** is rotated counterclockwise to carry the drill towards the wheel **166**, a differential grinding of the drill point will occur due to forward sliding of plate **30** plus the eccentric or cam motion provided by the offset of post **66**. Thus the surface immediately behind the lip will have less material removed therefrom than the surface further back from the lip, leaving a curved surface from lip to heel instead of a flat surface, and leaving the edge of the lip strongly reinforced by material remaining instead of being ground away as is usually done when drills are ground flat. At the same time proper clearance angle is maintained for the lip, which should be from 12° to 15°, depending on the particular layout of the offset or eccentricity of post **66**. Each lip of the drill is ground during counterclockwise motion of post **66**, the return motion of the post serving to remove very little material. The chuck **152** is flipped to engagement with studs **126***a* and *b* alternatively at the beginning of each counterclockwise swing.

The action of the two cam motions applies to all sizes of drills in the scope of the machine and will give each size drill the necessary body behind the lips as well as the continuous curve from the point of the drill to the end of the heel.

This causes the drill to cut better and stay sharp longer.

Referring now to Fig. 9, a simplified cradle element is illustrated for accommodating straight shank drills. This cradle element consists merely of the block **170**, having a V-shaped groove **172** to accommodate a straight shank and being adjustably slidable on shaft **116** by means of a tightening screw **174** in a manner which will be well understood. A clamping plate **176** may be utilized to hold element **170** on shaft **116**. Limit studs **178***a* and **178***b* are provided on side flanges, for the purpose hereinbefore explained for the studs **126***a* and **126***b*, and as set forth in my above-mentioned prior patent. This alternative form for the rear element of the drill cradle is furnished as part of a set; thus, when it is desired to grind straight shank drills the rearward cradle element as shown in Fig. 1 may be removed from shaft **116** and the simple V block **170** substituted thereon, the chuck **152** then being clamped directly to the drill.

By comparing Figs. 5 and 9, it will be apparent that the sides of groove **172** make an angle which is equal to the angle at the bottom of the opening **160**. Thus, the V-shaped groove at the bottom of this opening has walls against which the drill body is pressed by means of the clamp element **156**. It will be noted that these walls are equal to the angle of the groove **172**. Further, it will be noted that the shoulders **162***a* and **162***b* make an angle with each other likewise equal to the angle of the groove **172** and the bottom of the opening **160**. In fact, all of the angles in this particular instance equal 90°. This is an important point in the construction of the device, since it insures an exact 180° rotation of the drill each time a lip is ground just prior to grinding the other lip.

Referring to Figs. 1 and 1*a*, the relationship of the drill and the grinding wheel **166** is shown, the grinding wheel being provided with a guard **182** to which is fastened an end plate **184** shielding as much of the surface of the wheel as possible. Secured to guard **184** is a bracket **186** which supports a mirror **190** having a scratch line **192** on its surface. It will be appreciated that when the mirror surface is set at the proper angle with the scratch line disposed at a suitable angle and in fixed position, the post **66** may be swung so that the point of the drill is reflected in the mirror, the axis of the drill then being in a plane normal to the surface of the mirror, although the drill axis itself is not actually normal to the mirror surface. If the lips of the drill, or one lip, is then arranged parallel to the scratch line when either ear **162***a* or **162***b*, is engaged with its respective stud **126***a* or **126***b*, the setting of the drill will be such that the angle between the lip and the web point will be within a range which is considered suitable with respect to the point of the web for most efficient drilling. Thus, as viewed on Fig. 10, the angle **200** will be within the range of from 120° to 135°, this being considered the proper angularity between the point of web **202** and lips **204**. It will be appreciated that the exact angle provided is not critical so long as it is within the specified range. The mode of predetermining the particular angularity of the mirror surface and the angle of the scratch line thereacross depends upon the physical design of the combination and can readily be achieved by persons skilled in the art by the use of suitable gauges or by placing a properly ground drill in the fixture and swinging it around to a convenient position in which the reflection of the lips can be readily seen. It should further be noted that the axis of the drill need not be normal to the plane of the mirror, the angle of the mirror being set so as to face upwardly for convenience of the operator. A 45° angle for the plane of the mirror has been found suitable with respect to the horizon while the angularity of the mirror with respect to the axis of the wheel may be set so that a fairly full reflection of the drill point can be effected within the arc of swinging of the post **66**.

An alternative method of setting the drill where access is not readily available for a mirror would be by means of an indicia line **210** scratched on the front of element **76**, as shown in Fig. 4.

Having thus described my invention, I am aware that many modifications are possible without departing from

the spirit thereof and accordingly I do not seek to be limited to the precise illustration given herein except as set forth in the appended claims.

I claim:

1. The combination of a drill grinding fixture and a mirror and means for adjustably mounting said mirror adjacent a grinding surface, including an indicia mark on said mirror in a predetermined position, whereby the point of a drill carried in said fixture may be adjusted to be reflectively aligned with said indicia mark so as to provide the proper angle of the drill lip with respect to the grinding surface to insure predetermined limits of angularity between said drill lip and the web of said drill.

2. The combination of a grinding wheel, a mirror having an indicia mark on the surface thereof in a predetermined position, and a drill holding fixture having means for providing oscillatory motion of a drill point with respect to said wheel, said mirror being mounted with respect to the grinding surface of said wheel so as to effect a gauge for positioning the lip of a drill with respect to the indicia mark thereon whereby the lip of said drill engages the grinding surface at a predetermined angle during oscillatory motion with respect thereto, said fixture being movable to a degree whereat the axis of a drill therein may be set normal to the plane of said mirror.

3. The combination of a grinding wheel, a mirror adjacent the surface thereof, a visible gauge line means manifested on said mirror in a predetermined position, a drill holder, said drill holder being movable so that a drill carried therein may be positioned to have its axis in a plane normal to the mirror whereby a lip of said drill may be reflectively aligned with said gauge line.

4. The combination as set forth in claim 3, said visible gauge line being applied directly on the surface of said mirror.

5. A drill grinding fixture comprising a pivotally oscillatable drill holding means mounted for oscillation in a predetermined plane angularly fixed with relation to the surface of a grinding wheel and means for providing said drill holding means with unidirectional, rectilinear, translational motion in predetermined varying degree toward a grinding wheel during pivotal oscillation of said drill holding means in one direction, said translational motion means being actuated by said oscillation of said drill holding means.

6. A drill grinding fixture comprising a pivotally oscillatable drill support means mounted for oscillation in a predetermined plane angularly fixed with relation to the surface of a grinding wheel and means responsive to oscillation thereof for providing progressively increasing unidirectional, rectilinear, translational, motion of said support means toward a grinding wheel as said means is pivoted in one direction so as to grind off a progressively increasing amount of material rearwardly of the lip of a drill held in said support means.

7. A drill grinding fixture comprising a pivotally oscillatable drill support means mounted for oscillation in a predetermined plane angularly fixed with relation to the surface of a grinding wheel for supporting a drill so as to grind the drill point against a grinding wheel upon oscillation of said support means in one direction, including means for providing arcuate motion of said support means about an axis offset from the body of a drill held in said support means, and means for providing a simultaneous unidirectional, rectilinear, translational motion of progressively increasing degree to said support means toward said wheel as said support means is oscillated in said one direction, so as to grind off progressively increasing amounts of material rearwardly of a drill lip, said support means having an element for gripping a drill, said element being rotatably reversible whereby each lip of said drill may be alternately ground in turn.

8. A drill grinding fixture comprising a pivotally oscillatable drill holding means mounted for oscillation in a predetermined plane angularly fixed with relation to the surface of a grinding wheel and means for providing unidirectional, rectilinear, translational motion to a predetermined varying degree of said drill holding means toward a grinding wheel during oscillation of said means in one direction, said translational motion being unidirectional throughout the range of oscillation in said one direction, wherein said motion providing means comprises cam elements including a base, one of said cam elements being secured to said oscillatable drill holding means and the other of said cam elements being secured to said base, said cam elements being engageable with each other to actuate said drill holding means responsive to said oscillation in one direction.

9. A device as set forth in claim 8, one of said cam elements being adjustable so as to vary the amount of material removed from a drill point during the course of oscillation of said holding means in one direction.

10. A drill grinding fixture comprising a pivotally oscillatable drill holding means mounted for oscillation in a predetermined plane angularly fixed with relation to the surface of a grinding wheel and means for providing unidirectional, rectilinear, translational motion of said drill holding means toward a grinding wheel responsive to oscillation of said means in one direction, said holding means having an element for gripping a drill, said element being rotatively reversible whereby each lip of said drill may be alternately ground in turn.

11. In a device of the class described, a support element having a trough for supporting at least a portion of a drill, a drill holder adapted to be secured to said drill to serve as a handle for rotating said drill about its axis while it is supported in said support element so as to grind either lip thereof in a rotated position of said drill, said drill holder being formed with an opening, said opening having a pair of converging sides forming a trough in which an intermediate portion of said drill may be accommodated, a clamp element carried by said drill holder for securing said drill fixedly against the sides of said trough to thus clamp said drill in said drill holder, said drill holder having a pair of shoulders having surfaces positioned at a predetermined angle with respect to each other and with respect to the axis of a drill in said holder, and abutment means disposed on opposite sides of said support element alternately engageable by said shoulders to limit rotative motion of said drill holder to either of two stop positions so as to orient one drill lip or the other for grinding, wherein the angle between the sides of said trough in said support element and the angle between the sides of the trough in said holder and the angle between the engageable surfaces of said shoulder are all equal.

12. In a device as set forth in claim 11 wherein said angles are all equal to 90°.

13. A drill grinding fixture comprising a drill holding means mounted for rocking about a pivot, said pivot being mounted for rectilinear, translational motion in a plane angularly related to the axis thereof during rocking of said holding means in one direction, and means for effecting said translational motion in varying degree actuated by said rocking of said drill holding means.

14. In a drill grinding fixture as set forth in claim 13, wherein said drill holding means comprises an element for supporting the body of a drill rotatively about the axis of said drill and a chuck operative to be clamped about the body of said drill for selectively rotating said drill to bring one cutting edge or the other into grinding position.

15. A drill grinding fixture comprising a grinding wheel and a pivotally oscillatable drill holding means mounted for oscillation in a predetermined plane angularly fixed with relation to the surface of said grinding wheel, and means for providing said drill holding means with unidirectional, rectilinear, translational motion in predetermined varying degree toward said grinding wheel dur-

ing pivotal oscillation of said drill holding means in one direction, said translational motion means being actuated by said oscillation of said drill holding means.

16. A drill grinding machine comprising a grinding wheel and a pivotally oscillatable drill support means and means responsive to oscillation thereof for providing progressively increasing unidirectional, rectilinear, translational motion of said support means toward said grinding wheel as said means is pivoted in one direction so as to grind off a progressively increasing amount of material rearwardly of the lip of a drill held in said support means.

17. A drill grinding fixture comprising a grinding wheel and a pivotally oscillatable drill holding means and means for providing unidirectional, rectilinear, translational motion to a predetermined varying degree of said drill holding means toward said grinding wheel during oscillation of said means in one direction, said translational motion being unidirectional throughout the range of oscillation in said one direction, wherein said motion providing means comprises cam elements including a base, one of said cam elements being secured to said oscillatable drill holding means and the other of said cam elements being secured to said base, said cam elements being engageable with each other to actuate said drill holding means responsive to said oscillation in one direction.

18. A drill grinding fixture comprising a grinding wheel and a pivotally oscillatable drill holding means and means for providing unidirectional, rectilinear, translational motion of said drill holding means toward said

grinding wheel responsive to oscillation of said means in one direction, said holding means having an element for gripping a drill, said element being rotatively reversible whereby each lip of said drill may be alternately ground in turn.

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