Dec. 30, 1952 M. F. VAUGHAN 2,623,418

METHOD FOR MAKING WRENCH SOCKETS

Filed Oct. 20, 1948 2 SHEETS--SHEET 1

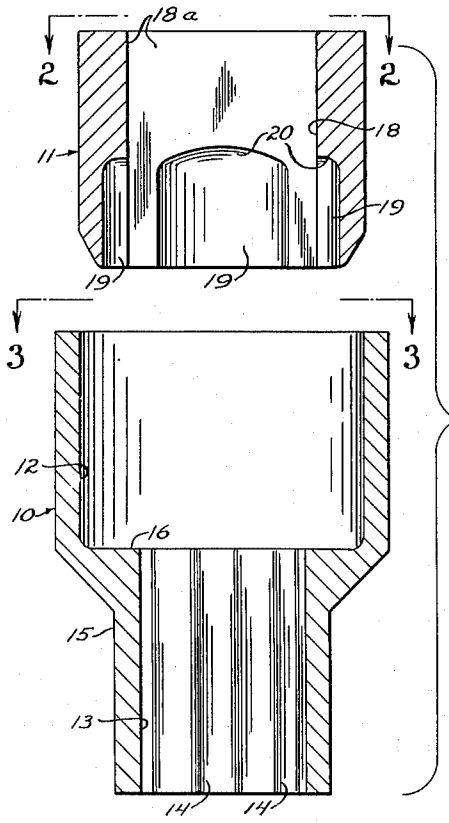


FIG. 1

FIG. 2

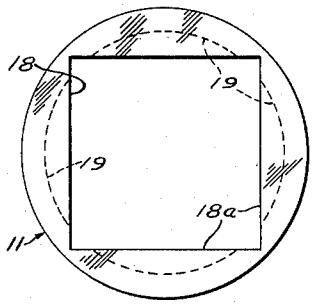


FIG. 3

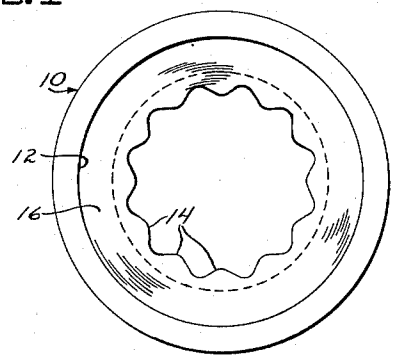
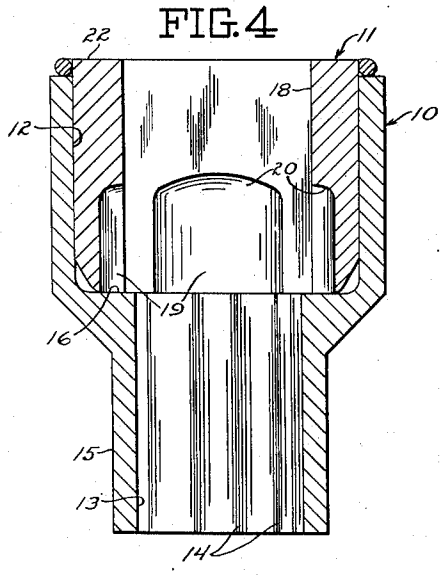


FIG. 4



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METHOD FOR MAKING WRENCH SOCKETS

Filed Oct. 20, 1948 2 SHEETS—SHEET 2

FIG. 5

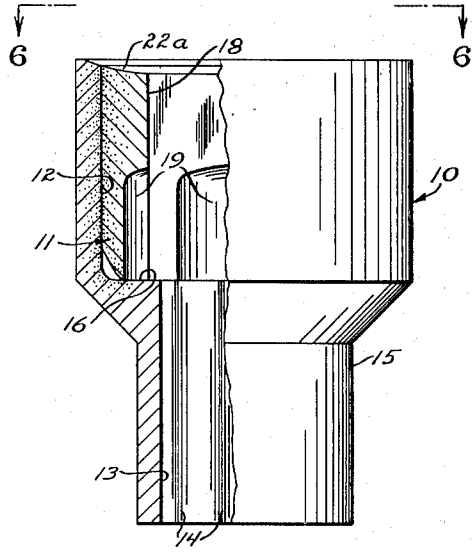


FIG. 6

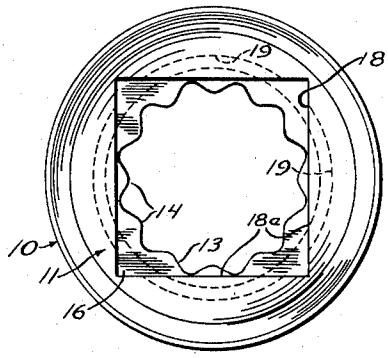


FIG. 7

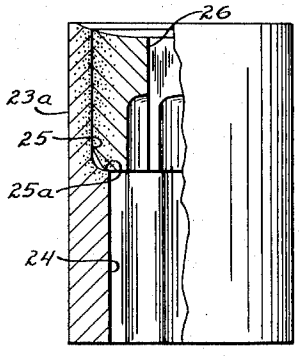
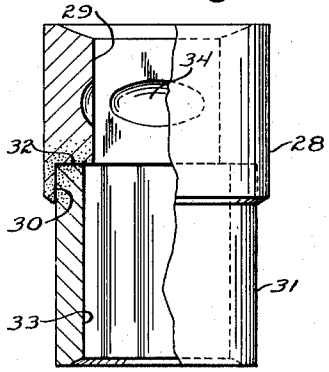


FIG. 8



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METHOD FOR MAKING WRENCH SOCKETS

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6 Claims. (Cl. 76—114)

1

This invention relates to wrench sockets and to a method for making the same.

Such wrench sockets have usually comprised a one-piece forged steel body, formed at one end with a serrated recess for receiving various types of nuts or bolt-heads of a particular general size, and a square recess at the other end for reception of a similarly shaped end of a turning tool. At least one flat side of the square recess was provided with a depression for reception of a spring-pressed detent on the end of the turning tool. Due to limiting factors incident to forging methods, however, forging of the opposite end recesses necessarily resulted in formation of an annular hump of stock in the wall of the body between the inner ends of the respective recesses, which in turn resulated in the body having to be that much longer than might otherwise be necessary, should the inner ends of the recesses coincide. Moreover, a wrench socket of relatively small size could not be provided with the detent depression on an inner flat side of the square recess, because of the impossibility of operating a cutting tool for that purpose.

One object of the present invention is to provide a wrench socket of the character described wherein the square turning-tool receiving recess may be extremely small and yet be provided with a recess for engagement of a spring-pressed detent of a turning tool.

Another object of the invention is to provide an improved plural part wrench socket, assembled as an integral unit, which will have durability comparable with that of a one-piece wrench socket.

Another object of the invention is to provide an improved wrench socket which lends itself to extremely economical production, and particularly by methods other than forging, such as by machining, boring, broaching, etc.

Another object of the invention is to provide an improved wrench socket construction and method for producing the same, wherein the number of production operations is substantially reduced as compared with forging one-piece wrench sockets, for example, the construction and method being particularly adapted for economical large-scale production.

Another object of the invention is to provide an improved wrench socket construction, wherein is eliminated the usual annular hump in the wall surface thereof between the inner ends of the opposite end recesses, and in which the serrated recess thereof may extend up to a common plane with the inner end of the turning-tool receiving

2

recess thereof, whereby the wrench socket may be of substantially reduced size as compared with prior forged sockets.

These and other objects of the invention will be manifest from the following brief description and the accompanying drawings.

Of the accompanying drawings:

Figure 1 is an exploded view, illustrating the parts, in vertical cross-section longitudinally therethrough, and on a greatly enlarged scale, of an improved wrench socket in accordance with the invention, the bottom part being the socket body and the upper part being an insert for the same.

Figures 2 and 3 are top plan views, on the same scale, of the insert and socket bodies, as viewed at 2—2 and 3—3, respectively, in Figure 1.

Figure 4 is a vertical cross-section, corresponding to Figure 1, illustrating the socket parts assembled as a unit for a subsequent operation thereon.

Figure 5 is a front elevation, partly broken away and in section to correspond in part to Figure 4, but illustrating the wrench socket in finished form.

Figure 6 is a top plan view of the completed socket, as viewed at 6—6 in Figure 5.

Figure 7 is a view similar to Figure 5, illustrating a completed wrench socket of different proportions but otherwise embodying the same features.

Figure 8 illustrates a modified form of the invention.

Referring particularly to Figures 1 to 3, the numeral 10 designates a wrench socket body, and the numeral 11 an insert for assembly with the same to produce a completed wrench socket (see Figure 5) in a manner to be described.

The body 10 is made from a length of cylindrical bar stock preferably of porous steel, provided with a cylindrical bore 12 extended longitudinally from one end of the body to approximately half the length thereof. A serrated aperture 13 is provided, as by means of a broaching tool, to extend longitudinally of the body from the other end thereof to communicate with bore 12, the serrations or points 14, 14 being predeterminately closely spaced peripherally of the aperture and extending for the full length thereof. These serrations or points, of which twelve are shown, are of the type adapted to engage the regularly spaced corners of a standard sized hexagonal nut or bolt head, corresponding to a standard size of wrench socket, received in the aperture in known manner of use of wrench sockets of the

type under consideration. For the particular proportionate sizes of wrench socket shown the body 10 may be reduced in diameter at 15, as by machining, that is, at the nut or bolt receiving end, to reduce the weight of the body as well as to facilitate the operation of the tool. In any case it is preferred that the serrated aperture 13 be substantially smaller in general cross-section than the bore 12, whereby an annular shoulder 16 is provided at the inner end of the bore.

The insert 11 may be made from a length of cylindrical bar stock of the same material as body 10, slightly longer than the depth of the bore 12 and having an outer diameter corresponding to the diameter of the bore, but allowing for a sliding fit. In some cases the cylindrical outer surface of the insert need not be finished other than as provided by the supplier of the stock. For facilitating insertion of the insert into engagement thereof with the shoulder 16, one end of the insert is chamfered to clear the fillet at the inner end of the bore.

The insert 11 is provided, as by broaching, with a longitudinally extending recess 18 therethrough, the same being of square cross-section and of standard size for receiving a similarly squared end of a standard turning tool (not shown). After the squared recess 18 is formed, a boring tool (not shown), of greater diameter than the distance across flat of the recess, but of smaller diameter than the exterior diameter of the insert, may be centered into the chamfered end of the insert, to provide arcuate grooves 19 on each flat face 18*a* of recess 18, to approximate half the length of the insert. The ends of these grooves 19 provide stop shoulders 20 for engagement (in the finished wrench socket) of a spring-pressed ball or detent on the square end of a turning tool inserted in recess 18.

Referring now to Figure 4, the two parts provided above are easily assembled as a unit, with insert 11 received in the bore 12 of body 10, the chamfered inner end of the insert being engaged with shoulder 16 and the outer end thereof projecting slightly from the outer end of the bore, as indicated at 22.

The assembled unit, in the upright position of Figure 4, is next placed in a suitable furnace with a ring of heat-fusible bonding metal, such as copper, applied to the enlarged end of the body and retained thereon by the projecting portion 22 of the insert. The extreme heat of the furnace is effective to fuse the copper ring, and the fused material is caused to flow between the contacting surfaces of the insert and body, and by the inherent nature of the copper flows through the pores of the body and insert by capillary action, to a substantial depth of the adjacent walls thereof. A suitable fusing temperature for this purpose is approximately 2075° F., but the requisite temperature may vary according to the materials used and other factors.

After the copper-fusing step described, the wrench socket unit may have the projecting end 22 of the insert cut, ground or otherwise removed to provide a neat flush end on the finished product, or a countersunk end may be provided thereon as illustrated at 22*a* in Figure 5.

In use of the wrench socket of Figure 5, which, of course, is of standard size, as for turning a hexagon nut of corresponding standard size, the socket is applied to engage the nut in the serrated recess 13 with the corners of the nut engaging behind the serrations. The operator of the wrench socket then engages a suitably proportioned squared end of a turning tool (not shown) in the squared aperture 18 of the insert 11 until the spring-pressed detent or detents on said tool end engage in one or more of the grooves 19, behind the stop shoulders 20, yieldingly to retain the turning tool in place with respect to the wrench socket unit. By operating the tool the wrench socket may be turned either for applying or removing a nut.

With reference to the detent engaging grooves 19 the present invention is very important, because there is no limit to the smallness of size of squared hole 18 that may be provided, beyond the limitations of the size of squared hole that may be broached. Thus, in one-piece wrenches of known types there was no way to provide a detent-receiving recess of any kind in a flat face of a quarter inch square turning-tool receiving recess, whereas by the present construction and method, grooves 19 and stop shoulders 20 are readily provided as described above.

Moreover, by the present construction and method, instead of the square hole of the insert being generally larger in cross-section than the serrated aperture of the body, it may just as readily be generally smaller, as illustrated in Figure 7, wherein is shown a modified form of assembled wrench socket, including a socket body 23*a* having a serrated nut or like receiving recess 24 extending from one end of the body to communicate with a larger bore 25 extending from the other end of the body, and thereby providing an annular shoulder portion 25*a* against which the inner end of a cylindrical insert abuts as before. Thus, the square tool-receiving recess 26 in the insert is substantially smaller in cross-section than the serrated recess without affecting the other features of the invention as recited above. The wrench-socket of Figure 7 is otherwise substantially as before.

In Figure 8 there is illustrated a modified form of the invention in which a cylindrical body 28 is provided with a square turning tool receiving recess 29 extending longitudinally from one end thereof and communicating with an enlarged bore 30, extending from the opposite end thereof. A cylindrical insert 31 is received in bore 30 of the body and has its inner end in abutment with an annular shoulder 32 defined by the juncture of recess 29 and bore 30, the insert having a serrated nut-engaging recess 33 extending therethrough. The insert is copper bonded to the body as before. Indentations 34 are provided in the flat faces of the square recess for releasable engagement by the spring-pressed detent of a turning tool (not shown). Except for the reversal of the parts described the general features of the wrench socket, Figure 8, are substantially as before.

It will be readily seen that in the construction described, the serrations or points of the serrated recesses extend for the full lengths of such recesses, and that the inner ends of the serrated recesses coincide with the inner ends of the turning-tool squared recesses. That is, there is no waste material in the improved wrench socket, which makes it possible to provide the same in substantially shorter lengths than was possible with prior art one-piece constructions, and hence wrench sockets of the present type may be utilized in limited spaces where it was not heretofore possible to use other types.

The present improved construction and method makes possible the use of automatic screw machines for carrying out many of the production

steps, which is a material factor in making the method extremely economical. In some instances, the inserts may, for example, be made from square tubing machined to provide a cylindrical exterior for purposes described.

Modifications other than described above may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. A method of making wrench sockets comprising the steps of providing a head composed of a length of metal stock, boring a hole from one end of said head to a proportion of the length thereof, broaching a serrated aperture longitudinally through said head from the other end thereof to communicate with said bore and to provide a peripheral shoulder at the inner end of the bore, providing a metal insert having a cylindrical outer cross-section for snug reciprocal reception in said bore and having a recess therethrough of polygonal inner cross-section for receiving a correspondingly shaped turning tool, cutting a groove in at least one face of said polygonal recess inwardly from an inner edge of the insert to provide a shoulder at a predetermined distance from the outer edge for engagement by a spring-pressed detent in a said turning tool, assembling said insert in sliding fit within said bore of said head with said inner end thereof seating against said shoulder, and bonding said head and insert together in said assembled relation.

2. A method of making wrench sockets comprising the steps of providing a head composed of a length of metal stock, boring a hole from one end of said head to a proportion of the length thereof, broaching an aperture of irregular work-turning cross-section longitudinally through said head from the other end thereof to communicate with said bore and to provide a peripheral shoulder at the inner end of the bore, providing a metal insert having a cylindrical outer cross-section for snug reciprocal reception in said bore and having a recess therethrough of polygonal inner cross-section for receiving a correspondingly shaped turning tool, boring inwardly of an inner end of said insert to provide arcuate recesses in each face of said polygonal recess to provide shoulders at a predetermined distance from the outer end of the insert for engagement by spring-pressed detents in a said turning tool, assembling said insert in sliding fit within said bore of said head with said inner end thereof seating against said shoulder, and bonding said head and insert together in said assembled relation.

3. A method of making wrench sockets comprising the steps of providing a head composed of a length of porous metal stock, boring a hole inwardly from an outer end of said head to a proportion of the length thereof, broaching a work-turning aperture of irregular cross-section longitudinally through said head from the other end thereof to communicate with said bore and to provide a peripheral shoulder at the inner end of the bore, providing a porous metal insert having a cylindrical outer cross-section for snug reciprocal reception in said bore and having a recess therethrough of polygonal inner cross-section for receiving a correspondingly shaped turning tool, assembling said insert in sliding fit within said bore of said head with the inner end thereof seating against said shoulder and with the outer end thereof projecting beyond the corresponding outer end of the head, seating a heat-fusible copper ring on the outer end of said head to be retained thereon by the projecting portion of said insert, and while the assembled unit is maintained in substantially upright position to present said ring at the upper end of the same applying heat to fuse the material of said ring to gravitate the same between the adjoining surfaces of the head and insert and penetrate the pores thereof by capillary action.

4. A method of making wrench sockets comprising the steps of providing a head composed of a length of porous metal stock, boring a hole inwardly from an outer end of said head to a proportion of the length thereof, broaching a work-turning aperture of irregular cross-section longitudinally through said head from the other end thereof to communicate with said bore and to provide a peripheral shoulder at the inner end of the bore, providing a porous metal insert having a cylindrical outer cross-section for snug reciprocal reception in said bore and having a recess therethrough of polygonal inner cross-section for receiving a correspondingly shaped turning tool, inserting said insert within said bore of said head with the inner end thereof seating against said shoulder and with the outer end thereof projecting beyond the corresponding outer end of the head, seating a heat-fusible copper element on the outer end of said head and surrounding said projecting portion of said insert, applying heat to fuse material of said copper element thereby to gravitate the same between the adjoining surfaces of the head and insert and penetrate the pores thereof by capillary action, and thereafter trimming said projecting portion of the insert substantially even with the outer end of said head.

5. A method of making wrench sockets comprising the steps of providing a head composed of a length of porous metal stock, boring a hole inwardly from an outer end of said head to a proportion of the length thereof, broaching a work-turning aperture of irregular cross-section longitudinally through said head from the other end thereof to communicate with said bore and to provide a peripheral shoulder at the inner end of the bore, providing a porous metal insert having a cylindrical outer cross-section for snug reciprocal reception in said bore and having a recess therethrough of polygonal inner cross-section for receiving a correspondingly shaped turning tool, cutting a groove in at least one face of said polygonal recess inwardly from an inner edge of the insert to provide a shoulder at a predetermined distance from the outer edge for engagement by a spring-pressed detent in a said turning tool, inserting said insert within said bore of said head with the inner end thereof seating against said shoulder and with the outer end thereof projecting beyond the corresponding outer end of the head, seating a heat-fusible copper element on the outer end of said head and surrounding said projecting portion of said insert, applying heat to fuse material of said copper element thereby to gravitate the same between the adjoining surfaces of the head and insert and penetrate the pores thereof by capillary action, and thereafter trimming said projecting portion of the insert substantially even with the outer end of said head.

6. A method of making wrench sockets comprising the steps of providing a head composed of a length of porous metal stock, boring a hole inwardly from an outer end of said head to a

proportion of the length thereof, broaching a work-turning aperture of irregular cross-section longitudinally through said head from the other end thereof to communicate with said bore and to provide a peripheral shoulder at the inner end of the bore, providing a porous metal insert having a cylindrical outer cross-section for snug reciprocal reception in said bore and having a recess therethrough of polygonal inner cross-section for receiving a correspondingly shaped turning tool, boring inwardly of an inner end of said insert to provide arcuate recesses in each face of said polygonal recess to provide shoulders at a predetermined distance from the outer end of the insert for engagement by spring-pressed detents in a said turning tool, inserting said insert within said bore of said head with the inner end thereof seating against said shoulder and with the outer end thereof projecting beyond the corresponding outer end of the head, seating a heat-fusible copper element on the outer end of said head and surrounding said projecting portion of said insert, applying heat to fuse material of said copper element thereby to gravitate the same between the adjoining surfaces of the head and insert and penetrate the pores

thereof by capillary action, and thereafter trimming said projecting portion of the insert substantially even with the outer end of said head.

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