Sept. 20, 1971 D. L. BETHKE 3,606,566

BUSHING FOR DRILL JIGS AND THE LIKE

Filed June 23, 1969

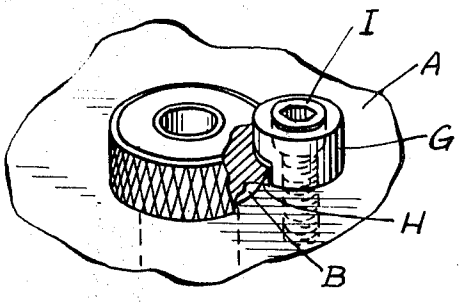


Fig. 1.

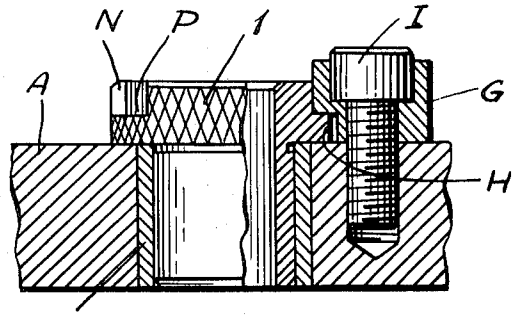


Fig. 2.

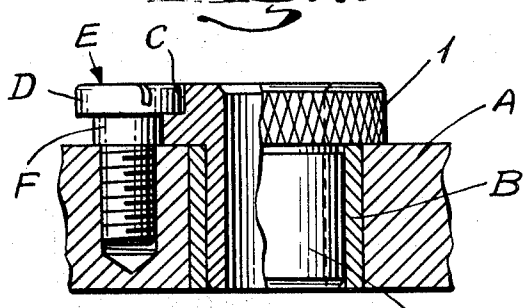


Fig. 4.

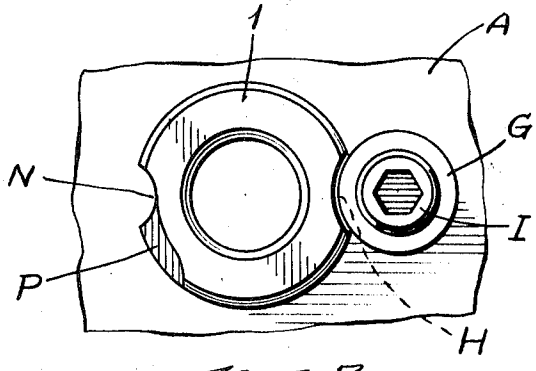


Fig. 3.

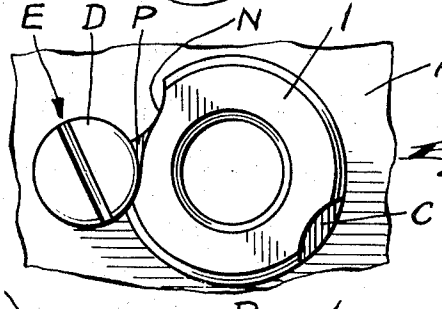


Fig. 5.

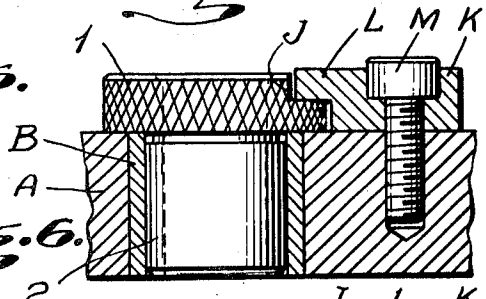


Fig. 6.

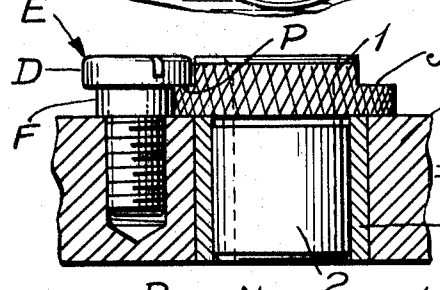


Fig. 8.

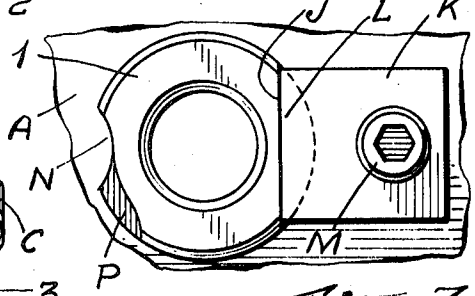


Fig. 7.

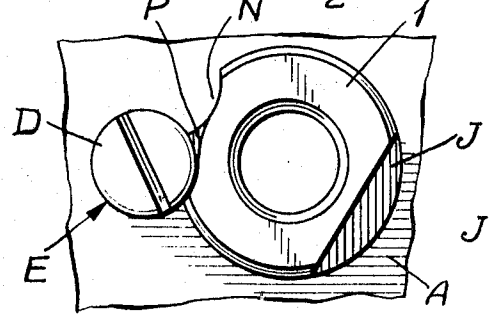


Fig. 9.

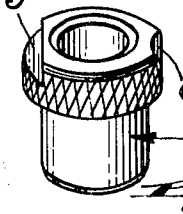
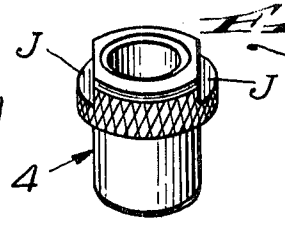


Fig. 10.

Fig. 11.



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BUSHING FOR DRILL JIGS AND THE LIKE

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Int. Cl. B23b 49/02
U.S. Cl. 408—241 1 Claim

ABSTRACT OF THE DISCLOSURE

A guiding bushing for drills and reamers and more particularly to an improved form of interchangeable bushing which may be readily replaced to accommodate different sizes of drills in a single location or to provide a means for interchange to accommodate wear. The holding means is optionally arrangeable for either contingency.

BACKGROUND OF THE INVENTION

(I) Field of the invention

The field of the invention is that of bushings for drill jigs and the like for guiding the drills, reamers and other tools in the performance of their operations on a workpiece.

(II) Prior art

The prior art known to applicant includes the catalog of United Drill Bushing Corp. entitled "Precision Drill Jig Bushings and Tooling Accessories," first edition, copyright 1964.

SUMMARY

In manufacturing operations involving drilling and reaming, the workpieces are held in position in drill jigs or fixtures and the drills and reamers are guided into the desired positions by bushings formed of hardened steel or other hard materials. Frequently in those cases in which a series of bores of different diameters are formed along a common axial line, the guidance is achieved by mounting the various bushings for the different diameters of drills, etc., interchangeably in a large bushing known as a "liner," the bushing being held by being formed with a manually releasable locking means permitting ready insertion and removal of bushings.

Another situation is that of rapid interchange of bushings of the same size in a supporting liner whenever a bushing becomes so worn as not to provide accurate guidance to the drill or other tools guided thereby. In such cases, the bushing is again removably mounted in a liner but is held against removal by a releasable clamp means. The capacity for quick interchangeability is especially important when a failure of a tool requiring bushing replacement serves to halt a line of production machinery.

The object of the present invention is to provide a bushing and securing means which, per se, may be adapted to either of these usages as occasion may require. Another object of the invention is to provide means whereby the foregoing objective may be achieved simply and without adding the cost of manufacture. Other objects and advantages will appear as the description of certain presently preferred embodiments of the invention proceeds in the specification following.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which illustrate certain presently preferred embodiments of the invention particularly described in the specification following:

FIG. 1 is a top perspective view of a surface of a jig component in which a prior art form of renewable bushing is incorporated;

FIG. 2 is a sectional view to a jig component in which a bushing constituting a first presently preferred embodiment of the invention is installed, the section being taken generally in the plane of the axial line of the liner bushing and the bushing holding means and a portion only of the renewable bushing being shown in section in that plane;

FIG. 3 is a top plan view of the embodiment shown in FIG. 2;

FIG. 4 is a sectional view similar to FIG. 2 but showing the alternative holding means employed when that first embodiment is used as a so-called slip renewable bushing;

FIG. 5 is a top plan view of the embodiment employed as shown in FIG. 4;

FIG. 6 is a sectional view generally like FIG. 2, but showing a bushing constituting a second embodiment of the invention and secured by one of the complementary holding means;

FIG. 7 is a top plan view of the embodiment shown in FIG. 6 as arranged in that figure;

FIG. 8 is a sectional view corresponding generally to FIG. 4 showing the holding means of FIG. 4 applied to the second embodiment of the invention;

FIG. 9 is a top plan view of the embodiment shown as arranged in FIG. 8; and

FIGS. 10 and 11 are perspective views of bushings constituting third and fourth embodiments of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

Referring to the drawings;

FIG. I shows, partly in section, a body member A, such as a portion of a drill jig in which a hardened liner bushing B is press fitted for reception of renewable bushings. As previously mentioned, renewable or replaceable drill bushings are employed for two general situations, viz, (a) a convenient mode of replacement in the event of wear on the inside diameter of bushings and (b) a mode of quickly affording guidance for a plurality of drills, counterbores, reamers, etc., in a formation of a hole having various diameters, wherefore the need is for quick interchangeability of the bushing to accommodate the various diameters of the tools employed. So-called renewable bushings are of two general types, viz, the fixed renewable bushings and slip renewable bushings. These bushings are all formed with cylindrical body portions closely slideably fitting the liner bushings with which they are to be used and with head portions of a greater diameter than the body portions 2. Each bushing includes an axial bore extending therethrough of a diameter which is operatively complementary to the drill or other tool to be guided by the bushing. Under present practice, the head portions of the bushings are variously recessed to be engaged by one only of the various types of holding means mounted on the body member of the jig in which the liner bushing B is mounted. One form of holding means comprises the formation of a concave recess C in the periphery of the bushing head affording clearance for the head D of a shoulder screw E, the depth of the recess parallel to the axis of the bushing being preferably such as to leave a portion of the periphery of the bushing which is a few thousandths of an inch in length greater than the length of the body F of the shoulder screw so that upon tightening the screw, the bushing is tightly clamped to the surface of the jig member A.

Another mode of securing a bushing having the same clearance recess C is to provide a collar G of about the same diameter as the head of the screw E with a concave recess H which is complementary to the periphery of the head of the bushing thus allowing the upper end of the

collar to project into the recess C with the bottom of the recess H engaging the bottom or ledge or the recess C. A screw I, extending through the center of the collar and engaging a shoulder formed in the collar serves both to clamp the collar against the jig member surface and the bushing against the end of the liner. This construction is usually preferred in the case of bushings of exceptionally large size, say, for drills and the like of ¾" diameter and up.

Still another mode of securing a fixed renewable bushing in the liner is to provide at least one sectoral recess J in the outer end face of a bushing head and to employ a clamp block K, having a forwardly projecting ledge portion L, to overlie the ledge portion of the recess J and by reason of a securing screw M extending through the block to secure the bushing in the liner and the clamp against the jig member A.

The so-called slip renewable bushings are provided with a concave recess N in the peripheral face of the head portion having a radial dimension and depth equal to the radial dimension of the head of the shoulder screw or of a collar like the collar G and said recess is provided with a lateral extension defined by a back wall which is parallel to the peripheral face of the head portion and which provides a lateral ledge portion of a thickness which is a few thousandths of an inch less than the axial length of the screw body F or of the corresponding depth of the recess H formed in the collar G. The screw or collar remains permanently fixed to the jig member and the bushings are removed and replaced by inserting them and removing them while the recess N is aligned with the head of the screw or with the body of the collar G. After a bushing is installed, it is rotated (usually clockwise) to bring the ledge P beneath the head of the screw or beneath the ledge surface of recess H of the collar, thus, holding the bushing against endwise movement when it is rotated to that position.

All of the foregoing arrangements are those employed in the drill jig and allied arts and the manufacture of standardized bushings and bushing securing means such as described is well known as shown for example in the above-mentioned catalog.

Each of the various holding devices has its own area of usefulness but not infrequently, a user needing to replace a bushing in a jig or fixture will find that while the desired size may be in stock, those available are not suited to the securing means of that particular jig or fixture. Moreover, these various holding means require that the bushing manufacturer carry at least four bushings for each length and drill size, one for bushings not requiring holding means and one each for each of the holding means above described. This, of course, makes an unduly large inventory.

The present invention takes these considerations into account and proposes two different head forms for renewable bushings, instead of the three heretofore required. According to this invention, each bushing head 1 would be provided at one point in its periphery with the concave recess N and the laterally extending ledge P enabling every such bushing to be used as a slip renewable bushing. Additionally, each of the heads of a first group of these bushings would be provided at another point in its periphery with a concave recess corresponding to the recess C above described, while the heads of a second group of these bushings having the recesses N and ledges P would be provided at another point in the periphery thereof with a sectoral recess such as the recess J above referred to. Thus, each bushing would be available for

use either as a slip renewable bushing or as a fixed renewable bushing. Moreover, if desired, on all bushings except perhaps, the very smallest sizes, the bushing head must be provided with all three recesses so that the one bushing would be truly universal for the standard means commonly employed for securing either slip renewable bushings or fixed renewable bushings.

FIGS. 10 and 11 illustrate the fact that the heads of the bushings for fixed renewable use only may be provided, as shown by the bushing 3 in FIG. 10, with one each of the recesses of the types previously indicated as C and J or with a pair of recesses of either of these forms as suggested by FIG. 11 in which the head of the bushing 4 is provided with a pair of recesses corresponding to the sectoral recess J previously described. Since this figure suggests the use of a pair of the C type recesses also, it has not been thought necessary to illustrate that, now obvious, modification.

In summation, the foregoing invention makes it possible for the user of drill bushings, particularly one who uses the bushings in quantity, to carry a lesser number of bushings in stock with assurance that they can be used at any point at which they are required. It further reduces the number of items which a manufacturer of drill bushings must keep in stock by a least one-third.

While in the foregoing specification, there have been described certain presently preferred embodiments of the invention, the invention is not to be deemed to be limited to the precise details thus disclosed by way of example and it will be understood that the invention includes as well all such changes and modifications as shall come within the purview of the appended claim.

I claim:

1. A bushing having a bore extending therethrough for guiding a tool operative in the formation of a hole in a workpiece held in a jig means on which said bushing is removably mounted; said bushing comprising a cylindrical body portion receivable in a hole in the jig means and terminating at the tool entrant end thereof in a head portion of a greater diameter than said body portion, a first concave recess formed in the periphery of said head portion and a second recess formed in the periphery of said head portion at a point other than adjacent to said first concave recess, said second recess extending from the tool entrant end face of said bushing to a point spaced from the end face of said head portion which is adjacent to said body portion with resultant formation of a ledge extending in a direction normal to the axial line of said body portion, and a second concave recess extending between the faces forming the end surfaces of said head portion, said second concave recess abutting one end of said ledge.

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U.S. Cl. X.R.

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Disclaimer

3,606,566.—*Dale L. Bethke*, West Covina, Calif. BUSHING FOR DRILL JIGS AND THE LIKE. Patent dated Sept. 20, 1971. Disclaimer filed Mar. 8, 1972, by the inventor.

Hereby enter this disclaimer to claim 1 of said patent.

[*Official Gazette June 13, 1972.*]