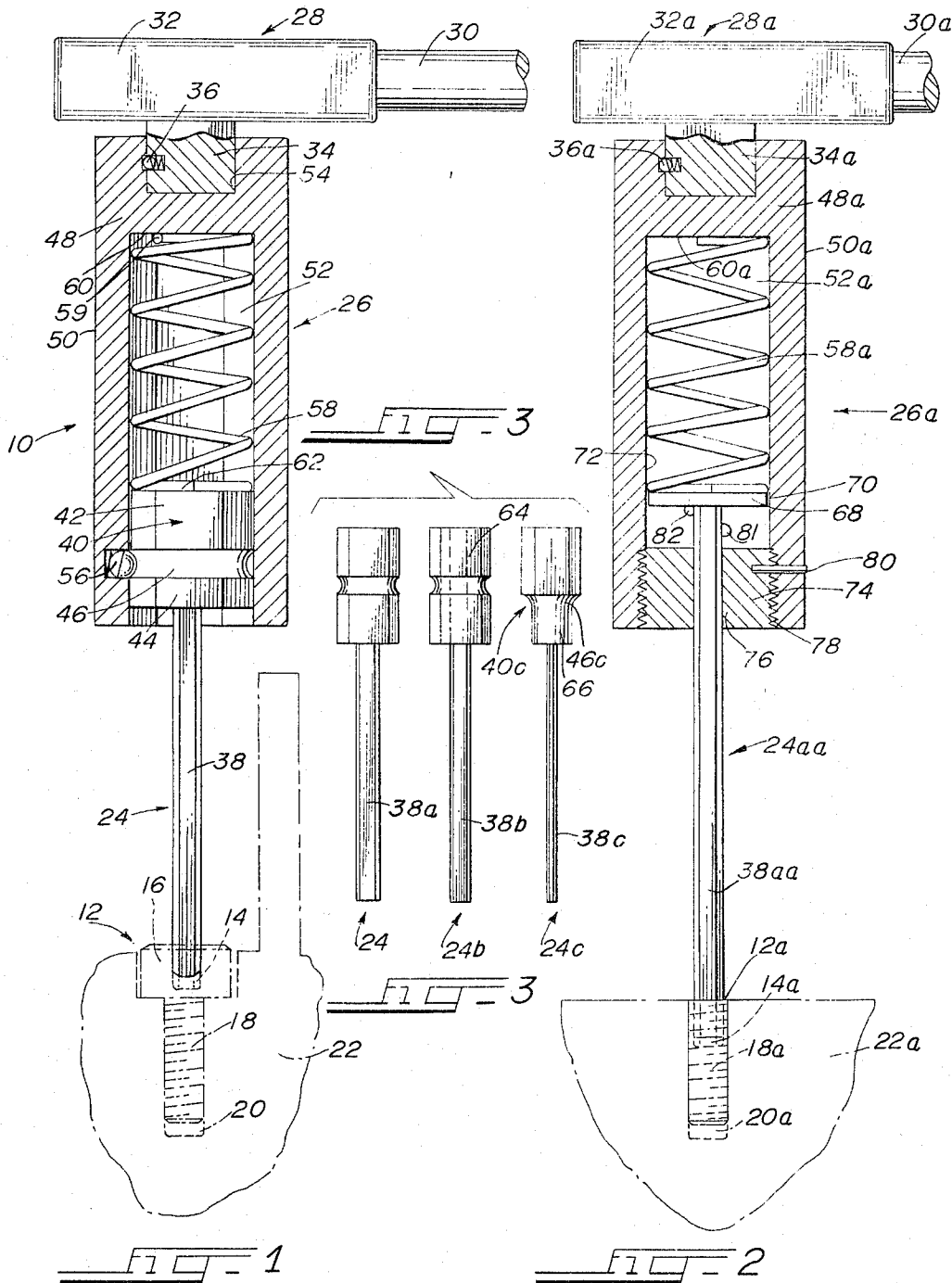


Dec. 6, 1966

H. G. KLATT, JR
ALLEN WRENCH DEVICE
Filed Nov. 18, 1965

3,289,503



INVENTOR.
HENRY G. KLATT, JR.
BY
James T. FitzGibbon
FitzGibbon

1

3,289,503

ALLEN WRENCH DEVICE

Henry G. Klatt, Jr., 5722 S. Elizabeth, Chicago, Ill.

Filed Nov. 18, 1965, Ser. No. 516,193

2 Claims. (Cl. 81-71)

This invention generally relates to a novel tool device and more particularly to the combination of a socket member adapted to receive, on one end, a driving handle, and, on the other end, removably and interchangeably, any one of a number of Allen wrench bits which are slidably mounted in said socket member. These Allen wrench bits are adapted to be received in, and co-act with Allen head type screws for rotating, and thus loosening or tightening them.

As is the case with ordinary bolts, cap screws, and the like, a great variety of sizes of Allen screws are used, and each different size of screw or bolt has an appropriately sized hexagonal recess in its head for receiving the Allen wrench device. An ordinary Allen wrench, as is well known, normally comprises an L-shaped piece of hexagonal stock, containing a relatively short and a relatively long leg, and the entire wrench is made from hexagonal steel stock. In use, one or the other of the legs is inserted in the hexagonal driving recess, and the other leg is gripped by the operator or mechanic, and the bolt or screw is loosened or tightened by applying a rotating force to the leg. Allen wrenches normally come in sets, and each wrench is proportional or congruent to each other wrench, the smaller diameter wrenches having relatively short legs, and the larger diameter wrenches, being used in applications requiring greater forces, have comparatively longer legs. When viewed as a set, these wrenches appear to be of the same relative proportions, the "L's" thus formed having substantially constant ratios of lengths between the longer and shorter legs thereof.

Allen-head screws can be of the ordinary type of screws or bolts, as referred to above, that is, for example, cap screws having a relatively thinner shank portion and a relatively larger head portion. Other Allen-head screws are commonly used as set screws, wherein there is no head portion, properly so called, but only a shank portion, with a hexagonal recess or re-entrant portion in one end thereof, adapted to receive an Allen wrench device of appropriate size.

It is common to use such set screws for locating pulleys, for example, on rotatable shafts or the like. A headless screw of this type has advantages insofar as it has no outwardly extending head, and the screw can be inserted into a threaded or tapped cylindrical bore, and still operated by an Allen wrench, because the diameter of the Allen wrench is smaller than that of the screw. Likewise, the screw of this type may be placed closely adjacent a projection or the like which would otherwise interfere with an attempt to place an ordinary wrench, such as a socket wrench or the like, thereover.

As a corollary of these facts, Allen-head screws or bolts are often used in locations where there is minimal clearance, such as in air conditioner pulleys, and the like. Because the normal Allen wrenches are of the fixed sizes and proportions referred to, it often happens that the short leg of the wrench does not offer enough leverage to loosen a tight screw and the long leg is so long that it interferes with other parts of the machine containing the screw, and the short leg is then of insufficient length to reach the recess in the screw. It also often happens that Allen bolts or screws are sought to be removed efficiently and quickly, but the simple nature of the Allen wrench does not lend itself to quick operation, such as a ratchet operation or drive means, because it is a unitary piece.

It sometimes also happens that the location of the Allen screw is so inaccessible that it is difficult if not impossible

2

to remove the screw, for the reason that there is insufficient room to move the outwardly extending leg of the wrench far enough so that it can be removed and re-inserted in the recess for further turning. Thus, for example, if the wrench cannot be turned at least one-sixth of a turn (60°), it is obvious that the wrench cannot be effectively re-inserted for further turning. With larger tools, this is normally no problem, because the ratchet drives used therein have fine teeth, and only a slight movement is needed to pass one tooth of the ratchet, whereupon the wrench handle may be moved back and the loosening or tightening movement repeated. These and other difficulties commonly occur in certain machines, for the reasons pointed out above, and for reasons explained more fully hereinafter.

Accordingly, it is an object of the present invention to provide a novel Allen wrench device which may be received in a socket, whereby a ratchet-drive or like handle means may be adapted for use therewith.

It is a further object of the invention to provide a novel socket device which makes possible easier manipulation of Allen wrench devices.

It is a further object of the invention to provide a novel socket device for use in association with a novel Allen wrench, wherein difficulties of prior devices may be overcome, and whereby otherwise inaccessible Allen screws may be conveniently and readily inserted and removed.

It is a further object of the present invention to provide a combination of novel Allen wrench and socket device therefor, whereby, by reason of its novel construction, the handle or driving portion of the wrench is movable relative to the end engaging the bolt or screw.

It is a further object of the invention to provide a unitary Allen wrench device, of novel construction, wherein the Allen wrench device is readily engageable with driving parts of a standard socket wrench set.

Other objects and advantages of the invention will be more apparent when considered in conjunction with the following description of the preferred embodiments of the invention, which I consider to be the best method of applying the principles of the invention, and which are illustrated in the following description and claims, and shown in the drawings, in which:

FIG. 1 is a side elevational view, partially in section, of the Allen wrench device of the present invention;

FIG. 2 is a side elevational view, partly in section, of a modified form of the Allen wrench device of the present invention; and

FIG. 3 is an elevational view of a series of Allen wrenches of the present invention, and suited for use with the device shown in FIGURE 1.

A preferred embodiment of the invention is illustrated in FIG. 1, where there is shown generally at 10 the novel Allen wrench device, which makes possible an operative connection between the operator or mechanic and the Allen screw 12, shown to comprise a hexagonal recess 14 in the head 16 thereof. The screw 12 has a lower threaded or shank portion 18, adapted to be received in a threaded or tapped portion 20 of a substrate 22.

Basically, the novel device comprises two removably engageable units, a wrench unit, shown generally at 24 and a socket unit, shown generally at 26. A ratchet handle 28 or like device to which the socket unit 26 is attached in use is shown to comprise a handle portion 30, a ratchet mechanism-containing portion or head 32, and a square-shaped drive member 34. This member 34 may contain a spring and ball retainer device 36, to secure the socket 26 to the drive member 34. Normally, the ratchet handle is a standard type used by mechanics, and the drive member 34 is $\frac{3}{8}$ of an inch in width. Such a handle 28 is commonly referred to as being a $\frac{3}{8}$ " drive socket wrench ratchet handle.

The novel Allen wrench unit comprises a shank portion 38, of hexagonal cross-sectional configuration, and a larger head portion 40. This head portion contains an upper hexagonal surface portion 42, and a lower hexagonal surface portion 44, and these surfaces are separated by a groove 46, to which reference will be made hereinafter.

FIG. 3 shows three typical wrench units 24 apart from the socket unit 26. The socket unit 26 comprises an outer hollow cylindrical body portion 48, which has a round exterior wall 50, and a hexagonal recess 52 therein. A square opening 54 in the top thereof accommodates the drive member 34 to prevent rotation of the socket unit 26 relative to the drive member 34 during the use of the tool. Contained in the hexagonal recess 52, and near the bottom therein, is a spring and ball retainer 56, adapted to engage the grooves 46 of the wrench unit 24, and thus prevent the wrench unit 24 from falling out of the recess 52.

Also disposed in the hexagonal recess 52 is a longitudinally extending spring 58, which abuts the top wall 60 of the socket unit 26, and extends downwardly to contact the top portion 62 of the wrench unit 24. Normally, this spring 58 is fully extended as shown in FIG. 1, and exerts virtually no pressure on the top portion 62 of the wrench unit 24, but slightly resists upward movement of the wrench unit 24 in the recess 52. The ball and spring retainer 56 normally holds the wrench unit 24 in the position shown in FIG. 1, but the wrench unit 24 may be moved upwardly in the recess 52 until the spring 58 is fully compressed. The length of the bore 52 is about 3 to 4 inches, and thus a vertical displacement of the wrench unit 24 is possible through a distance of about 3 or more inches. The tension on the spring and ball retainer unit 56 is such that the wrench unit 24 is retained in position when inserted in the recess 52, but a slight pressure will allow the wrench unit 24 to be either removed readily or to be further pressed into the recess 52, as for example, when there is relatively little working space between the handle portion 28 and the screw 12. The plurality of wrenches making up a set have identically sized head portions 42, 44, and these are selected to be readily slidable in the recess 52. The recess in the socket body is a standard hexagonal size, preferably $\frac{1}{2}$ inch. Thus, all the wrench heads are $\frac{1}{2}$ inch in size, and the shank portions vary in size from $\frac{1}{32}$ of an inch or smaller up to $\frac{1}{2}$ inch. In this way, the socket body 48 is not much larger than $\frac{1}{2}$ inch in diameter, namely, about $\frac{3}{4}$ inch or less, and the entire unit as assembled may readily be inserted into cramped locations for removing or tightening Allen-head screws. In this manner, there is no outwardly extending leg of the wrench unit to interfere with nearby parts of the machine, and the wrench is operable, by means of the ratchet head handle, even where back-and-forth movement of the handle is severely limited, i.e. 60° or less. The larger head portion of the wrench unit 24 also enables the size of the shank portion of the wrench to be stamped thereon, if desired, for convenience.

Referring now to FIG. 3, there are shown a number of wrenches or bits for use with the novel adapter 26. It will be seen that the wrench sizes of each is different; thus, the shank portions 38a, 38b, and 38c are of different sizes. Other modifications of the bits or wrenches 24 suited for use with the present invention are illustrated in FIG. 3, for example, where one wrench 24b is shown to have phantom lines illustrating a hexagonal recess 64 which is formed therein for receiving a piece of hexagonal stock which comprises the shank portion 38 thereof. Another wrench or bit is also illustrated in FIG. 3, and this wrench 24c is shown to have the lower portion of its head 40c in the form of a smaller necked-down portion 66, just below the groove or shoulder 46c.

It will be appreciated that a wrench such as that shown at 24a will not offer resistance to upward movement in

the recess 52 other than that caused by the spring 58, whereas a wrench 24 such as that shown in the other figures will have some resistance to upward displacement by reason of the contact of the ball and spring retainer 56 with the lower hexagonal portion 44 situated below the groove 46.

The removability of the wrenches 24, 24a, 24b, and 24c will be thus seen to make possible a number of advantages in use, namely, that the wrench or bit 24 may be manipulated by hand and inserted in a screw 12, and the handle portion 28, including the socket unit 26, placed thereover. Alternatively, the socket unit 26 and the wrench unit 24 may be placed into the screw 12, and the socket handle 28 then engaged with the socket unit 26.

It is particularly advantageous, when the screw 12 is located in a deeply recessed position, to place the wrench 24 into the socket first, as the socket will retain the wrench 24 by reason of the action of the ball and spring retainer 56. The bottom of the wrench 24 may be raised relative to the socket 26 by exerting downward pressure on the handle 28, thus forcing the top 42 of the hexagonal head portion 40 up into the recess 52, and this operation may be performed without any danger of losing the wrench 24 by a corresponding but unwanted downward movement out of the recess 52. Removal of the wrench 24 is easily accomplished by overcoming the restraining force of the ball and spring device 56, however, when this is desired. The use of the ratchet device with the fine ratchet teeth such as are contained in the ratchet portion 32 of the handle 28 allows easy removal of Allen-head screws even where it would be impossible to perform this operation where the access region of the bolt 12 from either side is less than 60°, for the reasons pointed out above.

A second embodiment of the Allen wrench device of the present invention is shown in FIG. 2, where the parts corresponding in function to the parts of the earlier device receive the same reference numerals, but which are distinguished therefrom by the addition thereto of the additional and distinguishing reference character "a."

In FIG. 2, there is shown an Allen screw 12a, a recess 14a therein for receiving the shank portion 38aa of the wrench 24aa, the screw 12a being received by its threaded shank portion 18a in a recess 20a in a machine part 22a. This figure also shows a ratchet wrench 28a with a handle 30a and a head portion 32a. A square drive member 34a is provided, with a ball and spring retainer 36 contained therein. A body portion 48a is provided with an exterior wall 50a.

However, in the embodiment of FIG. 2, somewhat different means are provided for retaining the wrench or bit portion 38aa relative to the socket portion 26a. At the upper end of the shank, wrench or bit portion 38aa of the wrench 24aa, there is provided a relatively movable base 68, situated between the shank 38aa and the spring 58a. The spring contacts the base 68 at one end and a top wall 60a of the recess 52a in the body 48a. In this embodiment of the invention, however, the recess 52a is circular, the edge 70 of the base 68 is relatively thin, and the base is also circular to provide a smooth contact with the inner wall 72 of the recess 52a. Alignment of the shank 38aa of the wrench 24aa is accomplished by stabilizing means in the form of a guide member 74 with a suitably formed hexagonal bore 76 therein. Threads 78 are shown provided in the guide member 74 to illustrate the manner in which the wrench unit is constructed, but it will be understood that means in the form of a pin 80 or the like are provided to prevent rotation of the guide member 74 relative to the motion of the socket 26a, which would defeat the function of the invention.

Means in the form of an ear 81 prevent the wrench 24aa from falling downward through the guide 74. Such means may also be in the form of a welded or soldered

5

joint 82 attaching the shank 38a to the base 68 to prevent the wrench 24aa from falling downward through the opening 76 in the guide.

An embodiment such as that shown in FIG. 2 is desired when the operator or mechanic wants only one or two tools and has normally only one or two common size shanks 38, 38a in his tool box, and yet wishes the advantages of adjustment, leverage, and the like provided by the present invention without the need for having an entire set of bits or wrenches 38a, 38b, 38c, etc., as would be desired by other operators with a greater variety of working conditions and machines. This embodiment will be seen to provide the up and down motion which is necessary for reaching comparatively inaccessible screws or bolts, and also provides a hexagonal surface 76 to transfer the torque or twisting force to the bolt 12a, which is shown in FIG. 2, as a typical set screw or the like without any separate head portion.

Whereas the retention of the spring 58a in the recess 52a is accomplished by the provisions of the base 68, in the embodiment of FIG. 1, the spring is prevented from falling out of the recess 52 by attachment means, in the form of a weld or solder 59, which attaches the spring 58 to the top wall 60.

It will thus be seen that the present invention possesses a number of advantages over the devices of the prior art, all of which render the removal and installation and tightening of inaccessible Allen-head bolts and screws much simpler than has been possible heretofore, and it does so by a relatively simple and ingenious means which does not require great expense or involve delicate parts or complex structures.

The directions as referred to herein and as used in the appended claims, namely, "top," "bottom" and the like, refer to the environment in which the invention is shown in the drawings, and not necessarily to the invention in its positions of use, which may vary considerably, as can be understood.

It will thus be seen that the present invention provides a new and improved Allen wrench device and thus has numerous advantages and accomplishes its intended objects, including those set forth above, as well as those inherent in the invention. It is understood that certain variations and changes may be made by those skilled in the art without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. An Allen wrench apparatus of the character described, comprising, in combination,

(a) a socket wrench body including

(1) a socket portion entering the upper end of said body, said socket portion being removably attachable to the drive means of a standard socket wrench,

(2) a longitudinally disposed central cavity entering said body from the bottom thereof and having a polygonal cross section, said central cavity

6

being of uniform size throughout its entire extent,

(b) spring means disposed in said central cavity, and
(c) a solid, one piece Allen wrench bit slidably mounted centrally in said cavity, said Allen wrench bit comprising

(1) a solid, lower, screw-engaging portion which is narrower than said central cavity, and

(2) a solid, upper head portion, said head portion being larger than said screw engaging portion, of the same cross sectional configuration as said central cavity, and sized for snug engagement therein, said head portion being adapted to engage one end of said spring means, said head portion further including a cut out portion therein, and means contained in the lower end portion of said central cavity for engaging said cut out portion to prevent said bit from falling freely from said cavity, but for allowing said bit to be removed therefrom.

2. An Allen wrench apparatus of the character described, comprising, in combination,

(a) a wrench body including

(1) an upper socket portion which is removably attachable to the drive of a standard socket wrench,

(2) a cylindrical bore of uniform diameter throughout its entire extent disposed in said wrench body and extending centrally of said body from the lower end thereof,

(b) spring means disposed in said cylindrical bore,

(c) plug means for the lower end of said bore, said plug means being removably locked to said body and having a polygonal opening extending axially there-through, and

(d) a solid, one-piece Allen wrench bit unit, said Allen wrench bit unit comprising

(1) substantially circular spring engaging means adapted to engage the lower portion of said spring means, and

(2) a shank portion, said shank portion being smaller than said cylindrical bore, and of the same configuration as and size to snugly engage, said polygonal opening in said plug unit.

References Cited by the Examiner

UNITED STATES PATENTS

1,493,983	5/1924	Hurley	81—177.60 X
2,621,688	12/1952	Wales	81—71 X
2,651,230	9/1953	Waterval	81—177.6 X
2,713,281	7/1955	Poteet	81—177.2
2,735,325	2/1956	Rudd	81—71

WILLIAM FELDMAN, *Primary Examiner*.

JAMES L. JONES, Jr., *Examiner*.