Sept. 19, 1967 M. F. BARONYAK 3,341,981

TWIST DRILL BIT SHARPENING DEVICE

Filed Feb. 1, 1965 2 Sheets-Sheet 1

FIG. 1

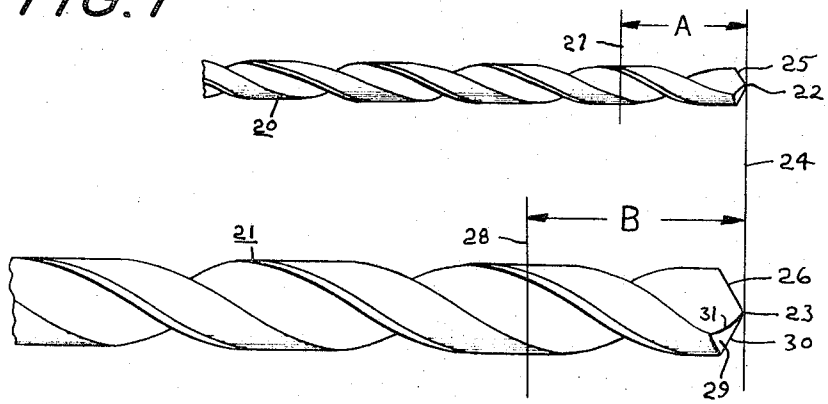

FIG. 2

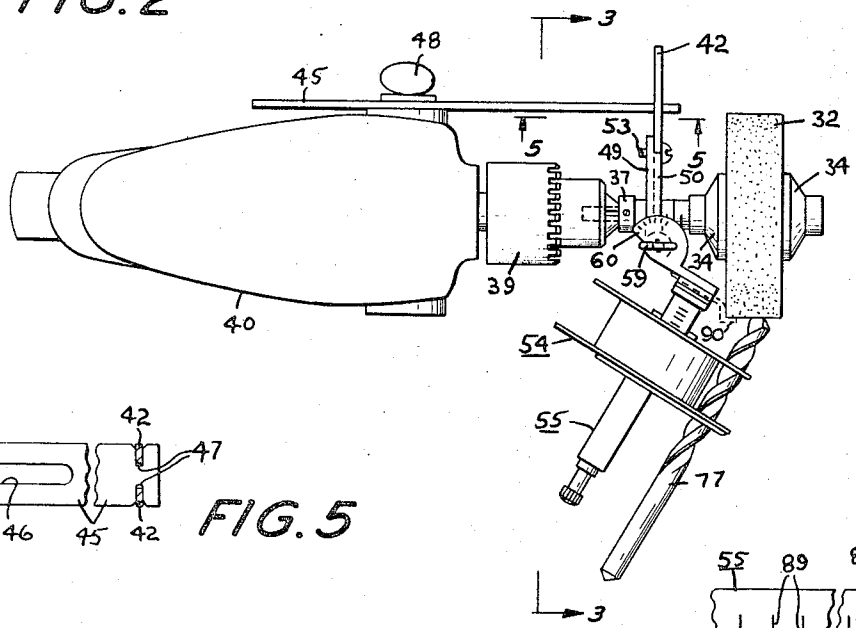

FIG. 5

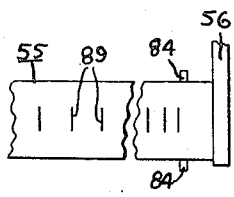

FIG. 4

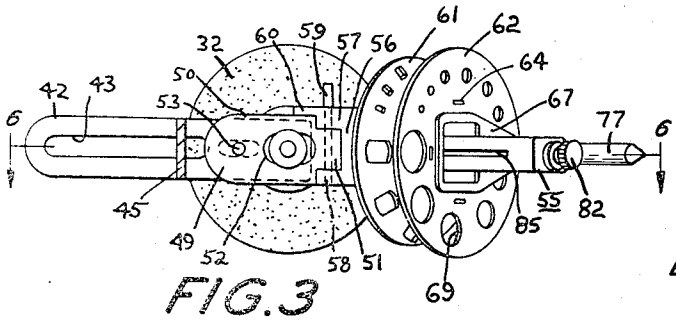

FIG. 3

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FIG. 6

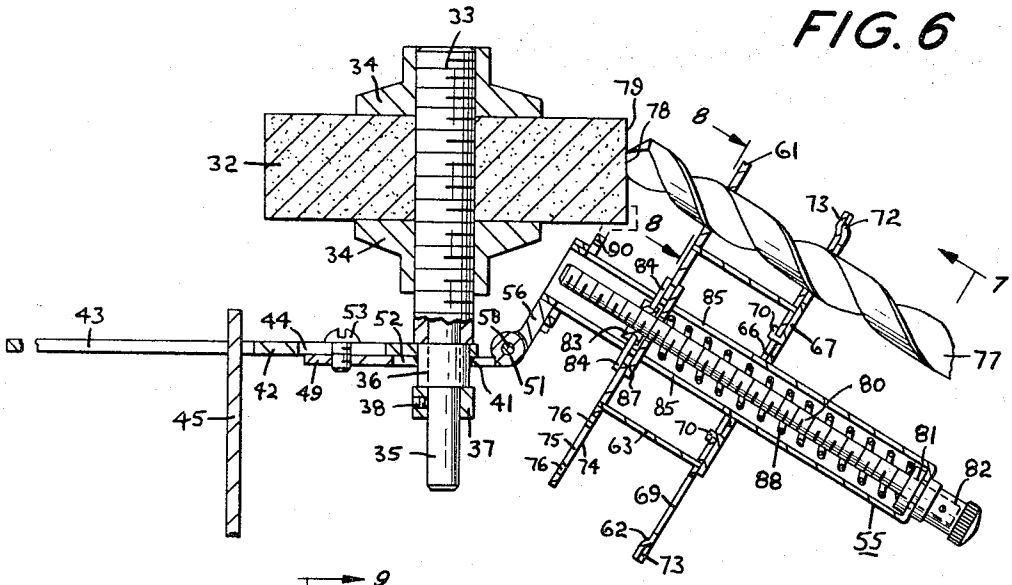


FIG. 7

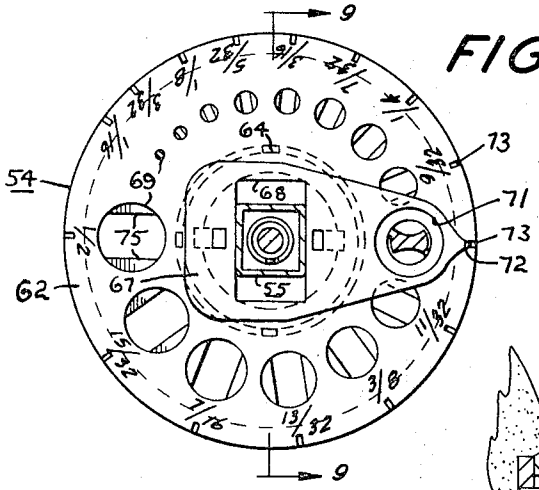
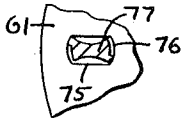


FIG. 8



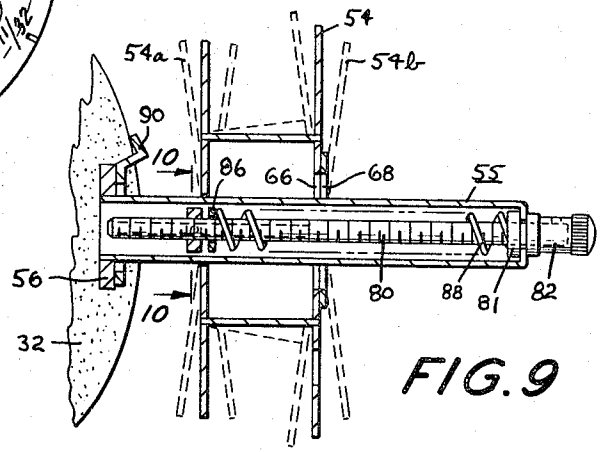


FIG. 9

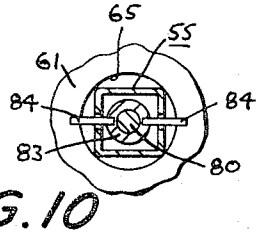


FIG. 10

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TWIST DRILL BIT SHARPENING DEVICE

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Filed Feb. 1, 1965, Ser. No. 429,495
13 Claims. (Cl. 51—241)

ABSTRACT OF THE DISCLOSURE

A twist drill bit grinder attachment for portable electric drills, including a grinding wheel on a rotatable shaft powered by insertion into the drill chuck, a rotatable detented bit sizing wheel mounted for sliding movement axially on a boom to a desired position and rockable about an axis orthogonal to the boom, the boom being carried on a support lockable to the drill and including an adjustment for orienting the bit sizing wheel to present a bit to be ground to the grinding wheel at a desired angle between useful limits. Sliding movement of the bit sizing wheel on the boom permits selection by means of index marks on the boom of the proper swinging axis for the bit with respect to the grinding surface to insure proper surface declination from the cutting edge to the trailing edge of the bit flute. The rotatable bit sizing wheel is provided with differently sized apertures to accept and hold differently sized twist bits in properly indexed position for grinding.

This invention relates generally to twist drill bits and apparatus for sharpening the same. More particularly, this invention relates to a relatively simple and inexpensive drill bit grinding device of a portable nature which may be carried about in a tool box for use in conjunction with an ordinary electric drill to sharpen dull drill bits as the occasion arises.

In the past, twist drill bit sharpening devices have been devised for use generally with bench grinders which are heavy and bulky and not normally transportable, being usually fixedly secured to a work bench or other supporting structure. Consequently, when the need arises for drill bit sharpening on the job, most often there is no grinder available for use. Additionally, bench grinders are relatively expensive devices not normally found in most home work shops because the lack of general utility does not warrant the purchase price. Moreover, drill bit holders or manipulators of reasonable cost for use with a bench grinder in sharpening twist drill bits are usually so physically constructed that the required clearance angle for proper bit dress is not taken account of at all, with the result that bits dressed with such a device are almost always incorrectly ground so that the resultant clearance is either too great or too little.

With too great a clearance angle there is insufficient back up mass for the cutting edge of the flutes giving rise to edge chipping and increased probability of drill bit breakage. In the case of too little clearance, very slow penetration of the work by the drill occurs and increased power is required to cut at a normal rate, some of this power being dissipated in frictional heat which may cause burning and consequent dulling of the cutting edges of the drill bit. Accordingly, it is a primary object of my invention to provide a novel drill bit sharpening device of relatively small size, light weight and ready portability which may be used in conjunction with an electric drill as a power source to quickly and properly dress a drill bit with proper lip or flute clearance angle.

Another object of my invention is to provide a novel twist drill bit sharpening device as aforesaid which includes in a self contained unit a grinding wheel and a bit holding device which latter is provided with bit sizing and indexing features operative to insure that the particular bit to be sharpened is presented to the grinding wheel at the proper angle, that the flute to be sharpened is properly oriented to the grinding surface, and that the bit is swingable about an axis orthogonal to the longitudinal axis of the bit with the swinging axis being adjustably positionable axially of the bit to provide a proper clearance angle for bits of different sizes.

A further object of this invention is to provide a novel drill bit sharpening device as aforesaid which is inexpensive, simple to operate, and quickly and easily secured to and detached from an electric drill when its use is desired.

The foregoing and other objects of my invention will appear more fully hereinafter from a reading of the following specification in conjunction with an examination of the appended drawings, wherein:

FIGURE 1 illustrates in plan view the working ends of a pair of twist drill bits of substantially different diameters.

FIGURE 2 illustrates a top plan view of the apparatus according to the invention mounted to a power drill and with a bit to be sharpened positioned in the bit holder;

FIGURE 3 is an elevational view of the apparatus according to the invention as would be seen when viewed along the line 3—3 of FIGURE 2;

FIGURE 4 is an enlarged fragmentary plan view of the drill bit holder support arm or boom illustrating more clearly bit size scaling marks thereon;

FIGURE 5 is a fragmentary view of a portion of the locking structure which fixes the sharpening devices relative to the drill case as would be seen when viewed along the line 5—5 of FIGURE 2;

FIGURE 6 is a horizontal sectional view through the apparatus according to the invention as would be seen when viewed along the line 6—6 of FIGURE 3;

FIGURE 7 is a vertical sectional view taken through the apparatus as would be seen when viewed along the line 7—7 of FIGURE 6 which discloses details of the bit sizing wheel;

FIGURE 8 is a fragmentary view of a portion of the front disc of the bit sizing wheel illustrating the rotational indexing slot for the bit shown in FIGURE 6, as would be seen when viewed along the line 8—8 of FIGURE 6;

FIGURE 9 is a vertical sectional view through the bit sizing wheel and its support arm as would be seen when viewed along the line 9—9 of FIGURE 7, showing in dotted outline the limits of rocking motion of the bit sizing wheel on its support arm about the horizontal pivotal axis located at the front face of the wheel; and

FIGURE 10 is a cross section through the bit sizing wheel support arm just forward of the pivot structure for the sizing wheel, as would be seen when viewed along the line 10—10 of FIGURE 9.

In the several figures, like elements are denoted by like reference characters.

Turning first to an examination of FIGURE 1, there is observed a pair of twist drill bits 20 and 21 of respectively smaller and larger diameter having their points 22 and 23 respectively disposed one above another and just touching the vertical reference line 24. Assume that the cutting edges 25 and 26 of one of the flutes of each of the bits 20 and 21 respectively lie in a plane which is common to the reference line 24, and that the reference lines 27 and 28 disposed to the left of the reference line 24 by the distances A and B respectively represent straight edges tangent to the facing edges of the flutes of the bits. The lines 27 and 28 for each of the respective bits are observed to be the first points to the left of the reference line 24 where lines parallel to

the line 24 may be established on the top side of the drill bit.

The importance of these lines 27 and 28 is that they each lie directly above and parallel to an axis passing transversely centrally through the drill bit and orthogonal to the bit longitudinal axis, such transverse orthogonal axis being coplanar with the cutting edge 25 or 26 of the respective bits. This horizontal axis whose position from the bit tip is determined by the location of the lines 27 and 28 is the axis about which the bit should be swung to sharpen the cutting edge of the bit so that the proper lip clearance angle of approximately 12 degrees to 15 degrees is realized. It should be noted that this pivot axis is not a fixed length from the reference line 24, or the bit tips, but is a function of the bit diameter, such axis location from the reference line 24 increasing with increasing bit diameter.

Lip clearance defines the declination rate of flute surface 29 of bit 21 extending from the flute leading edge 30 helically downward and backward to trailing edge 31. It is apparent that the arc length between the leading edge 30 and trailing edge 31 is longer for bit 21 than it would be for comparable path on the flute of bit 20. Consequently, if the swinging axis for bit 21 were located at the same distance from its point as for the bit 20 it would be necessary to swing a much wider arc in order to grind the surface 29. Similarly, if the pivotal axis for grinding of bit 20 were positioned substantially toward the left hand end of bit 20 instead of at line location 27, an extremely short arc would need to be swung to grind the flute of this bit. It has been found that the control of the grinding action is inferior when very short and very wide arcs are required, well controlled grinding being achievable with arcs on the order of thirty degrees.

The inexpensive grinding attachments presently available for use with bench grinders usually include a relatively long V-shaped bit holding arm inclined at an angle to the side surface of the grinding wheel to provide a desired tip angle to the bit, and are pivoted for swinging motion at a fixed point so far removed from the bit tip when the bit is clamped in the arm that the pivotal axis for the bit would typically be at approximately the left hand end of bit 20 as shown in FIGURE 1. This results in a sweeping arc having a relatively long radius of curvature so that the lip clearance angle is too shallow. The appartus to be now described includes the ability to shift the swinging axis axially with respect to the length of the drill bit to be sharpened so that a well controlled grinding sweep may be effected at such a radius of curvature as to provide substantially a proper lip clearance angle.

Referring now to FIGURES 2, 3 and 6, in particular, there is seen a grinding wheel 32 fixedly mounted upon a threaded shaft 33 for rotation therewith by a pair of internally threaded clamping bushings 34, the inner end of shaft 33 being provided with a reduced diameter coaxial shaft 35 fixedly secured thereto and extending through a sleeve bearing 36 within which it is rotatably secured against axial shifting by collar 37 locked to shaft 35 by set screw 38. The free end of shaft 35 is intended for disposition within and locking engagement to the chuck 39 of an electric drill 40, in the manner shown in FIGURE 2. The threaded bushings 34 permit adjustment of the grinding wheel 32 axially along shaft 33 so that different portions of the cylindrical surface of the grinding wheel may be brought into use as desired to maintain the grinding surface substantially dressed even with extended use. The sleeve bearing 36 is welded as at 41, or otherwise secured, to an elongated support arm 42 which extends laterally beyond the left hand side of the drill 40, the arm 42 being provided with an elongated slot 43 extending inward from a point proximate the free end of the arm 42, and a second elongated slot 44 located in the web of the support arm 42 between the inner end of slot 43 and the securement of sleeve bearing 36.

A locking arm 45 having an elongated slot 46 therethrough in its rear region and provided at its forward end with a pair of vertically aligned rectangular notches 47 locks the support arm 42 against rotation with respect to the housing of the drill 40 by having its forward end projected horizontally through the slot 43 in the support arm and then rotated into vertical position to engage the support arm in the notches 47, the locking arms 45 being then fixedly secured to the drill housing 40 by means of a wing stud 48 projected through the locking arm elongated slot 46 and into threaded engagement in the housing auxiliary handle hold. Differing drill housing widths are taken into account by the elongated slot 43 of the support arm 42 which permits the locking arm 45 to move laterally the proper distance for side alignment with the drill housing. The elongated slot 46 in the locking arm 45, best seen in FIGURE 5, permits accommodation for various dimensional differences in different drills as regards the distance between the wing stud hole and the front of the drill chuck.

Disposed behind the support arm 42 is a slide arm 49 having forwardly turned upper and lower flanges 50 which close fittingly respectively overlie and underlie the upper and lower edges of the support arm, the slide arm 49 extending from a point behind support arm slot 44 to the right beyond the end of support arm 42 and terminating in a vertically extending hinge loop 51. The slide arm 49 is longitudinally apertured as at 52 to provide a slot through which the sleeve bearing 36 may freely project, and is also provided proximate its left end behind the support arm slot 44 with a tapped hole into which is threaded a locking screw 53 the head of which seats against the front surface of the support arm 42 with the shank projected through the slot 44. As best seen from FIGURE 6, the locking screw 53 may be loosened so that the slide arm 49 may shift endwise with respect to support arm 42 and may then be again locked to the support arm by tightening the locking screw 53. This endwise shiftability of the slide arm 49 enables the structure carried by the hinge loop 51 of the slide arm to be shifted with respect to the cylindrical surface of the grinding wheel 32 to accommodate for grinding wheel surface wear.

Carried by the slide arm 49 at its hinged end is the drill bit selector and holder assembly which includes a bit sizing and selector wheel designated generally as 54 mounted for axial shifting motion along an elongated hollow tubular boom designated generally as 55 of square cross section and from the front end of which boom laterally extends an arm 56 rigidly fixed to the boom at one end and terminating at its opposite end in hinge loops 57 spaced immediately above and below the hinge loop 51 of slide arm 49. Projected downward through the hinge loops 57–51–57 is a pintle having a threaded lower end 58 threadedly engaged into the lower hinge loop 57 of the arm 56, the upper end of the pintle being provided with a wing head 59. As best seen in FIGURE 2, the upper edge of arm 56 is provided with an angulation scale 60 by means of which the selector wheel may be angularly positioned to present the bit to be ground at a desired angle to the edge of grinding wheel 32, the supporting boom 55 being then fixedly locked at the desired position by tightening the pintle wing head 59 to lock the hinge joint between arm 56 and slide arm 49. For most applications the bit grinding angle is normally chosen as fifty-nine degrees to the longitudinal axis of the bit, and if desired, the hinge joint could be dispensed with and the slide arm 49 and boom support arm 56 be made as one integral piece.

The selector wheel 54 comprises a front disc 61 and a rear disc 62 parallel to one another and spaced apart by means of the hollow cylindrical hub 63 which rigidly secures the discs in fixed relation to one another by means of tabs 64. The front disc 61 is centrally circularly apertured as at 65, as best seen in FIGURE 10, so that the boom 55 projects freely but close fittingly there-

through, while the rear disc 62 is provided with a central circular aperture 66 of substantially larger diameter than the diagonal of boom 55. Disposed flatwise against the rear surface of rear disc 62 and coupled radially non-shiftably to the rear disc is a bit size indicator plate 67 having rectangular central aperture 68 of width equal to that of the boom 55 and of a height longer than the height of the boom 55, as best seen in FIGURE 7. The circular aperture 65 of the front disc 61 together with the rearwardly spaced vertically elongated rectangular aperture 68 of the bit size indicator plate 67 provide for rocking motion of the selector wheel 54 in a vertical plane about a horizontal axis carried by the boom 55, as will be described hereinafter.

The extent of forward rocking of the selector wheel 54, indicated as the dashed line showing 54*a* of FIGURE 9, occurs when the lower edge of the rectangular aperture 68 rises into engagement with the bottom of the boom 55 while the limit of rearward rocking motion of the selector wheel 54, as shown in dashed lines as 54*b* in FIGURE 9, occurs when the upper edge of rectangular aperture 68 engages the upper surface of the boom 55. The rear disc 62 is provided with a series of bit sizing circular apertures 69 all arranged with their centers lying on a circle whose center is coaxial with the central longitudinal axis of boom 55 when the selector wheel 54 is disposed orthogonally to the boom, each circular aperture 69 corresponding to a specific diameter of drill bit. In the illustrated case, and as best seen in FIGURE 7, the apertures 69 are sized for bit diameters between one sixteenth inch and one half inch, in intervals of one thirty-second of an inch.

The size indicator plate 67 disposed flatwise against the rear surface of rear disc 62 is not rotatable relative to the boom 55 since the width of the slot 68 in the size indicator plate is exactly equal to the boom width. Consequently, the tabs 70 turned forward from the indicator plate 67 and radially outward about the periphery of circular aperture 66 in rear disc 62 frictionally lock the indicator plate 67 to the rear disc 62 so that the selector wheel 54 does not spin freely, but the frictional engagement is such that rotation of the selector wheel 54 is not prevented. The indicator plate 67 extends horizontally to the right and is provided with a circular aperture 71 whose center lies on the same circle as the centers of bit sizing apertures 69 and whose diameter is at least equal to the diameter of the largest aperture 69, the center of circular aperture 71 lying in a plane common to the central axis of boom 55 and shaft 33 which latter carries the grinding wheel 32. The tip of size indicator plate 67 is narrowed to a point which turns forward to provide a detent 72 engageable within the peripherally spaced depressions 73 formed on the rear face of rear disc 62, such depressions lying on radii of the disc passing through the center of the bit sizing circular apertures. The detenting arrangement insures that the selector wheel 54 does not rotate while bit grinding is being carried out.

The front disc 61 of selector wheel 54 is provided with a plurality of apertures 74 all having centers lying on a circle of radius equal to the radius of the circle on which lie the centers of the bit sizing circular apertures 69, each front disc aperture 74 also having its center colinear with the center of a corresponding circular aperture 69 so that a bit projected forward through a pair of aligned apertures 69 and 74 is disposed with its long axis orthogonal to the front and rear discs of the selector wheel 54. As best seen in FIGURES 3 and 7, the front disc apertures 74 are not circular but are instead formed with a pair of spaced apert straight parallel sides 75 which are parallel to a radius of disc 61 which passes medially therebetween. The ends of the front aperture parallel sides 75 are joined by circular arcs 76 which lie on a circle of the same diameter as the corresponding bit sizing circular aperture 69 and are aligned therewith.

From FIGURES 6, 7 and 1 it is observed that the parallel upper and lower sides 75 of the front apertures 74 in disc 61 correspond exactly to the horizontal straight edge condition previously identified in connection with reference lines 27 and 28. When now a drill bit, as for example 77 in FIGURE 6, is projected through its appropriate bit sizing circular aperture 69 in the rear disc and then fed rotatably through the corresponding front disc aperture 74 it will be appreciated that the bit 77 cannot slide axially in the selector wheel 54 but can only move axially by axial rotation of the bit. This insures that the bit does not accidentally shift axially during the grinding process.

The correspondence of reference lines 27 and 28 of FIGURE 1 to the location of front disc apertures 74 in order to locate the swinging axis transversely through the bit at such point is achieved by axially shifting the selector wheel 54 along the boom 55 until the cutting edge of flute 78 of bit 77 is line engaged with the cylindrical surface 79 of the grinding wheel 32. With the orientation of the various parts as shown in FIGURES 2 and 6, this occurs when the cutting edge of the flute 78 is horizontal.

Since the selector wheel 54 must be swung about a horizontal axis with the selector wheel at a particular point along the boom 55, it is mandatory that a fixed pivot against which the selector wheel can work be provided in order to insure that the selector wheel only rotates during the grinding process and does not shift axially in an uncontrolled manner. The mechanism for effecting this result is illustrated most clearly in the showings of FIGURES 6, 9 and 10 to which reference should be particularly directed.

Extending longitudinally centrally through the hollow square tubular boom 55 rearward from the front end and through the back wall of the boom is a threaded shaft 80. Fixed to the shaft 80 inside the boom 55 and disposed against the end wall is a collar 81, and secured upon the end of the shaft 80 which projects axially beyond the end of the boom 55 is a cap or end piece 82 grippable to rotate the threaded shaft 80 about its longitudinal axis, the collar 81 and cap 82 preventing axial movement of the shaft 80.

Threaded onto the shaft 80 is a nut 83 provided with a pair of pins 84 extending laterally in opposite directions through longitudinally extending slots 85 cut through the side walls of boom 55, the length of the pins 84 being such that they extend beyond the edges of the front disc central circular aperture 65 and provide a pivotal axis about which the selector wheel 54 may move when the front disc 61 of the selector wheel is abutted thereagainst. Also freely disposed upon the threaded shaft 80 and within the boom 55 is a centrally apertured disc or washer 86 provided with a pair of oppositely extending side arms 87 which also project through the longitudinally extending boom side slots 85 with the arms 87 projecting lateraly sufficiently far to extend beyond the edge of front disc central aperture 65 and engage the rear face of the selector wheel front disc 61.

Disposed about the threaded shaft 80 with one end abutting the collar 81 and the other end abutting the disc 86 is a compression spring 88 which constantly urges the disc 86 against the rear face of selector wheel front disc 61, and therefore constantly biases the front face of the selector wheel front disc 61 against the pins 84 carried by nut 83 on shaft 80. The selector wheel 54 may therefore be advanced along the boom toward grinding wheel 32 by rotating the threaded shaft operating end piece 82 in such direction as to advance the nut 83 along the shaft toward the grinding wheel, and conversely, the selector wheel 54 may be shifted rearward along the boom 55 by counterrotating the threaded shaft 80 to shift the nut 83 rearward away from the grinding wheel 32.

As best seen in FIGURES 2 and 4, the upper surface of boom 55 is provided with a series of indexing marks 89 each of which corresponds to one of the bit diameters

provided for on disc **62** of the selector wheel. These indexing marks **89** designate the points at which the pivoting axis for the selector wheel **54** should be located for the differently sized bits in order to coincide with the conditions described in connection with the showing of FIGURE 1. Thus, the first mark would correspond to the location of the pivotal axis for a one-sixteenth inch diameter bit while the most rearwardly located mark would correspond to the pivotal axis location for a one-half inch diameter bit.

When it is desired to grind a bit of a given size, the selector wheel **54** is longitudinally shifted along the boom to the index mark corresponding to that particular sized bit, and the proper bit sizing aperture is moved into detented operating position as shown in FIGURE 7 by rotation of the selector wheel **54**. The bit is now projected through the selector wheel **54** and will automatically engage the grinding surface **79** of grinding wheel **32** at the proper orientation when the grinding wheel **32** has been properly indexed to the boom **55**.

Indexing of the grinding wheel to the boom is very simply effected by merely flipping downward into horizontal position the captive indexing guide **90** rotatably carried by the front end of the boom **55**. If the grinding wheel cylindrical surface **79** is not tangential to the guide it is then necessary to shift the grinding wheel **32** until the condition illustrated in FIGURES 2 and 6 is achieved. This is readily effected by merely loosening the locking screw **53** which fixes slide arm **49** to support arm **42**, relatively end shifting these two members until the proper indexed alignment is obtained, and then relocking the screw **53**. The indexing guide **90** is now, of course, flipped upward into a non-interfering position and the bit sharpening may proceed. The ability to index the grinding wheel **32** to the boom **55** is of some importance, since it will be appreciated that extensive use of the device will reduce the diameter of the grinding wheel and require that it periodically be shifted further toward the boom **55** to maintain proper indexing.

Bit grinding is very simply carried out by presenting the bit flute to be ground against the grinding surface of grinding wheel **32** in the orientation as previously described, and then rocking the selector wheel **54** about its pivotal axis from a starting position shown in solid line in FIGURE 9 to the dashed line showing designated as **54***b*. If deep grinding is required, the starting position may be closer to that designated **54***a*. The bit may then be removed from the selector wheel **54**, rotated to one hundred and eighty degrees and reinserted into the selector wheel for grinding of the other bit flute.

Having now described my invention in connection with a particularly illustrated embodiment thereof it will be appreciated that modifications and variations of my invention may now occur from time to time to those persons normally skilled in the art without departing from the essential scope or spirit of my invention, and accordingly it is intended to claim the same broadly as well as specifically as indicated by the appended claims.

What is claimed as new and useful is:

1. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination,

(1) a support structure

(2) a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, said shaft having a free end extending beyond a portion of said support structure,

(3) a drill bit holder carried by said support structure proximate to said grinding element for presenting a drill bit tip to be ground in operative grinding relationship to the said grinding surface, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about a part of said support structure passing therethrough, said selector having a rotary wall portion with a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind, each aperture being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected therethrough intersects the said grinding surface, said rotary selector being rockable on pivot means carried by said support structure in a direction transverse to its plane of bit size diameter selection rotation to thereby pivot a bit to be ground and cause the bit tip to traverse to said grinding surface,

said support structure including locking means operative to lock said support structure to the housing of the electric drill with which it is used and against movement relative thereto when the free end of said grinding element shaft is clamped within the chuck of the electric drill.

2. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination,

(1) a support structure

(2) a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, said shaft having a free end extending beyond a portion of said support structure,

(3) a drill bit holder carried by said support structure proximate to said grinding element for presenting a drill bit tip to be ground in operative grinding relationship to the said grinding surface, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about a part of said support structure passing therethrough, said selector having a rotary wall portion with a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind, each aperture being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected therethrough intersects the said grinding surface, said rotary selector being rockable on pivot means carried by said support structure in a direction transverse to its plane of bit size diameter selection rotation to thereby pivot a bit to be ground and cause the bit tip to traverse the said grinding surface,

said support structure including locking means operative to lock said support structure to the housing of the electric drill with which it is used and against movement relative thereto when the free end of said grinding element shaft is clamped within the chuck of the electric drill, and said support structure also including selectively operable shifting means engaged with said drill bit holder pivot means operative for shifting the latter with respect to said support structure to shift the rocking axis of the drill bit holder with respect to the grinding surface of said grinding element.

3. A portable twist drill bit sharpening assembly as defined in claim **1** further including detent means carried by said bit holder and mechanically indexed to said support structure effective to releasably detent each of the said plurality of selector size apertures when the latter are rotated into the said particular position.

4. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination,

(1) a support structure

(2) a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, said shaft having a free end extending beyond a portion of said support structure,

(3) a drill bit holder carried by said support structure proximate to said grinding element for presenting a drill bit tip to be ground in operative grinding relationship to the said grinding surface, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about a part of said support structure passing therethrough, said selector hav-

ing a rotary wall portion with a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind, each aperture being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected therethrough intersects the said grinding surface, said rotary selector being rockable on pivot means carried by said support structure in a direction transverse to its plane of bit size diameter selection rotation to thereby pivot a bit to be ground and cause the bit tip to traverse the said grinding surface, and detent means carried by said bit holder and mechanically indexed to said support structure effective to releasably detent each of the said plurality of selector size apertures when the latter are rotated into the said particular position,

said support structure including locking means operative to lock said support structure to the housing of the electric drill with which it is used and against movement relative thereto when the free end of said grinding element shaft is clamped within the chuck of the electric drill, and said support structure also including selectively operable shifting means engaged with said drill bit holder pivot means operative for shifting the latter with respect to said support structure to shift the rocking axis of the drill bit holder with respect to the grinding surface of said grinding element.

5. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination,

(1) a support structure

(2) a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, said shaft having a free end extending beyond a portion of said support structure,

(3) a drill bit holder carried by said support structure proximate to said grinding element for presenting a drill bit tip to be ground in operative grinding relationship to the said grinding surface, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about a part of said support structure passing therethrough, said selector having a rotary wall portion with a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind, each aperture being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected therethrough intersects the said grinding surface, said rotary selector being rockable on pivot means carried by said support structure in a direction transverse to its plane of bit size diameter selection rotation to thereby pivot a bit to be ground and cause the bit tip to traverse the said grinding surface.

6. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination,

(1) a support structure

(2) a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, said shaft having a free end extending beyond a portion of said support structure,

(3) a drill bit holder carried by said support structure proximate to said grinding element for presenting a drill bit tip to be ground in operative grinding relationship to the said grinding surface, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about a part of said support structure passing therethrough, said selector having a rotary wall portion with a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind, each aperture being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected therethrough intersects the said grinding surface, said rotary selector being rockable on pivot means carried by said support structure in a direction transverse to its plane of bit size diameter selection rotation to thereby pivot a bit to be ground and cause the bit tip to traverse the said grinding surface,

said support structure including selectively operable shifting means engaged with said drill bit holder pivot means operative for shifting the latter with respect to said support structure to shift the rocking axis of the drill bit holder with respect to the grinding surface of said grinding element.

7. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination,

(1) a support structure

(2) a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, said shaft having a free end extending beyond a portion of said support structure,

(3) a drill bit holder carried by said support structure proximate to said grinding element for presenting a drill bit tip to be ground in operative grinding relationship to the said grinding surface, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about a part of said support structure passing therethrough, said selector having a rotary wall portion with a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind, each aperture being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected therethrough intersects the said grinding surface, said rotary selector being rockable on pivot means carried by said support structure in a direction transverse to its plane of bit size diameter selection rotation to thereby pivot a bit to be ground and cause the bit tip to traverse the said grinding surface,

said support structure including selectively operable shifting means engaged with said drill bit holder pivot means operative for shifting the latter with respect to said support structure to shift the rocking axis of the drill bit holder with respect to the grinding surface of said grinding element, and a plurality of spaced apart index marks carried by said support structure and with which said pivot means is selectively alignable by operation of said shifting means, each of said marks corresponding to a different one of said plurality of different sized bit holder selector apertures and being arranged so that alignment of said pivot means with the smallest bit size index mark occurs when said pivot means is shifted toward said grinding surface and alignment with the largest bit size index mark occurs when said pivot means is shifted away from said grinding surface from any point between these marks.

8. The bit sharpening assembly as set forth in claim 7 wherein said grinding element shaft carried by said support assembly is transversely shiftable within limits with respect to the latter and non-shiftably securable at a desired position, whereby the grinding surface is precisely positionable relative to said index marks to compensate for wear of said grinding element.

9. The bit sharpening assembly as set forth in claim 7 wherein said grinding element shaft carried by said support assembly is transversely shiftable within limits with respect to the latter and non-shiftably securable at a desired position, and wherein said grinding element is shiftable axially on its shaft and fixedly securable thereto at a desired position, whereby the grinding surface is precisely positionable relative to said index marks to compensate for wear of said grinding element.

10. A portable twist drill bit sharpening assembly for

operative attachment to an electric power drill having a housing and a chuck, comprising in combination,

(1) a support structure

(2) a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, said shaft having a free end extending beyond said support structure,

(3) a drill bit holder carried by said support structure proximate to said grinding element for presenting a drill bit tip to be ground in operative grinding relationship to the said grinding surface, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about a part of said support structure passing therethrough, said selector having a pair of spaced apart wall portions each having a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind with each aperture in one wall portion being aligned with a corresponding bit size aperture in the other wall portion to form spaced aperture pairs, each aperture pair being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected through both apertures of a selected pair intersects the said grinding surface, one aperture of each pair having at least one substantially straight edge corresponding to a chord of the circle equal in diameter to the diameter of the particular size bit, whereby a bit to be sharpened must be rotated axially in order to be shifted longitudinally through said aperture pair.

11. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination,

(1) a support structure

(2) a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, said shaft having a free end extending beyond a portion of said support structure,

(3) a drill bit holder carried by said support structure proximate to said grinding element for presenting a drill bit tip to be ground in operative grinding relationship to the said grinding surface, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about a part of said support structure passing therethrough, said selector having a pair of spaced apart wall portions each having a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind with each aperture in one wall portion being aligned with a corresponding bit size aperture in the other wall portion to form spaced aperture pairs, each aperture pair being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected through both apertures of a selected pair intersects the said grinding surface, one aperture of each pair having at least one substantially straight edge corresponding to a chord of the circle equal in diameter to the diameter of the particular size bit, whereby a bit to be sharpened must be rotated axially in order to be shifted longitudinally through said aperture pair, said rotary selector being rockable on pivot means carried by said support structure in a direction transverse to its plane of bit size diameter selection rotation to thereby pivot a bit to be ground and cause the bit tip to traverse the said grinding surface,

said support structure including selectively operable shifting means engaged with said drill bit holder pivot means operative for shifting the latter with respect to said support structure to shift the rocking axis of the drill bit holder with respect to the grinding surface of said grinding element.

12. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination, a support structure, a rotary grinding element on an axially rotatable shaft carried by said support structure and having a grinding surface, and a drill bit holder carried by said support structure for presenting a drill bit tip to be ground in operative relationship to the grinding surface of said grinding element, said support structure having

(a) adjustable locking means operative to lock said support structure to the housing of the electric drill with which it is used and against movement relative thereto when the said grinding element shaft is clamped within the chuck of the electric drill,

(b) a support boom to which said bit holder is mounted for rectilinear longitudinal shifting movement therealong toward and away from said grinding element including pivot means adjustable longitudinally of said boom and about which said bit holder is rockable within limits, the pivotal axis of said pivot means always lying in a common plane with a straight line portion of said grinding element grinding surface,

said drill bit holder having bit receiving and aligning means operative to align the bit to be ground so that the bit longitudinal axis intersects the grinding surface and is transversely intersected by the pivotal axis of said pivot means at a point substantially one half helical pitch of the bit from the bit tip.

13. A portable twist drill bit sharpening assembly for operative attachment to an electric power drill having a housing and a chuck, comprising in combination, a support structure, a rotary grinding element on an axially rotatable shaft carried by said support structure, and having a grinding surface, and a drill bit holder carried by said support structure for presenting a drill bit tip to be ground in operative relationship to the grinding surface of said grinding element, said support structure having

(a) adjustable locking means operative to lock said support structure to the housing of the electric drill with which it is used and against movement relative thereto when the said grinding element shaft is clamped within the chuck of the electric drill,

(b) a support boom to which said bit holder is mounted for rectilinear longitudinal shifting movement therealong toward and away from said grinding element including pivot means adjustable longitudinally of said boom and about which said bit holder is rockable within limits, the pivotal axis of said pivot means always lying in a common plane with a straight line portion of said grinding element grinding surface,

said drill bit holder having bit receiving and aligning means operative to align the bit to be ground so that the bit longitudinal axis intersects the grinding surface and is transversely intersected by the pivotal axis of said pivot means, said drill bit holder being in the form of a rotary bit diameter size selector mounted for rotation about said boom which passes therethrough, said selector having a pair of spaced apart wall portions each having a plurality of different specifically sized apertures therethrough corresponding to the sizes of different diameter bits which it is desired to grind with each aperture in one wall portion being aligned with a corresponding bit size aperture in the other wall portion to form spaced aperture pairs, each aperture pair being selectively rotatable into a particular position operative for bit grinding in which the longitudinal axis of a bit projected through both apertures of a selected pair intersects the said grinding surface, one aperture of each pair having at least one substantially straight edge corresponding to a chord of the circle equal in diameter to the diameter of the particular size bit, whereby a bit to be sharpened must be rotated axially in order to be shifted longitudinally through said aperture pair.

(References on following page)

References Cited

UNITED STATES PATENTS

1,109,320	9/1914	Burner	51—219
1,231,258	6/1917	Horvath	51—219 X
2,035,163	3/1936	Holmberg	51—225
2,580,884	1/1952	Bowman	51—219 X

2,800,755	7/1957	Perra	51—219 X
2,848,847	8/1958	Casselman	51—219 X
2,848,852	8/1958	Rosholt	51—219
3,172,242	3/1965	Wood	51—219 X

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