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Sullivan

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[54] **END WRENCH AND SOCKET WITH REDUCING INSERTS**

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[51] **Int. Cl.** **B25b 13/58**

[58] **Field of Search** ..... 81/121 R, 121 B, 180 B, 81/185, DIG. 11

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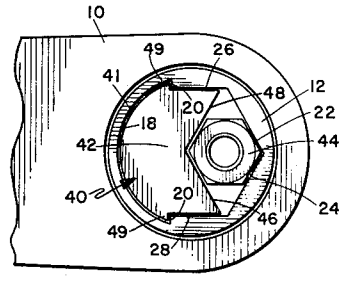
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[57] **ABSTRACT**

The wrench has a nut drive body with an insert and nut reception cavity that permits the use of selected inserts to obtain a range of nut drive sizes. The cavity has a conventional hexagonal pattern over four sides, but the usual remaining two sides are replaced by a partial cylindrical arc which terminates in insert retaining ridges. In the socket configuration, an insert release opening is provided as is a bolt reception bore offset from the central axis of the socket.

7 Claims, 6 Drawing Figures



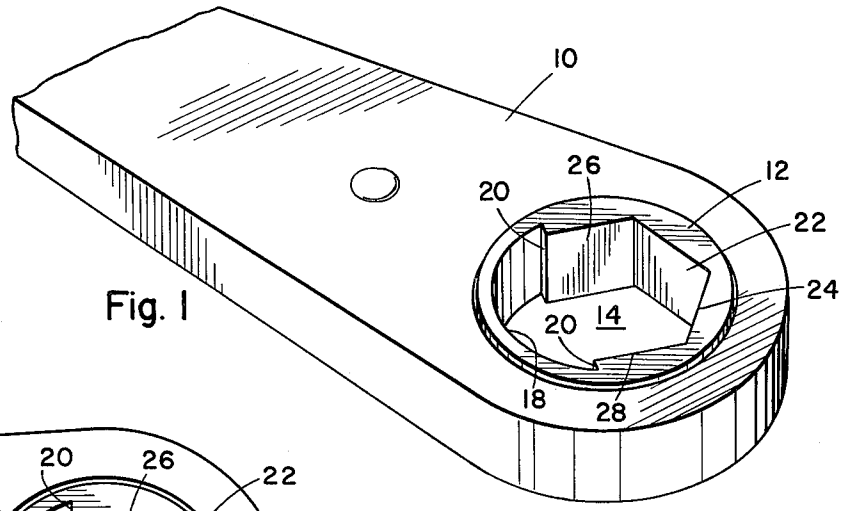


Fig. 1

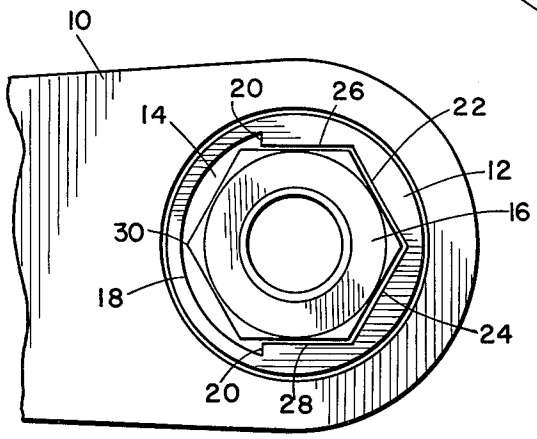


Fig. 2

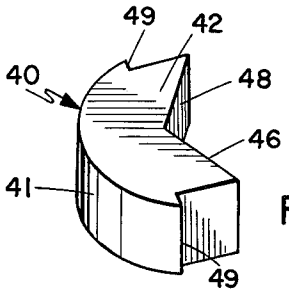


Fig. 4

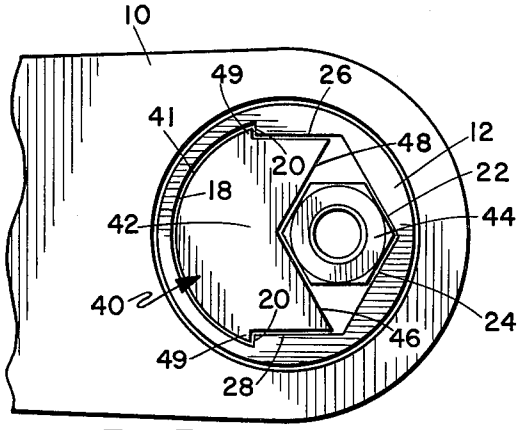


Fig. 3

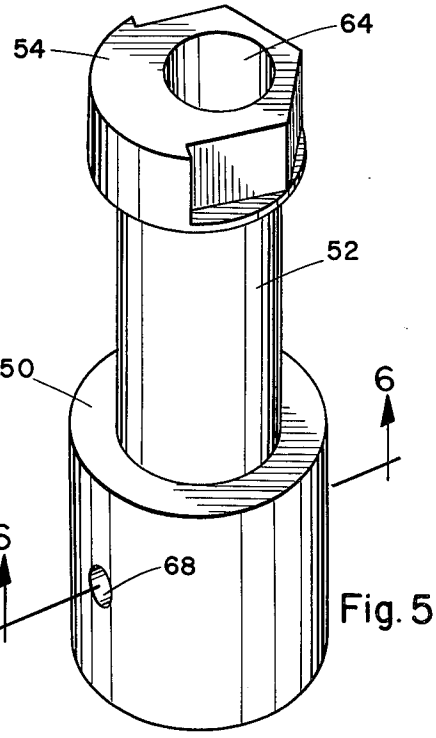


Fig. 5

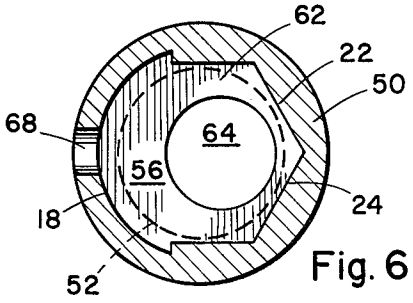


Fig. 6

END WRENCH AND SOCKET WITH REDUCING INSERTS

BACKGROUND OF THE INVENTION

Various wrench configurations have been proposed and built whereby selected inserts may be utilized to provide a range of socket sizes. The particular insert configuration selected is normally not applicable to both end wrench and socket wrenches and therefore two complete sets of wrench and inserts are required. Additionally the inserts frequently require extensive machining or other forming operations because of their configuration. A further deficiency of prior art devices is that the inserts tend to be thin walled and all the stresses are transferred through the thin-walled insert. A still further deficiency of such devices is that the inserts are difficult to position properly and to fully insert within the wrench structure.

In view of the deficiences of prior art devices, substantially all tooling in private use incorporates wrenches with removable drive portions so that a new drive portion must be inserted for each nut size utilized.

It is therefore desirable to have a wrench configuration into which a plurality of inserts may be readily inserted, which wrench configuration is adaptable to both end wrench and socket type nut drive bodies and which wrench configuration facilitates the insertion and removal of the inserts.

SUMMARY OF THE INVENTION

An exemplary embodiment of the invention incorporates a uniquely configured insert and nut reception cavity which may be utilized either in a nut socket drive body or in an end wrench nut drive body. The cavity configuration incorporates a pattern of flats comprising a nut drive section. The flats are comparable to the conventional hexagonal pattern over the portion of the circumference covered by four such flats, however, over the remaining portion of the cavity a partial cylindrical configuration is utilized to form an insert engagement channel. The terminus of the partial cylindridal configuration is joined with the remaining drive structure by insert retention ridges. The inserts utilized with the unique cavity configuration of the invention are relatively easily manufactured due to the fact that they do not have to fit within a complete enclosure, but rather are inserted into the insert engagement channel and then protrude along the flats of the drive section. As a result of the configuration, tolerances do not accumulate, and relatively high manufacturing tolerances will still produce acceptable inserts.

When used in the socket configuration an insert release opening is provided so that a tool may be utilized to release an insert after use. The socket member also includes an axial bolt reception bore that is offset toward the drive section to provide access of a bolt over the maximum range of nut sizes.

Inserts for drive members according to the invention are relatively easy to manufacture because of the reduced number of angulated flats. Additionally they have an inherent high strength with no thin-walled sections and therefore require less expensive material to have suitable resistance to damage.

As used herein the term nut is intended to include nuts, bolt heads and similar inserts.

It is therefore an object of the invention to provide a new and improved end wrench and socket with reducing inserts.

It is another object of the invention to provide a new and improved end wrench and socket with inserts that are relatively easy to manufacture.

It is another object of the invention to provide a new and improved end wrench and socket which has no close manufacturing tolerance requirements.

It is another object of the invention to provide a new and improved end wrench and socket which utilizes relatively low cost materials.

It is another object of the invention to provide a new and improved end wrench and socket in which the inserts are easily oriented and inserted.

It is another object of the invention to provide a new and improved end wrench and socket with provision for removing the inserts from the socket portion.

It is another object of the invention to provide a new and improved end wrench and socket with maximum internal accommodation for bolt ends.

It is another object of the invention to provide a new and improved end wrench and socket that accomodates a large range of nut sizes.

Other objects and many attendant advantages of the invention will become more apparent upon a reading of the following detailed description, together with the drawings in which like reference numerals refer to like parts throughout and in which:

FIG. **1** is a perspective view of the wrench.

FIG. **2** is a plan view of the socket portion.

FIG. **3** is a similar plan view with an insert added to fit a small nut.

FIG. **4** is a perspective view of a typical insert.

FIG. **5** is a perspective view of a socket drive attachment.

FIG. **6** is a sectional view taken on line **6—6** of FIG. **5.**

Referring now to the drawings, there is illustrated in FIG. **1** a ratchet type end wrench **10.** The end wrench incorporates a nut drive body **12** having an insert and nut reception cavity **14** configured according to the invention. The wrench may be made according to the conventional design wherein a nut is tightened by utilizing the wrench with a first face up and then that same nut loosened by inverting the wrench so that the ratcheting effect is in the opposite direction of rotation. The insert and nut reception cavity **14** is comprised of an insert engagement channel which has an arcuate surface **18** generally corresponding to a partial cylindrical surface and terminating in a pair of ridges **20.** Diametrically opposed to the arcuate surface **18** are the nut drive flats **22** and **24.** The nut drive flats are connected to the insert engagement channel by accommodation flats **26** and **28.**

The nut drive body may be utilized alone or in conjunction with a plurality of different inserts. In the use of the nut drive body to turn the maximum size nut no insert is necessary. This configuration is illustrated in FIG. **2** wherein a maximum size nut **16** is inserted within the body and contacts both the drive flats **22** and **24** as well as both of the accommodation flats **26** and **28.** The nut **16** is held in engagement with these surfaces by the correspondence of the partial cylindrical surface **18** with the apex **30** on the nut **16.**

The use of an insert to drive the smallest nut practical with a given drive member is illustrated in FIG. **3.** In

this figure, an insert **40** with an arcuate portion **41** and a depending protrusion **42** is retained within the drive member and traps the nut **44** between the drive flats **22** and **24** on the nut drive body and the flats **46** and **48** on the insert. The faces **22** and **24** have an included angle of 120° in common with all hexagonal configurations as do the surfaces **46** and **48**, so that the nut **44** is held firmly between four cooperating surfaces. The insert **40** has flanges **49** at opposite sides of arcuate portion **18** to fit against ridges **20.**

Referring now to FIGS. **5** and **6**, there is illustrated the socket type nut drive body **50.** The body incorporates an extension **52** for spacing the nut driving portion from the wrench. The extension terminates in a wrench engagement head **54.** The configuration of the head **54** corresponds exactly to the configuration of the insert and nut reception cavity **14** of the wrench **10.** The configuration of the insert and nut drive cavity **56** of the body **50** is illustrated in FIG. **2** wherein a cavity configuration identical to the insert and nut drive cavity **14** of the wrench **10** is illustrated. The cavity **56** terminates in an insert insertion flange **62** which limits the entry of the nut into the interior of the device. A bolt reception bore **64** is provided. The bore **64** is offset from the axis of the socket member **50** toward the nut engagement flats **22** and **24** in order to maximize the range of bolts which will pass into the bore **64.** The body **50** incorporates an insert release opening **68** which is positioned in the insert and nut reception cavity at the position of the insert insertion flange **62.** A tool may be inserted through the insert release opening **68** to dislodge inserts after use.

OPERATION

In use, the operator first determines whether the particular nut driving application requires an end wrench-type drive or an extension socket-type drive. Assuming a socket type drive is selected, then the head **54** of the socket drive body **50** is inserted into the insert and nut drive cavity **14** on the wrench **10.** Then an appropriate insert **40** is selected to produce the desired nut drive size, the length of protrusion **42** determines the size of nut which can be gripped. The insert is pressed into the cavity **14** until it contacts the flange **62.** The insert retention ridges **20** hold the insert in position and prevent it from moving toward the nut drive flats **22** and **24.**

The socket member is inserted over the bolt so that the nut drive flats **22** and **24,** together with the nut drive flats on the insert contact the four driven faces of the nut. The wrench is rotated to tighten the nut to the desired torque. Under the application of torque the insert transmits the forces over relatively large surfaces to the nut drive body and wrench, thereby avoiding damage to the surfaces or jamming of the insert in the socket. If a bolt protrudes through the nut it will be received within the bolt reception, bore **64** so as to not interfere with the nut driving action. After completion of the nut tightening, the socket end wrench are removed from the nut and the insert removed from the socket by the application of a tool or other suitably sized object through the insert release opening **68.** This makes the wrench ready for use with other sized nuts as required.

Having described my invention, I now claim:

1. A wrench with provision for reducing inserts so that the wrench may be utilized to turn a wide range of nut sizes wherein the improvement comprises:
- a nut drive body having an insert and nut reception cavity in at least one side thereof,
- said cavity comprising two adjacent nut engagement flats and a diametrically opposed insert engagement channel,
- said insert engagement channel comprising a partial cylinder insert engagement surface,
- said nut engagement flats intersect at an included angle of 120°,
- each of said nut engagement flats intersects with accommodation flats at an included angle of 120°,
- said accommodation flats extend between said nut engagement flats to said insert engagement channel,
- an insert,
- said insert having a partial cylinder surface corresponding to said insert engagement surface.

2. The wrench according to claim **1,** further including:
- engagement means in said insert engagement channel for retaining said partial cylinder surfaces on said nut drive body and said insert in engagement.

3. The wrench according to claim **2,** wherein:
- said engagement means comprises a pair of insert retention ridges at the terminus of said insert engagement surface.

4. The wrench according to claim **1,** wherein:
- said nut drive body comprises a substantially cylindrical socket member,
- said socket member having an insert insertion flange extending transversely of said socket member.

5. The wrench according to claim **1,** wherein:
- said nut drive body is substantially circular and said insert and nut reception cavity extends completely through said body.

6. The wrench according to claim **4,** wherein:
- said socket member includes an insert release opening into the insert and nut reception cavity at the position of said flange.

7. The wrench according to claim **4,** wherein:
- said socket member further including a bolt reception bore extending interiorly from said insert insertion flange,
- said bolt reception bore having an axis that is parallel to but offset toward said nut engagement flats from the axis of said socket member.

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