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DI RILL BIT SHARPENING JIG

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ABSTRACT OF THE DISCLOSURE

The forwardly projecting portion of a drill bit, secured to an independent holder, is mounted on a support secured to a base for pivotal movement on an axis substantially normal to the axis of the bit. The holder engages an abutment on the base, laterally outward from the bit axis, whereby the bit is rotated axially as it is pivoted with the support. The holder and support have confronting surfaces arranged for mutual abutment to limit forward feeding of a drill bit relative to a grinding wheel.

This invention relates to the sharpening of drill bits, and more particularly to a jig for supporting and moving a drill bit relative to a grinding wheel to effect precise sharpening of the bit.

It is the principal object of the present invention to provide a drill bit sharpening jig which may be mounted adjacent a conventional grinding wheel and utilized for sharpening drill bits of a wide variety of sizes and lengths.

Another important object of this invention is the provision of a drill bit sharpening jig which functions to produce a sharpened drill bit having a precisely centered tip and a properly relieved clearance angle behind the cutting edges of the bit.

A further important object of the present invention is the provision of a drill bit sharpening jig which is of simplified construction for economical manufacture.

The foregoing and other objects and advantages of this invention will appear from the following detailed description, taken in connection with the accompanying drawings in which:

FIG. 1 is a plan view of a drill bit sharpening jig embodying the features of the present invention, the same being shown supporting a drill bit in initial position for sharpening;

FIG. 2 is a side elevation as viewed from the bottom in FIG. 1; and

FIG. 3 is a side elevation similar to FIG. 2 but showing the components of the jig supporting the drill bit in its final position upon completion of sharpening of one of its cutting edges.

The jig includes a drill bit holder by means of which a drill bit 10 may be supported with a portion of its cutting end projecting therefrom. In the embodiment illustrated, the holder comprises a pair of plates 12 and 14 each of which is provided with a central, longitudinally extending, outwardly offset portion 16 of general V-shaped configuration in end view. These plates are arranged in face to face relation, with the offset portions projecting laterally outward, and interconnected by such means as the pair of screws 18 and clamping wing nuts 20. The plates thus are adjustable toward and away from each other.

The inner surfaces of the registering offset portions 16 cooperate to form a seat which receives the rearward portion of the drill bit and stabilizes the latter between the plates. The wing nuts then are tightened on the screws and the plates drawn together to clamp the drill bit therebetween. The longitudinal axis of the drill bit thus is oriented coaxially with respect to the longitudinal axis of the seat formed by the pair of offset portions 16.

The jig also includes an upstanding base member which, in the embodiment illustrated, comprises the base plate 22 and the pair of laterally spaced upstanding standards 24 and 26. The base member functions to mount means for supporting the drill bit holder and the projecting forward portion of the drill bit for rotation simultaneously on the axis of the seat formed by the offset portions 16 and on an axis substantially normal to the axis of said seat. In the embodiment illustrated, said supporting means includes the drill bit support 28 which is substantially V-shaped in end view. This support is positioned between the laterally spaced standards 24 and 26, with its apex 30 facing downward. Pivot pins 32 extend outward from the support 28 adjacent the upper diverging ends thereof, and project freely through aligned openings 34 adjacent the upper ends of the standards. The pins thus mount the drill bit support between said standards for rotation on an axis substantially normal to and above the axis of the apex 30.

In the embodiment illustrated, the pins 32 are provided by the ends of a rod 35 which is welded or otherwise secured to the outer surfaces of the support, intermediate the front and rear ends of the latter. The rod extends upwardly along the diverging sides of the support and then is bent outward at its terminal end portions to form the pivot pins.

An inwardly struck segment 36 of a top edge portion of one of the standards 26 intercepts the adjacent side edge of the drill bit support 28, to limit the rotation of the latter in the counterclockwise direction as viewed in FIGS. 2 and 3. A coil spring 38 interengages the drill bit support and one of the standards 26 for urging the support normally to said limit of counterclockwise rotation.

The upwardly diverging sides of the V-shaped support serve to support the projecting forward portion of a drill bit 10, and form guides by which the longitudinal axis of the drill bit is disposed parallel to the longitudinal axis of the apex 30. This parallel relationship is maintained regardless of the size of drill bit to be sharpened, the diverging sides of the support accommodating the support of drill bits which vary in diameter over a substantial range.

The supporting means for the holder and bit also includes an abutment on the base member arranged to engage the drill bit holder laterally of the axis of the seat formed by the offset portions 16 when the projecting portion of the bit is mounted in the support member 28. Thus, when the bit and holder are rotated as a unit on the axis of the pivot pins 32, the bit and holder are caused to rotate on the common longitudinal axis of the bit and seat.

In the embodiment illustrated, the abutment means is provided by the internally threaded sleeve 40 which is secured to one of the standards 24 and receives the threaded shank of the adjustment screw 42. This screw extends substantially parallel to the axis of the pivot pins 32 and is disposed rearwardly of the bit support 28. The inner end of the adjustment screw is movable toward and away from the vertical plane of the apex 30 of the support, and hence toward and away from the vertical plane of the common longitudinal axis of the drill bit and holder seat. In this manner the degree of axial rotation of the drill bit and holder, simultaneously with a predetermined degree of rotation of the drill bit and holder on the axis of the pivot pins 32, may be varied as desired.

In use, the base member of the jig is secured to a work bench with the forward end of the apex 30 of the drill bit support member positioned adjacent the working surface 44 of a grinding wheel, also supported in a fixed position on a work bench. The longitudinal axis of the
apex 30 is disposed angularly with respect to the working surface of the grinding wheel, to form therewith an included angle corresponding to the desired taper to be formed on the end of the bit. The bit to be sharpened is then fitted into the bit holder, between the offset portions 16 of the plates, and secured thereto preliminarily with only slight clamping pressure, either by the wing nuts 26, or merely by thumb and finger pressure. The forward end of the bit is projected from the holder a distance greater than the distance between the rearward end of the support member 28 and the working surface of the grinding wheel.

The bit is then oriented rotationally with respect to the holder to insure that the cutting edges 46 will abut the grinding wheel precisely at the initial stage of sharpening. This orientation is accomplished by viewing the bit and holder from the front end, with the holder arranged in the 3–9 o’clock position, and rotating the bit relative thereto until the right hand one of the cutting edges 46 is aligned with a predetermined clock position. Thus, for example, if the bit is 3/4" size, the cutting edge should align approximately with the eleven o’clock position; if it is 1/2" size, it should align approximately with the ten o’clock position; if it is 1/4" size, or larger, it should align approximately with the nine o’clock position.

The projecting portion of the bit then is placed upon the bit in parallel relation to the axis of the apex 30, with the bottom plate 14 of the bit holder resting upon the inner end of the adjustment screw 42 and the forward end of the bit abutting the grinding wheel. While maintaining this contact, and also while maintaining the bit holder against the inner end of the adjustment screw 42, the bit holder is moved forward along the bit until its forward end is spaced rearward from the rear end of the bit support member 28, by a distance equal to the desired length to be ground from the tip of the bit. The wing nuts 20 then are tightened down to secure the bit firmly to the holder.

The bit then is replaced upon the bit support member 28, as before, with the holder resting upon the inner end of the adjustment screw 42 and the support member rotated to its normal limit of counterclockwise rotation, but with the forward end of the holder spaced from the rearward end of the bit. The holder then is fed forward, bringing the tip of the bit into contact with the rotating grinding wheel. The holder is moved progressively forward as metal is ground from the tip of the bit, until the holder abuts the rearward end of the support member (FIGS. 1 and 2). Therupon downward pressure is exerted on the bit holder to rotate the latter and the bit and support member clockwise about the axis of the pivot rod extensions (FIG. 3). This rotation is accomplished by simultaneous rotation of the bit and holder on the common longitudinal axis of the bit and holder seat, by virtue of the engagement of the inner end of the adjustment screw 42 with the bit holder plate 14 laterally outward from said longitudinal axis. This axial rotation of the bit effects grinding of the surface 48 of the bit trailing the cutting edge 46, as will be apparent.

It is to be noted from FIGS. 2 and 3 of the drawing that the apex 30 of the support member 28 and the longitudinal axis of the bit are positioned below the transversely disposed axis of the pivot pin 32 when the support member is in its initial position, i.e. at its normal limit of counterclockwise rotation. Accordingly, as the support member is rotated counterclockwise from this initial position, the tip end of the bit is moved arcuately upward and forward toward the grinding wheel. This arcuate movement, together with the simultaneous axial rotation of the bit, effects grinding of the surface 48 of the bit trailing the cutting edge 46 in a rearward helical path. The tip of the cutting edge thus is provided with an arcuate, relieved surface which, as is well known, is necessary for proper cutting performance of the bit.

Having thus sharpened and properly contoured one-half segment of the cutting tip of the bit, the assembly of bit and holder is removed from the support member 28, rotated 180° and replaced upon the support member, and the foregoing sequence repeated to effect sharpening and contouring of the other half of the bit.

It will be understood that the sharpening procedure may be conducted by successive grindings on alternate half segments of the bit, rather than completing one segment before starting the other. This is desirable particularly when a considerable amount of the bit is to be ground away. It may be desirable, further, during such successive grindings, to rotate the bit slightly on its longitudinal axis to prevent the initial formation of a flat grind. It will be apparent to those skilled in the art that various changes may be made in the size, shape and arrangement of parts described hereinbefore. For example, the axis of the pivot pins 32 may be disposed below the apex 30 of the bit support member 28. In such instance, it will be understood that the adjustable abutment screw 42 will be positioned to engage the upper surface of the top plate 12 of the bit holder and that the sharpening operation will be performed by rotating the support member and the mounted assembly of bit and holder counterclockwise from an initial position of maximum clockwise rotation of the support member. The illustrated arrangement is preferred since it facilitates initial rotational adjustment of the bit to conform its cutting edge 46 to the working surface 44 of the grinding wheel.

The bit holder and bit support member may take various structural forms other than those illustrated. Still other features may be modified, as desired, all without departing from the spirit of this invention and the scope of the appended claims.

Having now described my invention and the manner in which it may be used, what I claim as new and desire to secure by Letters Patent is:

1. A drill bit sharpening jig, comprising
   (a) an upstanding base member adapted to be mounted adjacent a grinding wheel,
   (b) a drill bit support member having guide means for supporting a drill bit parallel to the axis of said guide means,
   (c) pivot means interengaging the base member and bit support member for pivoting the latter relative to the base member on an axis substantially normal to the axis of said guide means,
   (d) a drill bit holder independent of the base member and support member,
   (e) seat means on the holder for securing a drill bit releasably to the holder with the cutting end portion of the bit projecting from the forward end of the holder coaxial with the seat means for support by the guide means,
   (f) the support member and holder having confronting surfaces arranged for mutual abutment for limiting the extent of forward movement of a drill bit relative to a grinding wheel, and
   (g) abutment means on the base member arranged to engage the drill bit holder laterally from the axis of said seat means during rotation of the holder on the axis of the pivot means, whereby to cause the holder and drill bit to rotate on the axis of said seat means.

2. The drill bit sharpening jig of claim 1 wherein the independent drill bit holder comprises
   (a) a pair of plates,
   (b) screw means interconnecting the pair of plates releasably for moving them toward each other for gripping a drill bit therebetween, and
   (c) the seat means comprises an elongated outwardly offset portion of each plate.
4. The drill bit sharpening jig of claim 1 wherein the axis of the pivot means is disposed radially upward from the axis of the guide means.

5. The drill bit sharpening jig of claim 1 wherein the support member comprises a V-shaped member arranged with its apex directed downward and the axis of the pivot means is disposed above and substantially normal to the axis of said apex.

6. The drill bit sharpening jig of claim 1 wherein the abutment means is adjustable laterally for varying the degree of axial rotation of the independent drill bit holder.

7. The drill bit sharpening jig of claim 1 including stop means on the base member arranged for engagement by the support member for limiting rotation of the latter in one direction about said pivot means.

8. The drill bit sharpening jig of claim 7 including resilient means interengaging the base member and the support member and urging rotation of the latter toward said stop means.

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