

United States Patent

[11] 3,584,527

[72] Inventor **Donald R. Bosten**
Pittsburgh, Pa.
[21] Appl. No. **748,399**
[22] Filed **July 29, 1968**
[45] Patented **June 15, 1971**
[73] Assignee **Rockwell Manufacturing Company**
Pittsburgh, Pa.

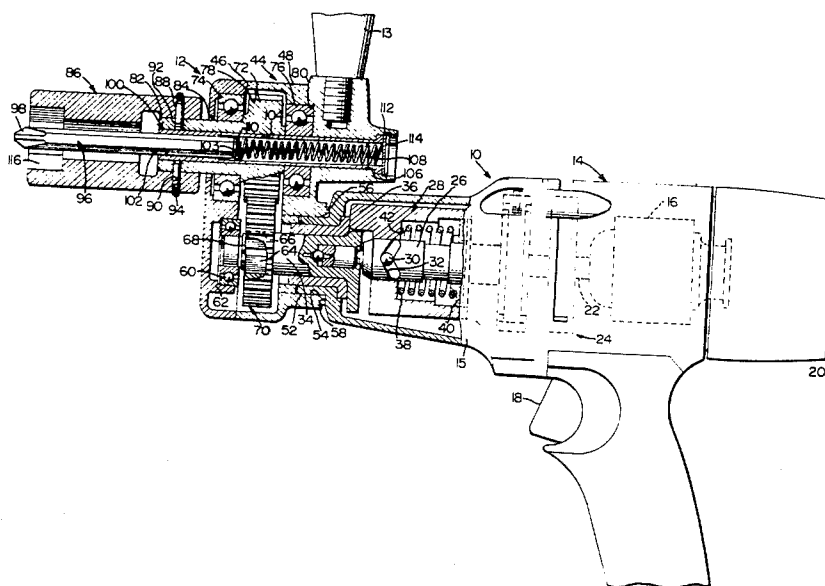
[56] **References Cited**
UNITED STATES PATENTS
3,323,395 6/1967 Burnett et al. 81/52.3
2,882,773 4/1959 Wing ... 81/56
2,895,360 7/1959 Madsen 81/52.3 X
3,323,394 6/1967 Bangerter et al. 81/52.3
1,343,667 6/1920 Evensen 81/56

[54] **TOOLS AND ATTACHMENTS THEREFOR**
9 Claims, 5 Drawing Figs.

[52] U.S. Cl. **81/56**
[51] Int. Cl. **B25b 17/00**
[50] Field of Search. **81/55, 56,**
52.3, 52.4

Primary Examiner—James L. Jones, Jr.
Attorney—Strauch, Nolan, Neale, Nies & Kurz

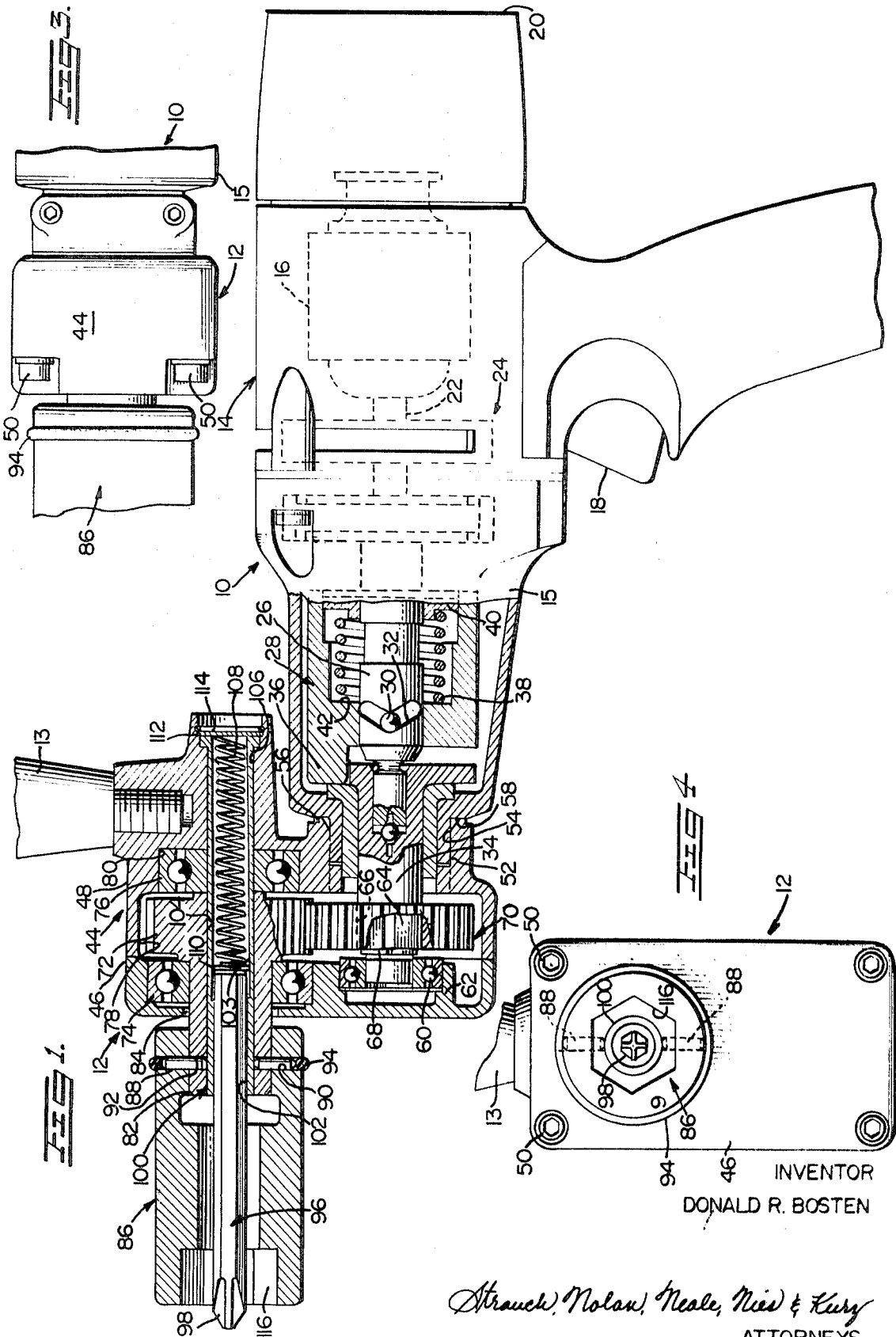
ABSTRACT: Attachments for making impact wrenches and the like capable of threading a retainer onto a threaded fastener while holding the fastener against rotation.



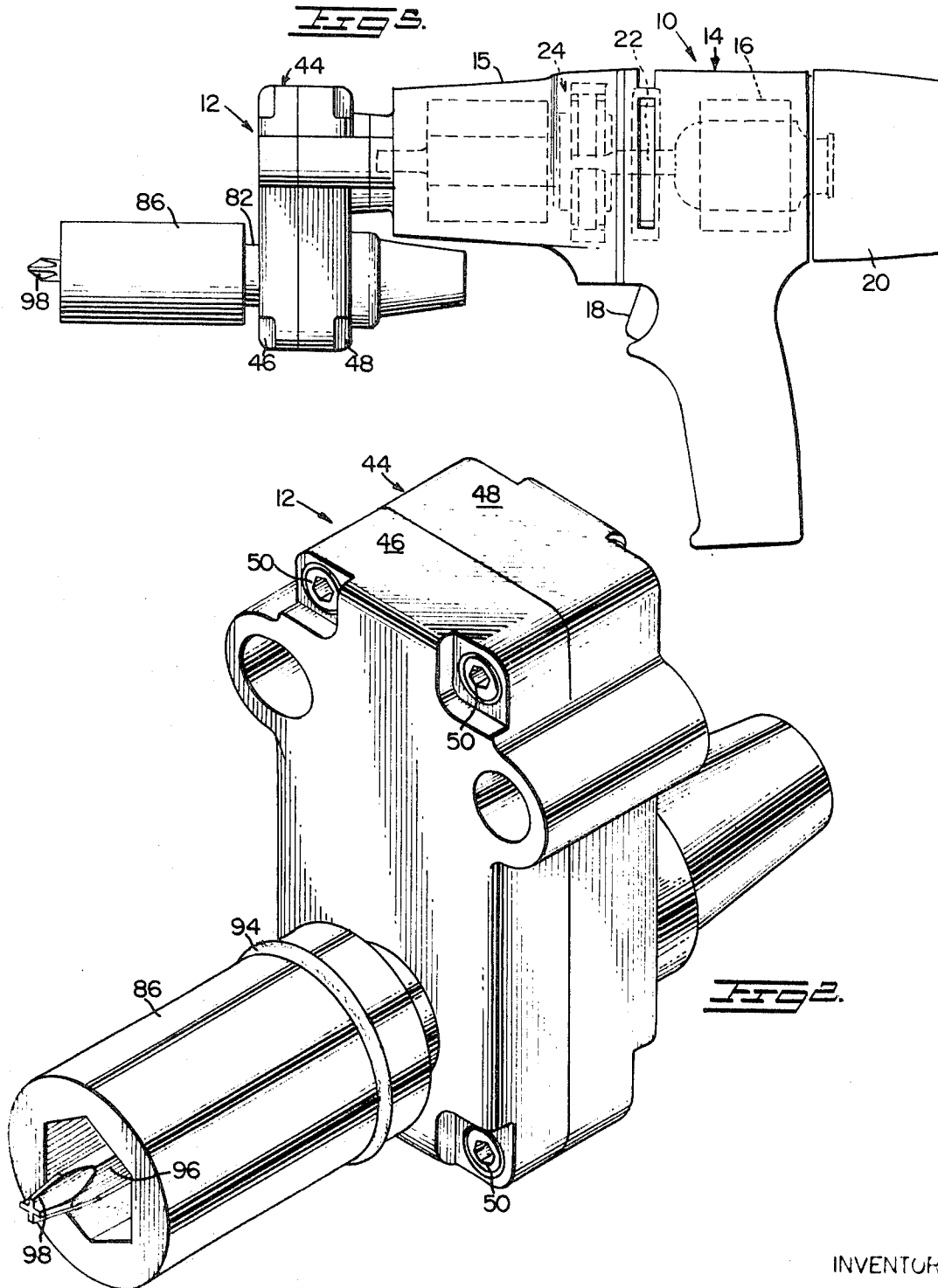
PATENTED JUN 15 1971

3,584,527

SHEET 1 OF 2



Strauch, Nolan, Neale, Nien & Kury
ATTORNEYS



INVENTOR
DONALD R. BOSTEN

Strauch, Nolan, Neale, Nies & Kery
ATTORNEYS

TOOLS AND ATTACHMENTS THEREFOR

This invention relates to tools and, more specifically, to novel, improved tools for threading a retainer onto a fastener while holding the fastener against rotation.

In many instances it is necessary to fasten two members together in a confined space or in other circumstances where a fastener and retainer can be reached from only one side of the assemblage of members being joined. There have been developed for such applications fasteners which have a socket in their shank end so that they can be held against rotation from the side of the assemblage on which the retainer is threaded onto the fastener. Accordingly, in circumstances of the type just described, access to one side of the fastener is all that is required.

Power tools have heretofore been developed for installing or setting fasteners of the type just described. Typical of these is the bolt-holding wrench described in La Torre U.S. Pat. No. 2,955,496, which includes an axially movable, nonrotatable mandrel for holding a bolt against rotation while a rotatable socket threads a retainer onto the fastener.

One of the disadvantages of the arrangement described in the patent just mentioned is that an entire separate tool is required to produce the desired mode of operation. This may in many circumstances make the cost of using fasteners of the type just described prohibitive.

Also, in many if not most instances, it is desirable to impart a rotary impact to the retainer as it is tightened to prevent the retainer from loosening later. Tools such as those described in the patent mentioned above have the disadvantage that there is no provision for supplying such an impact.

It is one important and primary object of the present invention to provide novel, improved tools for holding fasteners against rotation while threading fasteners thereon which do not have the disadvantages of previously proposed tools of this character.

Another important and related object of the invention resides in the provision of novel attachments for making power tools capable of holding fasteners against rotation while threading fasteners thereon.

Yet another important and also related object of the invention is the provision of novel tools of the type in question which are capable of exerting rotary impacts on a retainer to insure that they are securely tightened.

Generally speaking, the present invention by which the foregoing and other objects are accomplished includes a casing attachable to an impact wrench or other power tool with a rotary output shaft. Housed in the casing are an input gear with a central bore adapted to receive the output shaft of the tool and an output gear provided with an extension to which a retainer rotating socket can be detachably fixed. Also housed in the casing is a nonrotatable, slidable member having a Philips or other tip adapted to be engaged in a correspondingly configured recess in the shank end of the fastener to restrain it against rotation while the retainer is threaded onto the fastener.

Because the fastener holding and retainer rotating mechanism is constructed as an attachment, it is much less expensive and accordingly has a wider range of application than tools heretofore proposed for holding a fastener stationary while threading a nut on it. Also, as mentioned, the attachment may readily be utilized with an impact wrench to insure that the retainer is securely tightened. Furthermore, with only minor structural changes, the attachment may be modified to make it usable with any of a wide variety of power tools.

Several important objects and features and significant advantages of the present invention have been discussed above. Other objects, further important features, and additional advantages of the invention will become apparent from the appended claims and as the ensuing detailed description and discussion proceeds in conjunction with the accompanying drawing, in which:

FIG. 1 is a side view of a power tool equipped with a fastener holding and retainer rotating attachment in accord with the principles of the present invention, part of the attachment housing being broken away to show its internal components;

FIG. 2 is a pictorial view of the attachment;

FIG. 3 is a partial top view of the tool and attachment, showing the manner in which the attachment is connected to the tool;

FIG. 4 is a front view of the tool and attachment; and

FIG. 5 is a side view of an alternate embodiment of the invention.

Referring now to the drawing, FIG. 1 depicts a power tool 10 equipped with a fastener-restraining and retainer-rotating attachment 12 constructed in accord with the principles of the present invention and provided with a handle 13 to facilitate manipulation of the tool.

The illustrated tool 10 is a Rockwell Model 625 Impact Wrench. It is to be understood, however, that the use of this particular tool is not critical but that virtually any type of power tool with a rotary output shaft could be substituted for it.

With continued reference to FIG. 1, the exemplary power tool 10 just mentioned includes a casing 14 housing a motor 16, the operation of which is controlled by an on-off switch 18 and a forward-reverse switch 20. The output shaft 22 of motor 16 is connected to a gear reduction drive 24, the details of which are not part of the present invention and will accordingly not be described herein except in conjunction with the present invention.

Referring still to FIG. 1, the output member of gear reduction drive 24 is a rotatably supported shaft 26 drive connected to a sleeve 28 by balls 30 (only one of which is shown), which are seated in grooves 32 in shaft 26 and in cooperating grooves (not shown) in sleeve 28. The generally V-shaped configuration of grooves 32 permits relative longitudinal movement between shaft 26 and sleeve 28, but prevents the sleeve from rotating with respect to the shaft.

Sleeve 28 is drive connected to an output shaft 34 rotatably supported in and protruding from the forward end of casing 14 by teeth 36 on the forward end of sleeve 28 and cooperating teeth (not shown) on the rear portion of shaft 34.

The components just described constitute a conventional mechanism for imparting rotary impact to a work-performing component attached to shaft 34. Specifically, in the presence of a restraining torque on shaft 34, sleeve 28 retracts (i.e., moves toward motor 16) against the bias of a spring 38 disposed between a spring support 40 fixed to shaft 26 and a spring seat 42 in the forward end of sleeve 28 with this movement being accommodated by the configuration of slots 32. The retraction continues until the teeth 36 on sleeve 28 clear the cooperating teeth on shaft 34, which results in rotary motion of sleeve 28 relative to shaft 34. This relative motion is then imparted to shaft 34 by the action of spring 38 which biases sleeve 28 forwardly, causing its teeth 36 to engage successive teeth on shaft 34. The result is a rotary impact on shaft 34. Successive rotary impacts follow until the restraint on the shaft is removed or motor 16 is deenergized by releasing switch 18.

Referring now to FIGS. 1-5, the rotary shaft 34 just described is employed in accord with the principles of the present invention to drive the rotary components of fastener holding and retainer rotating attachment 12. The latter includes a casing 44 consisting of a front section 46 and a rear section 48 which are assembled to each other and to the casing 14 of tool 10 by cap screws 50. These screws extend through aligned apertures (not shown) in front and rear casing sections 46 and 48 into drilled and tapped apertures (likewise not shown) in casing 14. Casing 44 is positioned relative to casing 14 by a boss 52 on the latter, which extends into an aperture 54 in attachment casing section 48, and the abutment of the rear edge 56 of casing section 48 with a forwardly facing shoulder 58 on casing 14.

Referring now specifically to FIG. 1, the output shaft 34 of tool 10 extends through the opening 54 in attachment casing rear section 48 and is rotatably supported in a bearing 60 mounted in a boss 62 in attachment casing forward section 46. Fixed to shaft 34 for rotation therewith by flats 64 adjacent the forward end of shaft 34 and cooperating flats (not shown) in its central bore 66 and by a retainer ring 68 is a spur-type input gear 70.

Also housed in casing 44 and meshed with input gear 70 is a spur-type output gear 72. This gear is rotatably supported by bearings 74 and 76 mounted in recesses 78 and 80 in housing sections 46 and 48, respectively.

As shown in FIG. 1, output gear 72 has an elongated hub extension 82 which extends through an opening 84 in casing front section 46. Detachably fixed to hub extension 82 exteriorly of casing 44 is a retainer receiving socket 86. More specifically, the socket is fixed to the gear hub extension by pins 88, which extend through apertures 90 in the socket into grooves 92 in the hub extension and are retained in place by a resilient ring 94.

Casing 44 also houses a driver bit 96 provided with a Philips or other tip 98 adapted to engage a correspondingly configured recess in the fastener onto which a retainer is to be threaded. As shown by FIGS. 1 and 4, bit 96 will typically have a hexagonal cross-sectional configuration and is slidably mounted in a cylindrical bit retainer 100 having a similarly configured hexagonal bore 102 in the forward portion to restrain the bit from rotating, while being slidable in the retainer. The rearward portion 103 of the bore in retainer 100 is enlarged for ease in changing bits, and to accommodate retaining ring 110. This allows bit 96 to slide forward axially in retainer 100 until retaining ring 110 encounters hexagonal bore 102. This encounter prevents bit 96 from falling out the forward end of the tool, when not engaging a fastener.

Driver bit 96 is biased to the left as shown in FIG. 1 by a spring 108, which abuts the end of driver bit 96. The opposite end of the spring abuts a washer 112 fixed in recess 106 by a retainer 114.

In order to change bits, retainer 114 is removed from the rear of the attachment, releasing washer 112 and spring 108. This clears the bore for the removal of driver bit 96 and its replacement.

To thread a retainer onto a fastener with tool 10, the retainer is inserted in the socket 116 in the forward end of socket member 86 or started on the fastener, and the tip 98 of driver bit 96 is engaged in the shank end of the fastener. Switch 18 is then depressed to energize motor 16, effecting a rotation of socket member 86 through a drive train including motor output shaft 22, gear reduction drive 24, shaft 26, balls 30, sleeve 28, shaft 34, and gears 70 and 72. This threads the retainer onto the fastener, which is held against rotation by driver bit 96. The threading of the retainer onto the fastener continues until the retainer is tightened. At this point, shaft 34 is restrained against rotation by the retainer through socket member 86 and gears 72 and 70. This results in rotary impacts being transmitted to shaft 34 in the manner described above, and these are transmitted through gears 70 and 72 and socket member 86 to the retainer to insure that it is securely tightened.

Many mechanical modifications may of course be made in the exemplary tool 10 illustrated in FIG. 1 without departing from the principles of the present invention. For example, in FIG. 1, attachment 12 is so oriented relative to tool 10 that the axis of rotation of socket member 86 and driver bit 96 is above the axis of rotation of tool output shaft 34. As shown in FIG. 5, the attachment 12 may equally well be so connected to the tool that the first mentioned axis of rotation is below the axis of rotation of tool output shaft 34. Alternatively, the attachment may be so oriented with respect to the tool that this axis of rotation lies to one side of the rotation axis of output shaft 34.

Another modification is the "package" making up the attachment. In the illustration disclosed above, an ordinary im-

pact wrench was adapted by adding an attachment without altering the wrench. The modification would add to that package a replacement 15 for the portion of the housing enclosing the output end of the tool, along with a replacement anvil 34, already coupled internally of the attachment housing to gear 70. Thus, to adapt the impact wrench to this fastener service the operator need only remove the bolts holding the output end 15 of the housing to the tool, remove this end and anvil 34, and replace this with the attachment which would include a substitute output end 15 and a substitute anvil 34, already assembled to the attachment. Replacing and tightening the bolts would complete the changeover.

Other mechanical modifications of the embodiment illustrated in FIG. 1 will also readily occur to those skilled in the relevant arts. Accordingly, to the extent that these are not expressly excluded from the appended claims, they are fully intended to be covered therein.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What I claim and desire to be secured by Letters Patent is:

1. In combination: a rotary impact tool comprising a first casing, a shaft rotatably mounted in and protruding from said first casing, a motor in said first casing, means in said first casing for imparting rotary impacts to said rotatably mounted shaft having an output member drive connected to said shaft and an input member, and means drive connecting said input member to said motor; an attachment for threading retainers onto bolts and other fasteners while holding the fastener against rotation which comprises a second casing having therethrough an aperture through which the rotatably mounted shaft of the rotary impact tool extends, a retainer rotating member, means in said second casing and drive connected to the rotatably mounted shaft of the rotary impact tool for rotating said retainer-rotating member, and means mounted in said second housing for axial, nonrotatable movement and extending therefrom which is engageable with a fastener to prevent rotation of said fastener; and means detachably connecting said second casing to said first casing.

2. The combination of claim 1, wherein the retainer-rotating means includes a gear housed in said second casing and having a hub extension extending to the exterior of said second casing and a retainer-engageable socket member detachably fixed to said hub extension.

3. The combination of claim 2, wherein the means for rotating the retainer-rotating member comprises a second gear in said second casing which is meshed with the first-mentioned gear, said second gear being journaled on the rotatably mounted shaft of the rotary impact tool and fixed to said shaft for rotation therewith.

4. The combination of claim 2, wherein the means for preventing rotation of the threaded fastener includes a sleeve-like retainer fixed in and against rotation relative to said second casing and extending through said hub extension, a driver bit having one end thereof configured to fit in an aperture in the shank end of a fastener to prevent rotation of the fastener, said driver bit being slidable in but nonrotatable with respect to said sleeve-like retainer, and resilient biasing means in said retainer urging said driver bit in a fastener engaging direction.

5. In combination: a rotary impact tool comprising a first casing, a shaft rotatably mounted in and protruding from said first casing, a motor in said first casing, means in said first casing for imparting rotary impacts to said rotatably mounted shaft including an output member drive connected to said rotatably mounted shaft and an input member, and a reduction drive drive connecting said input member to said motor; an attachment for threading retainers onto bolts and other

5

fasteners while holding the fastener against rotation which comprises a second casing having therethrough an aperture through which the rotatably mounted shaft of the rotary impact tool extends, a first gear housed in said second casing and having a hub extension extending to the exterior of said casing, a retainer engageable socket member detachably fixed to said hub extension, means for rotating said first gear comprising a second gear in said second casing meshing with said first gear, said second gear being journaled on and drive connected to the rotatably mounted shaft of the rotary impact tool, a sleeve-like retainer in and fixed against rotation relative to said second casing and extending through said hub extension, a driver bit having one end thereof configured to fit in an aperture in the shank end of a fastener to prevent rotation of the fastener, said driver bit being slidable in but nonrotatable with respect to said sleeve-like retainer, and resilient biasing means in said retainer urging said driver bit in a fastener engaging direction; and means detachably connecting said second casing to said first casing.

6. The combination of claim 5, together with means positioning said attachment relative to said rotary impact tool which comprises a boss on said first casing configured to fit in the recess in the second casing through which the rotatably mounted shaft of the rotary impact tool extends.

7. An attachment adapted to be employed in conjunction

6

with a tool having a rotatable driven shaft protruding therefrom, comprising a casing; a first gear having a noncircular central bore therethrough rotatably supported in said casing, there being an opening in said casing in alignment with said bore through which the tool shaft is adapted to be inserted to provide a drive connection to said first gear; a second gear in said casing in mesh with said first gear, said second gear having an integral hub portion protruding through said casing to the exterior thereof; a retainer receiving member detachably fixed to said hub portion exteriorly of said casing; and a fastener engaging member slidably mounted in said casing and extending to the exterior thereof through said second gear hub portion, said fastener engaging member being restrained against rotation relative to the casing.

8. The attachment of claim 7, together with a sleeve-like retainer member in said casing and restrained against rotation relative thereto, said retainer member having a noncircular bore therethrough and said fastener engaging member having a cross-sectional configuration matching that of said bore and being slidably disposed in said bore.

9. The attachment of claim 8, together with a spring member disposed in said retainer member and urging said fastener engaging member in a fastener engaging direction.

30

35

40

45

50

55

60

65

70

75