

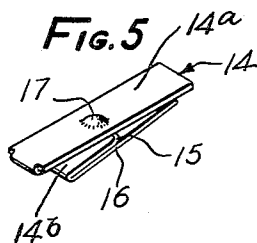
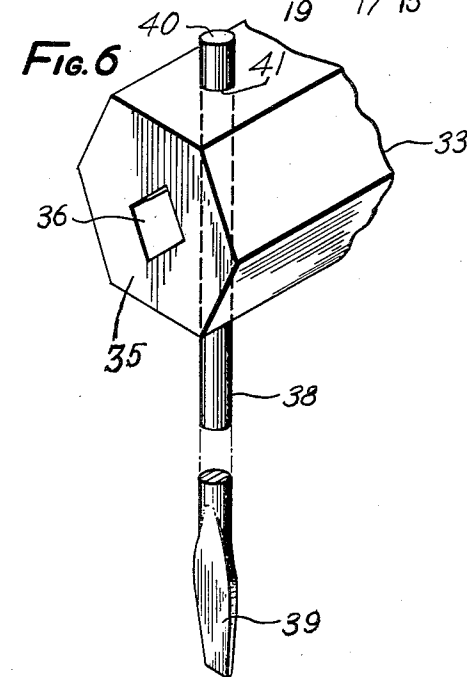
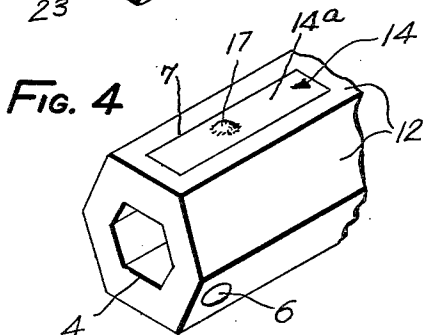
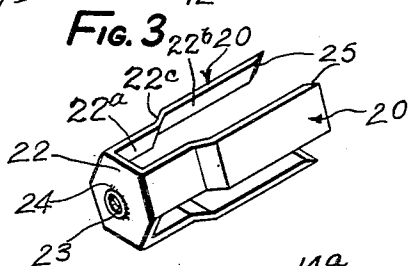
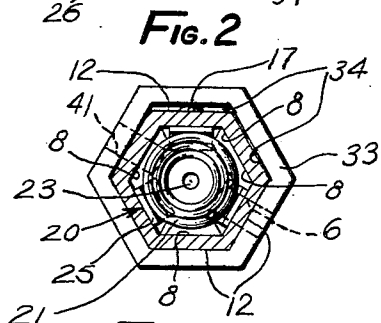
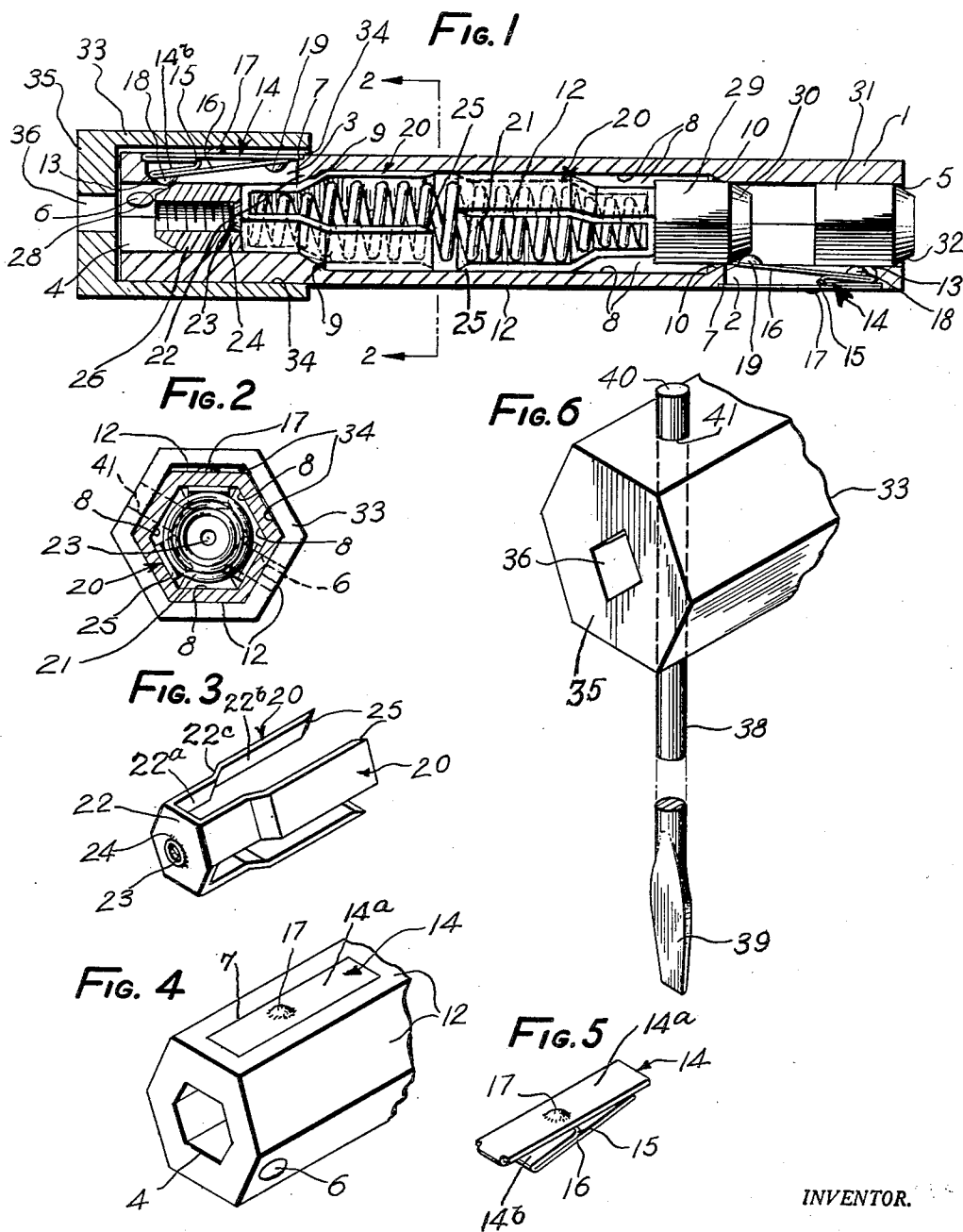
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AUTOMATIC LUG WRENCH

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AUTOMATIC LUG WRENCH

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4 Claims. (Cl. 81-125)

This invention relates to wrenches, of the type employed for removing nuts and bolts from the hubs of cars or the like.

It is an object of the present invention to provide a wrench for removing nuts and bolts from the hubs of cars or the like which is entirely automatic, and can be operated either manually or by a reversible electric motor, or other source of power.

It is another object of the present invention to provide a wrench of the above type that will either telescopically receive and store nuts therein or will dispense them onto bolts in rapid fashion, and that has novel nut-retaining leaf-spring-mounted detents and novel coil-spring followers.

Other objects of the invention are to provide an automatic lug wrench which is of simple construction, has a minimum number of parts, is inexpensive to manufacture and efficient in operation and use.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a longitudinal vertical sectional view of a preferred embodiment of the present invention;

Fig. 2 is a transverse sectional view taken along the line 2-2 of Fig. 1;

Fig. 3 is a perspective view of one of the coil-spring-retaining members forming a part of the invention;

Fig. 4 is a fragmentary perspective view of one end of the wrench housing;

Fig. 5 is a perspective view of one of the leaf springs forming another part of the invention; and

Fig. 6 is a fragmentary perspective view of the drive socket forming a part of the invention and illustrating the manual operation of the same.

Referring now to the drawing, 1 represents a wrench barrel or housing of elongated shape having an exterior, hexagonal surface 12, substantially as illustrated.

The barrel 1 is provided with a central, enlarged hexagonal bore 8 which merges at one end into a truncated pyramidal bore 9 that, in turn, merges into a reduced hexagonal socket 4, the socket 4 extending through said one end of the barrel 1. The other end of the central hexagonal bore 8 likewise merges into a tapered bore 10 which, in turn, merges into a reduced hexagonal socket 5, the socket 5 being of greater diameter than the socket 4.

The barrel 1 is provided at opposite ends with oppositely disposed, elongated, longitudinally extending, substantially rectangular, through slots 2 and 3 which communicate respectively with the sockets 5 and 4. The outside perimeters of the slots 2 and 3 are provided with shoulder-forming rabbets 7; and the outermost ends of their inside perimeters are provided with retaining ledges 13.

The barrel 1 at opposite ends is provided with a pair of laterally aligned openings 6 therethrough for a purpose which will hereinafter become clear.

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Nuts 26 are slidably positioned within the hexagonal socket 4 while somewhat larger nuts 29 and 31 are slidably positioned within the hexagonal socket 5.

It will be noted that the hexagonal sockets 4 and 5 prevent relative rotational movement between the nuts 26, 29 and 31 and the barrel 1 with respect to the longitudinal axis of the barrel.

A pair of substantially M-shaped leaf springs indicated generally at 14 are provided and include enlarged, rectangular outer leaves 14a (Fig. 5) which are adapted to be received within the rabbets 7 of the slots 2 and 3, the outer leaves 14a being formed with the outwardly pressed protrusions 17. The outer portion 14a at one end is integrally formed with an inwardly bent, U-shaped central portion 14b having a fulcrum bend 15, which is in turn integrally formed with an inner movable leaf 16 having inwardly pressed protrusions 18 and 19 at opposite ends thereof, the retaining ledges 13 at the outermost ends of the slots 2 and 3 preventing movement of the leaves 16 into the sockets 4 and 5, as will be obvious. It will be noted that the outermost protrusion 18 is adapted to abut a conical surface of an outermost nut, such as the conical surface 28 of a nut 26, as shown at the left-hand end of Fig. 1, while the protrusions 19 are adapted to abut the conical surfaces of following nuts, such as the surface 30 of a nut 29 at the right-hand end of Fig. 1. The outer leaves 14a of the leaf springs 14 are frictionally secured within the rabbets 7, although other fastening means may be employed. It will also be noted that the inner leaves 16 of the leaf springs 14 are adapted to move alternately from the position at the left-hand end of Fig. 1 to that shown at the right-hand end about the fulcrum bends 15.

A pair of complementary three-sided spring retainers indicated generally at 20 are provided and each includes a hexagonal end wall 22 and three side arms integrally formed therewith and extending at right angles thereto along three alternate edges, each of the side arms having a first straight portion 22a integrally connected to, and offset from, a second straight portion 22b by an inclined shoulder 22c (Fig. 3), free ends of the second straight portions 22b being beveled outwardly, as at 25. As shown in Fig. 1, the spring retainers 20 are slidably positioned within the central bore 8 at opposite ends thereof and are limited against outward displacement therefrom by the abutment of the inclined shoulders 22c with the tapered bores 9 and 10. It will also be noted that the three side arms of one of the spring retainers 20 are 60 degrees out of phase with the three side arms of the other spring retainer so that they can intermesh when forced together by an accumulation of nuts within the central bore 8. Each of the outer end walls 22 of the spring retainers 20 is formed with a central, circular opening 23 outwardly pressed and defining a conical ridge or fillet 24 which is adapted to be received within the inner end of an innermost nut, such as the nut 26 or 29.

It will be noted that the nut 31 is provided with a conical surface 32 which abutted the protrusion 19 when the nut 31 was in the position now shown in Fig. 1 as occupied by the nut 29.

The spring retainers 20, and more particularly the fillets 24 thereof are urged outwardly against the nuts 26 and 29 by means of a coil spring 21, the main central body of which is disposed within the offset portions 22b of the three side arms of the spring retainer 20, and is formed near each end with tapered portions that abut the tapered shoulders 22c of the spring-retainer side arms, said tapered portions merging into reduced-diameter terminal portions which are received within the straight portions 22a of the spring-retainer side arms. Thus, it will be seen that the nuts 26 and 29 are biased toward the hexagonal sockets

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4 and 5 by the spring 21 acting through the spring retainers 20, that expulsion of the outermost nuts is prevented by the protrusions 18 of the spring retaining members 14, and that entry of a following nut into its hexagonal socket is prevented by the associated protrusion 19 of the spring retaining member 14 whenever an outermost nut is being withdrawn from its socket as shown at the right-hand end of Fig. 1.

A hollow, hexagonal drive socket 33 having a hexagonal interior surface 34 is adapted to slidably receive therewithin either end of the barrel 1, the drive socket being open at its inner end to permit such reception and being formed at its outer end with a hexagonal end wall 35 having a central angular opening 36 adapted to receive the correspondingly shaped end of a drive shaft of a reversible electric motor or the like when it is desired to operate the device by power. The protrusion 17 will engage frictionally the interior surface 34 of the drive socket to retain the socket on the barrel, as will be obvious. The socket 33 is also provided with a pair of oppositely disposed laterally aligned openings 41 aligned with the openings 6 in the barrel and adapted to receive therethrough a lever bar 38 for rotating the barrel manually, the lever bar 38 having a blunt end 40 and a screw driver bit 39 at the other end. In Fig. 1, the hexagonal interior surface 34 of the socket is shown receiving one end of the barrel 1.

In operation, as shown in Fig. 1, the nut 31 and the hexagonal socket 5 of the barrel 1 are placed over and in longitudinal alignment with a threaded stud, not shown, onto which the nut 31 is to be screwed. The barrel 1 is then rotated in a clockwise direction about its longitudinal axis by means of the bar 38 during manual operation or by means of the drive opening 36 during power operation until the nut 31 is screwed fully onto the stud. This function being completed, the barrel is then backed off of the nut, thereby leaving the nut upon the stud. As the nut was moving out of the socket 5, it depressed the protrusion 18 and thereby rocked the protrusion 19 into the path of the following nut 29 to temporarily prevent entry of said following nut into the socket. After the nut 31 is removed from the barrel, the protrusion 18 is freed and the leaf spring 14 pivots about the fulcrum 15 to release the protrusion 19 from the following nut 29 so as to permit the coil spring 21 and the spring retainer 20 to propel said following nut 29 into the position formerly occupied by the outermost nut 31. When the last nut enters the socket 5, the outward travel of the spring 21 and its retainer 20 is limited by the abutment of the inclined shoulders 22c with the tapered bore 10. The same process is reversed for the removal of nuts from a stud. In this case, the barrel 1 will be rotated in a counterclockwise direction after the hexagonal socket 5 has been placed on the first nut to be removed. In like manner a second nut can be removed, and the entry of the second nut behind the protrusion 18 simultaneously moves the first nut back against the spring action of the spring 21 and behind the protrusion 19 of the leaf spring 14. Thus, it will be noted that the barrel not only dispenses nuts but stores nuts therewithin.

The operation described above also applies to the left-hand end of the barrel, in which case the drive socket 33 is removed and placed on the right-hand end. It will also be noted that the hexagonal socket 4 at the other end of the barrel is of smaller diameter than the hexagonal socket 5 whereby to accommodate one or more nuts of smaller size depending upon the make of car.

Referring particularly to Fig. 6, it will be noted that the butt 39 of the bar 38 may also be used as a screw driver or wedge to pry off a hub cap of an automobile. When being used as a screw driver, it is rotated by gripping the socket 33 in the hand and if more leverage is required, the barrel may be inserted into the socket and used as an extension handle.

It will also be noted that any common ratchet-type

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wrench handle, hinge handle or similar object having a square stud of proper dimension to fit within the drive opening 36 may be employed.

Referring to Fig. 1, and more particularly to the left-hand end thereof, it will be seen that the protrusion 18 of the left-hand leaf spring 14 holds the outermost nut 26 in position to be applied to a stud bolt, not shown, providing, of course, that the driving socket 33 is removed and placed on the other end of the barrel.

Referring to the right-hand of Fig. 1, the protrusion 19 of the right-hand leaf spring is shown retaining the nut 29 against outward displacement through the hexagonal socket 5 and preventing it from following the outermost nut 31 as the latter is pulled from the mouth of the wrench. The following nut 29 will be retained in the position shown until the nut 31 is pulled from the wrench, which releases the leaf-spring arm 16 so that it will pivot about the fulcrum 15 to remove the protrusion 19 from the path of the nut 29 and to move the protrusion 18 into said path, in order to permit the nut 29 to be forced outwardly by the spring 21 until the nut is stopped by the protrusion 18 and occupies the normal position of an outermost nut, such normal position being illustrated by the nut 26 at the left-hand end of Fig. 1. The nut 29 is thus retained by the protrusion 18 which previously retained the nut 31. The purpose of this double retaining assembly is to eliminate the possibility of accidentally threading two nuts onto one stud.

The nuts 29 and 31 may be considered as comparable in size to those employed on Ford motor cars, while the smaller nut 26 is comparable to those employed on General Motors products. To use the nut-driving hexagonal socket at either end of the barrel, it is only necessary to place the barrel-driving socket 33 over the opposite end of the barrel.

The offset straight portions 22b of the side arms of the spring retainers 20 act as a stabilizer for the spring retainers themselves and also serve to prevent the complete compression of the spring 21. It will be noted that the free beveled edges 25 will slide over the coil of the spring 21 when the spring retainers 20 are being moved inwardly by nuts passing into the bore 8. The tapered bores 9 prevent jamming by centering any irregularly shaped nuts, and also prevent the spring retainers from being ejected from the mouth of the wrench.

In assembly, the spring retainer at the left-hand end of Fig. 1 is first forced through the hexagonal socket 5 and moved into the left-hand end of the wrench; next, the compression spring 21 is inserted through the socket 5 with the aid of a small instrument passing through the opening 23 of the first spring retainer, and is moved inwardly of the barrel, and then the other spring retainer 20 is compressed and forced into the bore 8 through the socket 5. Once in the barrel, the spring 21 will return the retainers 20 to their normal positions against the shoulders defined by the tapered bores 9 and 10 and the device is ready for use. The spring retainers 20 and the compression spring 21 may be removed by reversing the above operations.

Without departing from the function and scope of the invention, it will be readily apparent that a single-ended, automatic lug wrench of the above type may be provided, if one end of the barrel is formed so that it corresponds in structure to the end closure 35 of the socket drive 33, and is provided with the drive opening 36 as well as the transversely aligned openings 41 to permit the use of the bar 38.

It will be noted that when the spring 21 is compressed sufficiently, the beveled ends 25 of the stabilizing inner side portions 22b will abut the tapered bores 9 and 10 to limit the degree of compression of the spring and thus prevent damage to the same.

While various changes may be made in construction, it will be understood that the invention includes such

minor changes that come within the scope of the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. An automatic lug wrench comprising an elongated barrel having an angular exterior surface, said barrel having at one end an inwardly extending nut-turning socket of angular cross section, said barrel being adapted to slidably receive therewithin and to dispense therefrom, a plurality of nuts of angular cross section, and said barrel having an elongated through slot communicating with the interior of said socket; spring means disposed within said barrel and compressible by nuts entering through said socket; a substantially M-shaped leaf spring having an outer rectangular leaf secured within the outer portion of said slot, a fulcrum portion and an inner arm, an inner face of said arm having protrusions at opposite ends, whereby the outermost of said protrusions will engage the outer end of an outermost nut, and whereby outward movement of such outermost nut will depress said outermost protrusion and thereby rock said inner arm about said fulcrum portion so as to bring the innermost of said protrusions into said bore and into the path of a following nut, so that said innermost protrusion will engage the outer end of such following nut and thus prevent its outward movement into said socket until such outermost nut has entirely passed said first protrusion; and means for rotating said barrel about its longitudinal axis for either screwing an outermost nut onto a stud or unscrewing a nut for storage within the barrel.

2. An automatic lug wrench according to claim 1, a central portion of said barrel having an enlarged bore of angular cross section communicating with said nut-turning socket through a tapered bore defining an inclined shoulder; said spring means comprising a coil spring positioned within said enlarged bore and having a tapered intermediate portion and a reduced terminal portion adapted to extend into said socket; a spring retainer comprising a polygonal end wall adapted to slide within said socket, and angularly spaced side arms extending at right angles from said end wall; said side arms having first straight portions also slidable within said socket, intermediate tapered portions defining shoulders adapted to abut said tapered bore and to serve as an abutment for the tapered portions of said coil spring, and offset straight portions slidable within said enlarged bore; said side arms enclosing said coil spring and stabilizing the same; free ends of said offset straight portions being beveled to facilitate movement over the coil spring; and said end wall having an outwardly stamped circular opening adapted to fit within the internally threaded bore of an innermost nut.

3. An automatic lug wrench according to claim 2, said means for rotating said barrel comprising a hollow drive socket of angular cross section adapted to slidably receive that end of the barrel opposite to said nut-threading socket, said drive socket having an end wall at the outer end thereof, said last-mentioned end wall having an angular drive opening, said hollow drive socket and said barrel having laterally aligned drive openings, said outer leaf of said leaf spring having a protrusion adapted to frictionally engage the interior of said drive socket; and said drive socket and barrel being selectively driven by a shaft positioned in said drive opening, and by an elongated, manually operated lever bar disposed through said laterally aligned openings.

4. An automatic lug wrench according to claim 3, said barrel at said end opposite to said nut-turning socket having a second inwardly extending, nut-turning socket of angular cross section intermediate in size to said first nut-turning socket and said enlarged bore and communicating with the adjacent end of said enlarged bore through a second tapered bore providing a second inclined shoulder, said second nut-turning socket being adapted to receive therewithin nuts of a different size than are received in said first socket, said coil spring extending along said enlarged bore and being formed at that end adjacent said second tapered bore with a second tapered portion which likewise terminates in a reduced terminal portion and is adapted to be received within said second nut-turning socket; a second spring retainer similar in structure and function to said first spring retainer, but having its side arms staggered with respect to said first-mentioned side arms so as to permit compression of said spring under extreme tension and to limit said compression by the abutment of the free ends of said offset straight portions with said first and second tapered bores; said barrel at said opposite end having a second, elongated through slot communicating with said second nut-turning socket; a second M-shaped leaf spring, similar in structure and function to said first-mentioned leaf spring, positioned within said second through slot; said barrel at said opposite end thereof also having laterally aligned openings adapted to be aligned with said drive-socket openings to permit either nut-turning socket of the wrench to be used.

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