United States Patent

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[54] ADJUSTABLE CHAMFERING TOOL

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[52] **U.S. Cl.**.....**408/186,** 408/193, 408/225

[51] **Int. Cl.**.....**B23b 51/16**

[58] **Field of Search** 77/65, 66, 73.5; 145/123, 125, 145/130; 408/186, 193, 225

[56] **References Cited**

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[57] **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

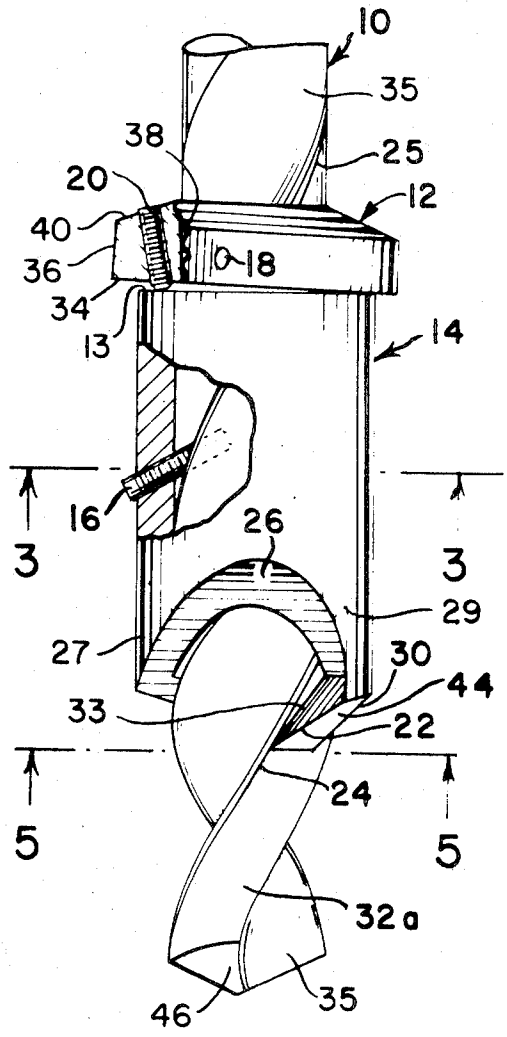
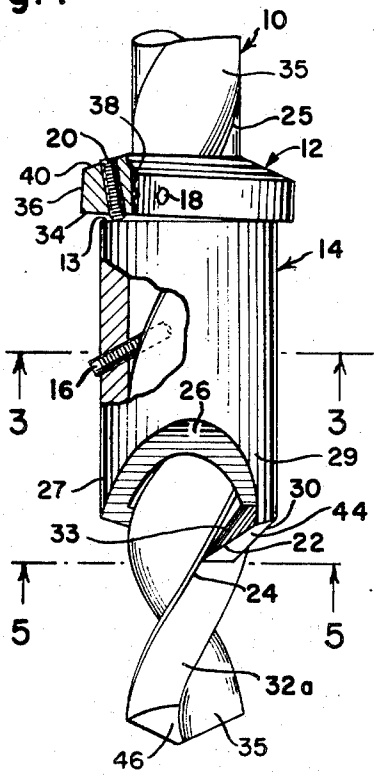


Fig. 1



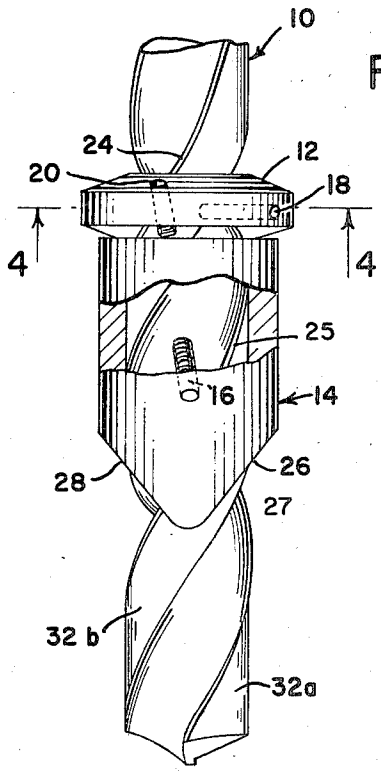


Fig. 2

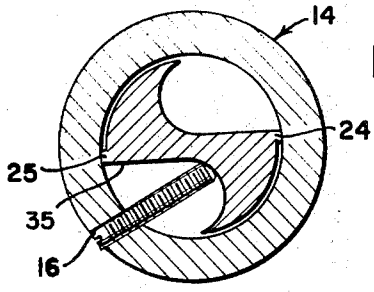


Fig. 3

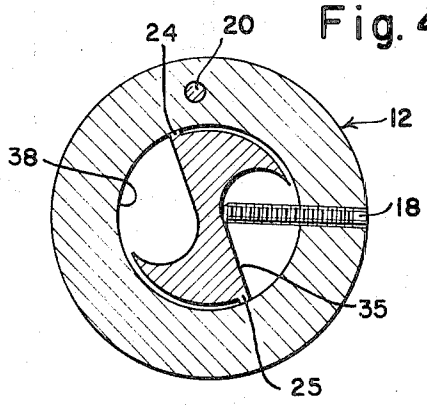


Fig. 4

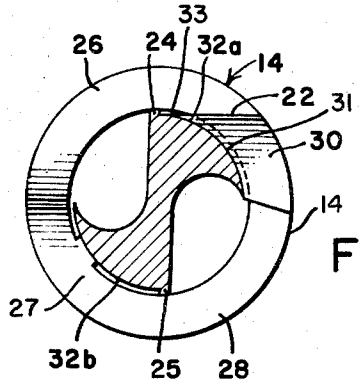


Fig. 5

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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 with 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 arcuately 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 **32***a* and **32***b* (See FIG. 5). The relationship is such that the internal surface **31** of the cutter portion **30** rides snugly on the drill land **32***a*. With the chamfer bit positioned as shown (FIGS. 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 **32***a* at a lesser diameter than margin **24** and radially outwardly and at the proper angle to chamfer the hole produced by the drill.

A set screw **16** is threadably received in a tapped hole in the bit directly above portion **27**, and it tightly 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. When tightened in that position, screw **16** draws 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 **34**, concentric cylindrical straight sides **36** and **38** 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 **32***a* 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 foreces 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 causes 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 typed of drills and the like. Also, the construction can be modified to adapt it to various conditions of operation and use.

I claim:

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 adjustably 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 forced engagement of the walls of its inner bore with said margins, and a chamfering unit adjustably 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 threadable 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.

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