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CODED DRILL BUSHING
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2,915,926

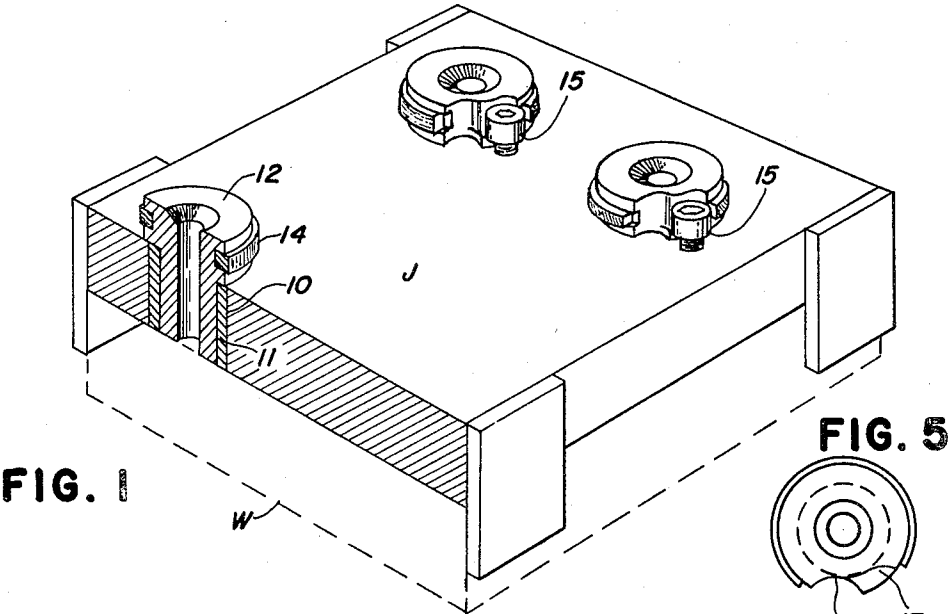


FIG. 1

FIG. 5

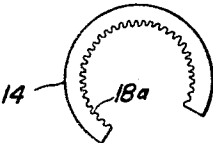


FIG. 7

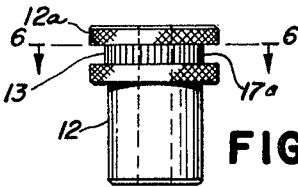


FIG. 4

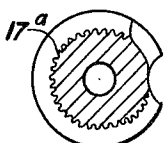


FIG. 6

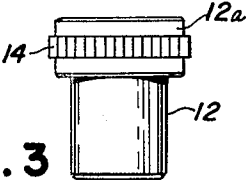


FIG. 3

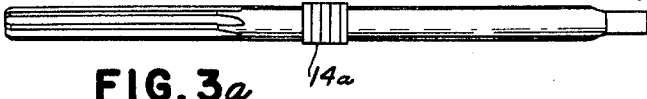


FIG. 3a

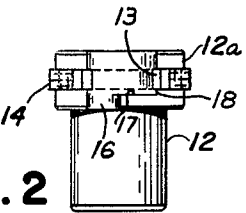


FIG. 2

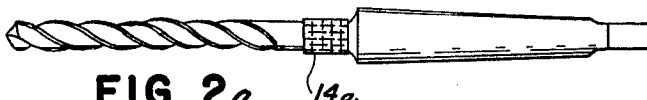


FIG. 2a

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CODED DRILL BUSHING

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2 Claims. (Cl. 77—62)

This invention relates to the metal working art and more particularly to drilling, reaming, and other hole-forming operations. In its finer aspects the invention concerns drill bushings especially, but not exclusively, of the slip-type and its primary aim is to avoid the confusion and unnecessary waste of time that is currently occasioned in matching tools with the bushings and in inserting and removing the bushings.

The purpose and function of a drill bushing is to control and guide the cutting edges of a drill, reamer, tap, etc. true to a certain location. Customarily the bushings are inserted in a fixture, jig, or plate that is previously located upon and clamped to the workpiece. One or a number of bushings may be placed in different locations in any one fixture with the result that all the holes made or worked upon in the workpieces will have been located by the one master and all will be in exact correspondence piece-for-piece.

More frequently than not, however, there is need to perform several operations on the one hole, for example, drilling (small), drilling (large), reaming, counterboring, tapping, etc., and the need arises for removable and interchangeable bushings. By interchangeable is meant, that for a given range of hole sizes in a bushing the outside diameter of the bushing is a constant or a standard and a hole provided in a jig-plate or fixture to receive such a standard bushing will receive and accurately center any other bushing of the same standard. In the ordinary course of tooling a piece it may be necessary therefore to change bushings several times, with corresponding changes in tools, before the hole in the piece is finished, hence the standardization or grouping of O.D. bushing sizes indicated.

In many instances girl operators are employed in the production line to operate the machines and the frequent extracting, changing, and inserting of bushings has produced sore fingers and objectionable calluses. This invention further aims to provide not only an improved method of coding the bushings and coacting tools but a means of coding that facilitates making the changes and inherently affords protection to the fingers of the operator.

A preferred manner of carrying out these and other objectives later to be mentioned consists in color coding the bushings and the respective tools used therewith. By so doing it becomes a relatively simple task to select from a group of bushings and assorted tools those that are to be matched and used together. Similarly a pre-selected sequence of tooling operations is quickly learned and followed by using the coded bushings and tools in a planned color sequence. The color coding may consist of the insertion in the exposed head portion of a bushing of a non-soluble die or band of color such as a permanently colored section of plastic or rubber. Preferably the color section is placed in the vertical side of the bushing that receives minimum wear and stays relatively free of score marks caused by spiraling chips.

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Other objects and advantages will be in part indicated in the following description and in part rendered apparent therefrom in connection with the annexed drawings.

To enable others skilled in the art so fully to apprehend the underlying features hereof that they may embody the same in the various ways contemplated by this invention, drawings depicting a preferred typical construction have been annexed as parts of this disclosure and, in such drawings, like characters of reference denote corresponding parts throughout all the views, of which:

Fig. 1 of the drawings represents jig plate having several of the improved bushings inserted therein.

Figs. 2 and 3 are elevational views of the bushings of this invention, color coded, in correspondence with the tools to be used therewith, namely a color-coded drill Fig. 2A and a color-coded reamer Fig. 3A.

Fig. 4 illustrates a preferred construction of a coded slip-bushing.

Fig. 5 is a plan view of the bushing illustrated in Fig. 4.

Fig. 6 is a sectional view through line 6—6 of Fig. 4.

Fig. 7 is a detail of a coding ring that may be used with the bushing.

Referring more particularly to Fig. 1, the member J represents a jig-plate that is suitably guided by and secured to the workpiece W indicated in dotted line. The jig-plate is accurately drilled and reamed at one or more locations according to the nature of the work to be performed on the workpiece, to provide holes 10 within which are located headless, press-fit bushings or liners 11. The inner bore of the press-fit bushing is customarily hardened and ground to receive and accurately locate the slip-renewable bushing 12. The slip bushings are preferably hardened and ground on their exteriors and slidingly fit into the bore of the liners 11. The hole size in the renewable bushing is such as may be required for the tool to be located and guided thereby and is special for a particular size of tool. For example, if the finished hole in the workpiece is to be reamed 0.250" dia. the bushing hole will be only a few tenths larger so that a 1.250" dia. reamer may be used therein. However, the drill used to initially make the hole in the workpiece will be approximately $\frac{1}{64}$ " smaller in diameter and the drill bushing a similar $\frac{1}{64}$ " smaller in hole size. The difference in hole size of the bushing for drilling and the bushing for reaming in the example given, is too small to be observed and distinguished with the naked eye and while the bushings are often stamped on their tops with the hole size, the stampings are not only small and barely discernable but often mutilated and scored, defying legibility. Similarly, the tools used with the bushings are usually stamped with their sizes, however, the stampings are small and due to wear and abuse are frequently illegible. Because of this a considerable portion of the operator's day is lost in matching up the various tools and bushings required for the job at hand.

The present invention proposes a practical solution to problems of that character and a preferred form consists in forming a groove 13 in the flanged head portion 12 of the bushing and inserting therein an identifying marker such as a segmental ring 14. The groove may be formed in the flange at the same time the head of the bushing is formed and no additional operation is necessary. The groove thus formed is adapted to receive the coding ring 14 which is of corresponding width.

Where the slip bushing is required to be clamped in place in the fixture as by means of a clamp screw 15 it is proposed to construct the coding ring 14 in the form of the segment that will extend more than half-way around, but less than a complete circle around the bushing so that a gap is left between its ends for the clamp

screw 15. As illustrated more clearly in Fig. 5 the periphery of the bushing is notched or relieved through, as at 16, to pass the head of the clamp screw and circumferentially relieved part way as at 17 to form a ledge upon which the head of the clamp screw seats. Such a notch and step not only permits the head of the clamp screw to remain below the top of the bushing during use, but forms a convenient means for quickly changing the bushing merely by loosening the clamp screw and manually twisting the bushing part way around until the through-notch 16 is aligned with the head of the screw whereupon axial movement of the bushing from the hole is possible. Another bushing or replacement is placed into the hole and twisted into clamping position in a similar manner.

To facilitate the handling and twisting operations the outer wall of the head flange on a bushing usually is roughened with a relatively coarse and deep knurl, the apices of the diamonds in the pattern being quite sharp and rough on the fingers. Accordingly, by constructing the coding ring 14 of a radial thickness that slightly exceeds the depth of the groove 13 so that its periphery slightly exceeds the outer diameter of the knurling, considerable protection to the fingers is had while not obliterating the function of the knurling that remains on the flange portion above and below the ring.

It is preferred also to form the groove 13 of less thickness than the thickness of the head flange of the clamp screw so that the flanged head does not slide into the groove. When so constructed the ledge 17 of the bushing will be slightly below the lower wall of the groove 13 and provide a shoulder 18 (Fig. 2) against which the screw head abuts. This shoulder 18 acts as a positive stop and limits the angular movement of the bushing. It will be further noted that by stopping the ends of the ring 14 short of the recess 16, 17 provided for the clamp screw, at one or both sides of the recess, a portion of the groove 13 is left exposed for the insertion of a pry-bar, to assist in extracting the bushing from the hole. Occasionally a slip-bushing will stick, and with the type of bushings heretofore used, had to be forcibly driven out from the under side. The present invention it will be seen permits stubborn bushings to be easily extracted from the top side of the jig.

Twisting or creeping of the coding ring around the bushing may be prevented in accordance with this invention by forming complementary interdigitating ribs or serrations on contacting surfaces of the ring and groove. A preferred form of interlock is illustrated in Figs. 6 and 7 which comprises the forming of axial ribs and grooves 17a in the bottom of the groove 13 in the head of the bushing and complementary ribs and grooves 18a on the inner surface of the ring 14. The ribs in the groove may be rolled in at the same time the outer knurl is applied using a stepped knurling wheel or wheels and adds little to the cost of manufacture. The ribs on the ring may

be formed during the molding thereof or by stamping, rolling, etc. while the coding member is in strip form.

Grooved bushings constructed as herein explained may of course be used without the coding ring since the grooving per se does not impair the functioning in any way. However, when the coding feature is required for a given operational sequence the colored ring is easily snapped into place in the groove. And as before indicated the interfitting serrations prevent the ring from creeping and from accidental dislodgement and the ring as a whole being preferably spring tensioned, locks tightly in place but is readily removable should a change in the color coding be desired.

The tools used with the respective bushings, two of which are represented in Figs. 2A and 3A, may be marked with a matching color band 14a. Colored-plastic adhesive tape has been found to be very distinctive and quite durable for this purpose.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can, by applying current knowledge, readily adapt it for various utilizations by retaining one or more of the features that, from the standpoint of the prior art, fairly constitute essential characteristics of either the generic or specific aspects of this invention and, therefore, such adaptations should be, and are intended to be, comprehended within the meaning and range of equivalency of the following claims.

Having thus revealed this invention, the following combinations and elements, or equivalents thereof are claimed by Letters Patent of the United States:

1. A renewable slip-bushing having a shank portion adapted to fit a hole in a fixture and a flanged head portion adapted to project above and overlie the fixture, said flanged head portion being exteriorly knurled to provide a grip, and said flanged head portion being formed with an annular groove in its exterior that divides the exterior knurling into two annular bands, and a ring-like section of colored material insertable into the groove formed in the head portion.

2. The combination of claim 1 in which the bottom of the groove formed into the head portion is serrated and in which the ring-like section of colored material is open-ended and also serrated on its inner surfaces, said serrations of the ring-like section and in the bottom of the groove being adapted to interlock.

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