ADJUSTABLE CHAMFERING TOOL

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ABSTRACT
A chamfering tool is disclosed having adjustable locking means to hold in a selected position on a twist drill. The chamfering tool has a set screw which is tightened to hold it in place, and locking means is a collar which is then slid down onto the top of the chamfering tool. The collar has a radial set screw which is tightened to engage a flute surface of the drill. That causes the collar to cant in such a way as to lock the collar to the drill, and a second set screw is then tightened to hold the collar in its canted position.

7 Claims, 5 Drawing Figures
ADJUSTABLE CHAMFERING TOOL

This invention relates to chamfering tools and the like, and particularly to adjustable locking means in combination with drills and the like.

An object of this invention is to provide improved means for chamfering holes. A further object is to provide improved apparatus for enlarging holes while they are being drilled. A further object is to provide apparatus that can perform either chamfering or enlarging simultaneously with other operations. Another object is to provide for the above apparatus which can be adjusted in position with respect to drill depth. A further object is to provide a chamfering apparatus which can be sharpened easily. A further object is to provide an adjustable apparatus for use on drills or the like which maintains a rigid predetermined position when subjected to vibration and longitudinal force. A further object is to provide for the above with apparatus which is efficient and dependable, and which is adaptable to various conditions of operation and use. These and other objects will in part be obvious and in part pointed out below.

In the drawings:

FIG. 1 is a partially sectioned side elevation of one embodiment of the invention.

FIG. 2 is similar to FIG. 1, but shows the tool rotated 90°.

FIGS. 3 and 5 are sectional views on the lines 3—3 5—5, respectively, of FIG. 1, and

FIG. 4 is a sectional view on the line 4—4 of FIG. 2.

Referring to FIGS. 1 and 2 of the drawings, a standard double fluted drill 10 has mounted upon it a chamfering bit 14 and a retaining collar 12. Chamfering bit 14 is a machined steel cylinder with a flat top surface 13 which is perpendicular to the longitudinal axis of the bit. The bottom of the bit is cut out on two opposite sides, leaving two portions 27 and 29 having surfaces 26 and 28. As shown in FIG. 2 at the two sides or portion 27, surfaces 26 and 28 are at an angle of 50° and they are joined by a rounded surface. Portion 29 (FIG. 1) is similarly shaped, but has a cutter portion 30 which extends downwardly and accurately below the adjacent portion of surface 26. Cutter portion 30 has a cutting edge 22 which is at the proper position and angle with respect to drill 10 to cut the workpiece and chamfer the hole being drilled.

The internal diameter of the main portion of bit 14 is slightly larger than the diameter of the drill margins 24 and 25. However, the internal radius of cutter portion 30 is less than the diameter of the drill margins, but slightly greater than the external diameter of the drill lands 32a and 32b (See FIG. 5). The relationship is such that the internal surface 31 of the cutter portion 30 rides snugly on the drill land 32a. With the chamfer bit positioned as shown in FIG. 1 and 5, the leading edge 33 of surface 31 is in trailing relationship with respect to the adjacent margin 24 and is at a lesser radius. Hence, cutting edge 22 extends from land 32a at a lesser diameter than margin 24 and radially outwardly and at the proper angle to chamfer the hole produced by the drill 10.

A set screw 16 is threadably received in a tapped hole in the bit directly above portion 27, and it lightly engages the surface 35 of the web of the drill as shown in FIG. 3. As shown in FIG. 1, wherein the axis of the drill is vertical, the axis of screw 16 is at an angle of the order of 30° from the horizontal. However, the screw axis is not in a radial plane but is at the angle shown in FIG. 3. The tightening of that position, screw 16 directs cutter extension 30 radially inwardly and somewhat upwardly so that surface 31 is held against the adjacent land surface 32. Hence, edge 33 is held in the optimum cutting position in trailing relationship with respect to the adjacent margin 24.

Retaining collar 12 is a toroidal-shaped steel ring having a flat bottom surface 44, concentric cylindrical straight sides 38 and 39 and a beveled top surface 40. The internal diameter of this collar is slightly larger than the external diameters of the drill margins 24 and 25. Two screws 18 and 20 are threadably received in tapped holes in the collar 12, screw 18 (See FIG. 4) extending into the drill flute and contacting surface 35 of the drill near the center of its web. Screw 18 has its axis along a radius of the collar and therefore is substantial radial to the axis of the drill. Screw 20 has its axis perpendicular to the adjacent area of the top surface 40 of the collar. Hence, while screw 20 is generally vertical, it extends at an angle radially inwardly and rests against surface 13 of bit 14.

In assembling the components as shown in the drawings, first the screws are backed off from the respective positions shown. Collar 12 is then slid onto the drill, with the end of screw 18 passing into the flute with the surface 35. Bit 14 is then slid onto the drill in a similar manner with screw 16 passing up along the same flute. With that relative relationship, cutter extension 30 moves along the drill and land 32a in trailing relationship with respect to the adjacent margin 24 (See FIG. 5). Bit 14 is then adjusted to the desired position upon the drill and screw 16 is tightened. With bit 14 thus located, collar 12 is slid down onto the top of the bit, with surface 34 resting on the top surface 13 of the bit, and the collar is held manually in that position while screw 18 is tightened. Even though the collar is held firmly, the tightening of screw 18 causes the collar to cant or twist slightly with respect to the drill axis as shown in the drawings, with one side of the collar moved upwardly away from surface 13 of the bit and the opposite side of the collar pressed tightly against surface 13 on the bit. The collar assumes that canted position because of the forces created by screw 18 between the collar and the drill.

The canting of the collar is generally about the axis of screw 18 so that the point where the collar is spaced furthest from surface 13 is spaced at an angle of the order of 90° around the collar axis from screw 18. That canting of the collar is shown at the top edge (at the left in FIG. 1) of the inner cylindrical surface 38 of the collar to be pushed tightly against the drill Margin 24 (See also FIG. 4), and the bottom edge (at the right in FIG. 1) of cylindrical surface 36 is pushed tightly against margin 25. Screw 20 is then tightened to the position shown in FIG. 1 so that it presses upon surface 13 and locks the collar in the canted position with respect to the drill and bit 14. The drilling and chamfering unit is then used to drill and chamfer the workpieces.

Bit 14 is positioned at a predetermined distance from the drill tip so that when the drill moves downwardly it produces the desired hole, and cutter portion 30 produces the chamfer at the top of the hole. During the chamfering, bit 14 is held securely from axial movement upon the drill. Screw 20 holds collar 12 in its locked position, and the upward forces are transmitted from the bit to the collar at one side through screw 20 and at the other side from surface 13 directly to surface 34. That is, the forces act to hold the collar in this canted position and insure that the collar remains locked to the drill. Bit 14 may be moved downwardly on the drill or removed by merely loosening screw 16, and collar 12 may then be removed by loosening screw 18. However, there is a tendency for the collar to be held in the canted position but when screw 18 is loosened, a downward force can be applied at the zone of screw 20 to snap the collar loose. Alternative to moving the bit downwardly, both of screws 18 and 20 can be loosened and the collar freed by pushing downwardly at screw 20. Bit 14 can then be moved upwardly by loosening screw 16.

It has been found that the specific relationship between the three screws and between each of them and the drill and bit gives very satisfactory results. When sharpening of the drill and chamfering bit is required, the assembly procedure can be followed; but now the bottom surface 44 of cutter portion 30 is aligned with the bottom surface 46 of the drill. The drill and chamfering bit are then ground simultaneously in the same plane, and that sharpens edge 22 and the edge of the margin. If a chamfer angle other than the drill point angle is required, it is only necessary to position bit 14 so that cutter portion protrudes beyond the tip of drill 10. In the position any angle within the capability of the drill grinder can be created at the cutting edge 22.

There are many advantages over the prior art in utilization of the embodiment of this invention described above. The adjustable chamfer bit offers decided advantages over step drills in that the position of the chamfer bit can be easily changed to...
meet different operational requirements. Also, the operational life of the adjustable chamfer bit is much longer because of the resharpened method utilized. Regrinding of the second cutting edge on a step drill almost always results in nicking the margins on the smaller diameter portion, thus destroying its usefulness after only a few resharpenings. The present invention also offers decided advantages over other proposed constructions for adjustable chamfer bits, particularly in that during operation the bit does not creep on the drill in the present embodiment, since the wedged retaining collar provides an extremely stable support for the bit.

It is understood that there are other embodiments of the invention, for example, involving other types of drills and the like. Also, the construction can be modified to adapt it to various conditions of operation and use.

1. A tool comprising, a fluted rotary cutting tool having lands and adjacent margins adapted to form a hole in a workpiece, a chamfering unit or the like, adjustable mounted on said cutting tool having a radial cutting portion extending inwardly of said margins for engagement with an adjacent one of said lands, and locking means cantedly mounted on said cutting tool for preventing relative axial movement between said cutting tool and said chamfering unit.

2. The chamfering tool as defined in claim 1 wherein said locking means comprises a toroidal collar surrounding said rotary tool including an inner annular wall having generally diagonally opposed edges cantedly engaged with the margins of said rotary tool, and wherein said chamfering unit is mounted adjacent said collar and in engagement therewith, whereby movement of said collar and said chamfering unit axially with respect to said rotary tool is prevented by the canted engagement of said collar and margins.

3. The chamfering tool as defined in claim 2, including a generally radially extending set screw threadably received in said collar and adapted to engage a fluted portion of said rotary tool, whereby said collar is canted with respect to the longitudinal axis of said rotary tool.

4. The chamfering tool as defined in claim 3 wherein said collar is canted with respect to the top surface of said chamfering unit and engages said top surface at one portion thereof, said collar further including a generally vertically extending set screw adapted to engage said top surface at a point diametrically opposed to said one portion to maintain said canted relation during formation of said hole.

5. The chamfering tool as defined in claim 2 wherein said chamfering unit is adjustably mounted by means of a removable set screw adapted to engage a fluted portion of said tool along a line offset from a radial plane and at an acute angle to the horizontal plane.

6. A chamfering tool or the like comprising, a fluted longitudinally extending drill bit having lands and adjacent margins adapted to form a hole in a workpiece, an annular retaining collar surrounding said bit, a radially extending set screw threadably received in said collar and adapted to engage a fluted portion of said bit to mount said collar on said bit in a canted position with respect to the longitudinal axis of said bit whereby said collar is locked in position relative to said axis by the engaged measures of the walls of its inner bore with said margins, and a chamfering unit adjustable mounted on said bit and having a rear end remote from the free end of said bit, in axial contact with a portion of said collar whereby said collar prevents relative axial movement between said bit and said unit during formation of said hole.

7. Apparatus for preventing axial displacement of an accessory cutting unit on a rotary tool comprising, a double fluted longitudinally extending rotary drill bit having lands and adjacent margin portions, a toroidal collar having an inner bore in which said bit is positioned, means for canting said collar with respect to the longitudinal axis of said bit including a single radially extending set screw threadably engaged with said collar and adapted to contact the surface of one of the flutes on said bit whereby the forces created by the contact of said screw and said surface of the flute cant said collar with respect to the longitudinal axis of the bit and lock the collar in a canted position against the margin portions by the forced engagement of the walls of the inner bore of the collar with said margins, and a generally longitudinally extending set screw threadably engaged with said collar and adapted to engage said accessory unit to lock said collar in said canted position with respect to said bit and said unit.