March 18, 1969 E. J. ONDECK 3,433,108

SOCKET WRENCH

Filed May 23, 1967

Fig. 2

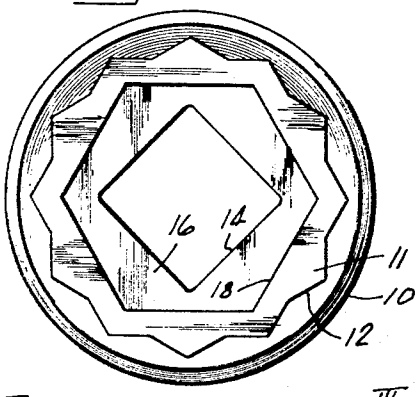



Fig. 3

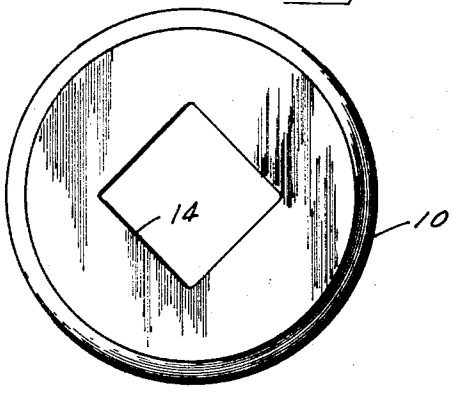



Fig. 1

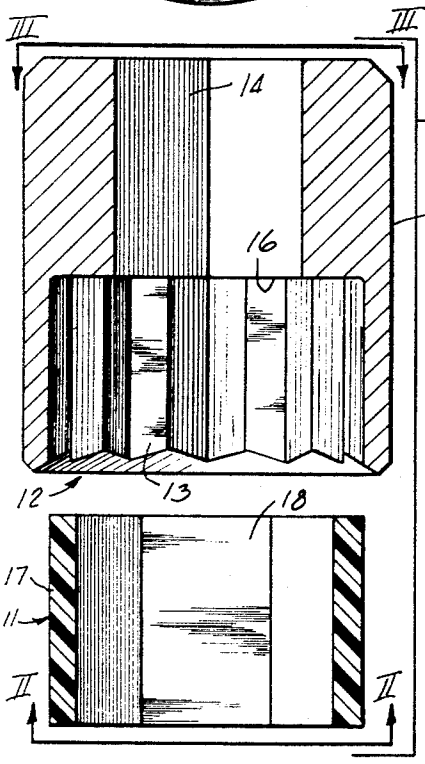



Fig. 4

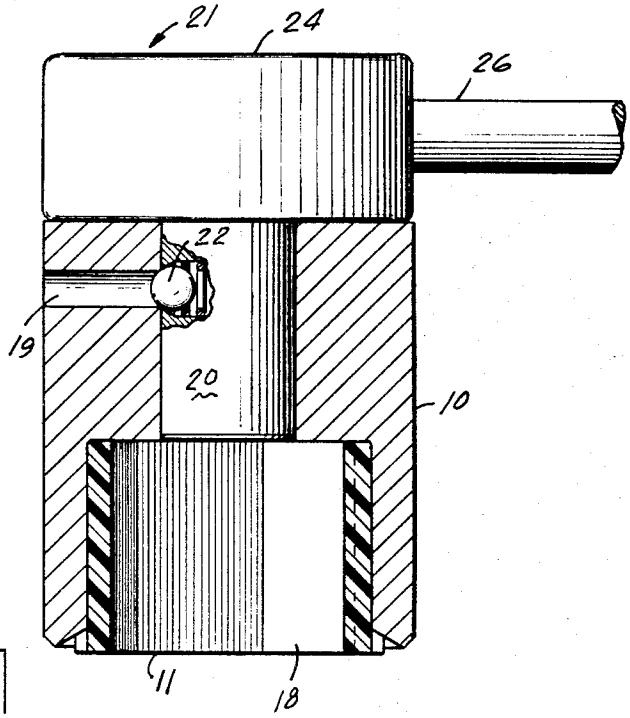
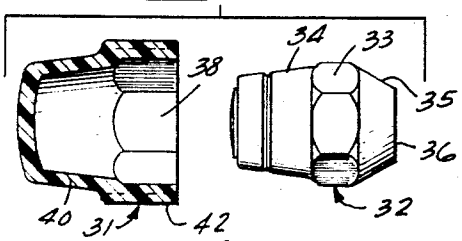



Fig. 5

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3,433,108

# SOCKET WRENCH

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Int. Cl. B25b *13/06, 13/58*

## ABSTRACT OF THE DISCLOSURE

A wrench socket having a square bore for engagement by a turning tool head and at the opposite end thereof an aperture adapted to engage an insert in sliding fit relationship. The insert has an exterior which corresponds to the number of longitudinal surfaces of the aperture and an interior having ordinarily half the number of longitudinal sidewall surfaces as the exterior surface or, in any event, the same number as the number of flat surfaces found on the nut to be turned by the socket.

### *Background of the invention*

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

Such wrench sockets usually comprise a one-piece forged steel body formed at one end with a serrated aperture, ordinarily having twelve corners, for receiving various types of nuts or bolt heads of a particular general size and a square recess at the other end of a different radial size defining a shoulder between the recess for reception of a similar shaped end of a turning tool in a manner coextensive with the shoulder. At least one flat side of the square recess has a depression for reception of a spring-pressed ball on the end of the turning tool.

Wrench sockets have also been made with inserts for engagement of nuts or bolt-heads of a particular general size. Such inserts have been provided conventionally of steel for reducing the size of the serrated recesses or of plastic for electrically insulating the socket wrench from a nut or bolt.

### *Summary*

The present invention is directed to a socket wrench having a non-mar plastic insert having longitudinal sidewalls adapted to fully engage a like number of sidewalls in a wrench socket in sliding fit relationship and an inner cross-section having longitudinal sidewalls. The insert has the same number of outer sidewalls as the socket and the same number of inside walls as the nut with which it is used. The insert has 24 outside wall (or 12 corners mating with a conventional socket wrench) and provides in novel combination therewith six inside walls (or 6 points) for use with hexagonally headed nuts. By being adapted to engage a nut, bolt or the like having a like number of sidewalls, voids between the interior sidewalls and the nut are eliminated. This is to confine the plastic and hence to prevent plastic flow of the plastic insert.

An object of the present invention is to provide a wrench socket of the character described wherein at one end of the socket there is a recess for a turning tool and at the opposite end thereof a serrated aperture adapted to engage an insert having a recess therethrough whose inner cross-section is composed of one-fourth the number of longitudinal sidewalls as the exterior surface.

Another object of the present invention is to provide an improved plural part wrench socket which has durability comparable with a one-piece wrench socket.

Another object of the invention is to provide an improved wrench socket which has no metal-to-metal contact between the socket and a nut or the like.

Another object of the invention is to provide an improved wrench socket construction and method for producing the same.



Another object of the invention is to provide an improved wrench socket having a mating serrated aperture adapted to engage an insert having a like number of serrations on its exterior cross-section.

Other objects, advantages and capabilities of the invention will become apparent from the following description taken in conjunction with the accompanying drawings showing a preferred embodiment of the invention.

On the drawings:

FIG. 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 top part being the socket body and the bottom part being an insert for the same;

FIGS. 2 and 3 are top plan views on the same scale of the insert and socket body as viewed along the line II—II and III—III, respectively of FIG. 1;

FIG. 4 is a vertical cross-section corresponding to FIG. 1 illustrating the socket parts assembled as a unit; and

FIG. 5 is an exploded view of an alternative insert embodiment in cross-section and a plan view of a nut to be turned by the insert.

As shown in the drawings:

The principles of this invention are particularly useful when embodied in a wrench socket as illustrated in FIG. 1 wherein a wrench socket head **10** and an insert **11** are adapted for assembly in sliding fit relationship.

The head **10** is made from a length of cylindrical bar stock preferably of steel having an equal-sided serrated aperture **12** which is provided as by means of a broaching tool. The aperture **12** has twenty-four sides arranged in angularly disposed pairs defining twelve equal coplanar pairs of flat wall portions **13** extending longitudinally from one end of the head to approximately half the length thereof. The insert has twenty-four equal longitudinal flat sidewalls **17** corresponding to the wall portions **13** of the serrated aperture **12**.

The head **10** has a square bore **14** extending longitudinally at the other end thereof to communicate with the serrated aperture **12**. The wall portions or sides **13** extend for substantially the full length of the aperture **12** to a shoulder **16** and are adapted to engage the external walls **17** of the insert **11** in mating relationship.

The insert **11** has a central recess **18** therethrough of a hexagonal inner cross-section for receiving the regularly spaced sides and corners of a standard size hexagonal nut or bolt head in mating relationship. The length of the sidewalls **17** of the insert **11** are slightly greater than the depth of the aperture **12** to provide maximum steel support area for the plastic liner and still assure only plastic liner contact with the sides of the nut or bolt head.

The insert **11** may be made from a material such as glass filled polycarbonate, nylon or "Delrin" which is an acetal resin. The insert **11** has an outer diameter corresponding to the diameter of the aperture **12**, but allowing for a snug sliding fit. It is desirable in practice to make the radial thickness of the insert **11** as small as possible to increase its useful life.

The insert **11** may be formed as a continuous extrusion whereby the outer sidewalls **17** would be formed simultaneously with the inner recess **18**. This would be the most economical manufacturing method. The individual inserts would be cut off from the continuous extrusion in appropriate lengths. Alternatively, the insert **11** may be made as a molding or casting. This would be appropriate where the insert is required to have a special configuration, other than a generally regular polygon. In-

cluded in such special configurations would be inserts with tapers, cutouts, lips or flanges.

The square bore **14** is provided with a cylindrical recess **19**. It is of standard size for receiving a similarly square end **20** of a standard turning tool **21**. The end of the recess **19** provides a stop shoulder for engagement of a spring-pressed ball **22** on the square end **20** of the turning tool **21** inserted in bore **14**.

Referring now to FIG. 4, the two parts **10, 11** provided above are easily assembled as a unit with the insert **11** received in the aperture **12** of the head **10**. The assembled unit is then bonded together in a conventional manner for steel and plastic parts. Alternatively, the body **10** and insert **11** may be in frictional engagement only to allow for removal after use.

In use of the assembled socket wrench, the insert **11** within the head **10** is applied to engage a nut (not shown). The operator of the wrench socket then engages the square end **20** of the turning tool **21** in the square bore **14** of the head **10** until the spring-pressed ball **22** on the tool engages the recess **19** yieldingly to retain the turning tool **21** in place with respect to the wrench socket **10** and nut.

By turning the tool **21**, the wrench socket **10** may be turned either for applying or removing the nut. The fact that there are no voids between the hexagonal inner surface **18** and the nut to be engaged is important in that the presence of voids would permit plastic flow of the insert **11** under torque loads used in tightening the nut. The absence of any void space precludes such plastic flow and insures that the plastic liner **11** will engage a hexagonal nut and be able to turn the nut without marring its surface or the surface on which the nut rests. It is especially contemplated here to use this plastic insert **11** in those situations where the finish of a metal nut or bolt is to be protected while this part is being secured or removed from its position.

Summarizing, the invention comprises the socket wrench head **10** having a twenty-four-sided, twelve point aperture **12** corresponding to the insert **11** which in turn has a recess having a six-sided six-point inner configuration. The plastic liner or adaptor **11** is constructed to cooperate with a nut slightly smaller in dimension than a nut properly fitting in the socket without the liner.

A critical limitation in the satisfactory manufacture and sale of plastic liners is precise fitting of the twenty-four-sided or double-hexagonal inside surface **12** of the head **10** and the twelve-sided outer surface of the insert **11** so that no open space or void is allowed between the head and the insert which, as with the insert **11** and the nut being worked on, would result in a cold flow of plastic into the relieved areas of the insert **11** and head **10**.

An alternative embodiment of the invention uses a molded or cast insert **31**, FIG. 5, for engagement with a correspondingly shaped twelve-sided socket wrench (not shown). The insert **31** is adapted to engage a chromed nut **32** or the like. The nut **32** has a hexagonal turning surface **33**, and forward and rear tapered portions **34** and **35**, respectively. The rear tapered portion **35** is terminated by a circular portion **36** having a threaded opening therein (not shown) for engagement with a bolt.

The insert **31** has an interior configuration including a hexagonal surface **38** and tapered portion **40** corresponding to the hexagonal surface **33** and tapered portion **34** of the acorn inut **32**.

The insert **31** has a twenty-four-sided exterior surface **42** which is adapted to engage a correspondingly shaped socket wrench in sliding fit relationship.

The plastic insert **31** incorporates the principles of the invention as to the prevention of marring the nut **32** being worked and having four times the number of exterior surfaces **42** as interior nut engaging surfaces **38**.

As noted, preferred practice uses hexagonal nuts while standard sockets are 12 point. If square nuts are to be fastened a 4-point inside insert is used while the outside of the insert remains 12 pointed. The liner may be used with closed and/or box end wrenches having 12-point openings, as well as with the wrench illustrated. The plastic liner of the present invention may be used in non-mar situations and also where it is desirable that a dielectric be provided between a nut or bolt and a wrench socket.

Although minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

**1.** In a combination with a socket wrench body having an aperture defined by a serrated wall having a plurality of corners each bounded by flat wall portions of substantially identical size defining an included obtuse angle,

an insert of thin walled non-flowable plastic having an outer contour snugly received in reciprocal sliding mating relationship in said aperture and for receiving a bolt head, and having a recess defined by corners bounded by flat hexagonally arranged side walls having continuous planar contour between corners defining included like obtuse angles that are radially aligned with alternate corners of said corners of said serrated wall,

said side walls being marginally opposed adjacent to their recess corners by the coplanar wall portions of alternate ones of said aperture corners in closely spaced overlapping and parallel relationship with respect thereto, and being opposed in a radial direction at their mid portions by the wall portions of the remaining ones of said aperture corners which terminate at the respective coplanar wall portions and define included acute angles with respect to the respective side walls, and

said insert completely and solidly filling in confined relationship the space between said aperture and a bolt head received in said recess.

**2.** The combination called for in claim **1** in which said obtuse angles of said corners of said aperture and recess are 120° and the number of aperture corners is 12 and the number of said recess corners is 6.

**3.** The combination called for in claim **1** in which said socket wrench body has an internal shoulder engaged by said insert at its inner end supporting same against displacement at its inner end.

**4.** A wrench socket as recited in claim **1** wherein the plastic of said insert is selected from the group consisting of glass-filled polycarbonate, nylon and acetyl resin.

**5.** A wrench socket as recited in claim **1** wherein said serrated aperture has four times the number of sidewall surfaces as the number of sidewalls on the interior of said insert.

**6.** A wrench socket as recited in claim **1** wherein said insert is thin-walled between parallel opposed faces.

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81—185; 240—48; 340—84, 92, 138