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GEAR OPERATED POWER WRENCH

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Fig. 1

Fig. 2

Fig. 3

Fig. 4

2 Sheets-Sheet 1
My invention relates to improvements in power wrenches of the socket type for tightening nuts, bolts and for similar purposes.

The primary object of my invention is to provide a gear operated wrench of the above type adapted to be driven by a motor or operated by hand as a ratchet wrench.

Another object is to provide for shortening the wrench for operation in restricted spaces either by motor, or by hand, as a ratchet wrench.

Still another object is to provide in such a wrench an efficient practical, antifriction gear drive in the wrench head for a socket driving shaft.

Yet another object is to provide for ratchet operation of the wrench by a handle, or by power drive by a motor attached to the handle and operatively connected to the socket driving shaft for power drive of said shaft.

Yet another object is to provide for dispensing with the handle and attaching a motor to the head in driving relation to the socket driving shaft so that the wrench may be shortened and the motor used as a handle for ratchet operation of said shaft or power drive thereof selectively.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a view in plan of my improved wrench equipped with the handle and the motor attached to the handle;

Figure 2 is a view in side elevation of the same with the motor detached from the handle;

Figure 3 is an enlarged view in longitudinal section partly broken away and taken on the line 3—3 of Figure 1;

Figure 4 is a view in plan of the wrench with the motor attached to the wrench head;

Figure 5 is an enlarged fragmentary view taken on the line 5—5 of Figure 4;

Figure 6 is a view in horizontal section taken on the line 6—6 of Figure 5;

Figure 7 is a view in transverse section taken on the line 7—7 of Figure 3, and

Figure 8 is a view in transverse section taken on the line 8—8 of Figure 5.

Referring to the drawings by numerals, my improved wrench comprises a substantially tubular head 1 having a radial neck 3. The neck 3 is provided with a threaded socket 5 in its outer end, a smooth bearing socket 7 in its inner end coaxial with the socket 5 and an annular internal shoulder 9 between said sockets 5, 7 all for a particular purpose presently seen.

The head 1 is provided therein with transmission means for rotating the usual hexagonal socket driving shaft 33 for attachment to standard socket members, not shown. The transmission means designated generally by the numeral 11 comprises a bevel gear 13 within said head 1 having a hub 15 fitted and journaled in the bearing socket 7. The bevel gear 13 meshes with a bevel gear 17 in the end of the head 1 concentric thereto and having a separate sleeve hub 19 to which said gear is connected by pins 21.

The bevel gear 17 and hub 19 are fitted between the inner race members 22 of a pair of ball bearing units 23 fitted in the ends of the head 1 and removably held therein by a pair of concentric annular keeper plates 25 recessed in and secured by screws 27 to the ends of said head 1. The pins 21 are suitably fixed to the inner race members 22 so that the bevel gear 17 and hub 19 and inner race members 22 rotate as a unit.

A pair of bushings 29 are press fitted in the inner race members 22. The bushings 29 as shown in Figure 6 are internally hexagonal in cross-section, as are also the bevel gear 17 and its hub 19 as shown in Figure 3, and form an axial socket 31 for a hexagonal relatively longer wrench socket driving shaft 33 adapted to be inserted endwise in the socket 31 to extend from one end of the head 1 out of the outer end of said head. The shaft 33 is provided with end friction ball detents 35 for holding the same in place and holding the extending end of the shaft in a wrench socket or the like, not shown.

A pair of stop disks 37 are pivoted by screws 39 on the keeper plates 25 for swinging over either end of the shaft 33 to limit insertion of the same into the socket 31.

The handle 41 is tubular with a hand grip 43 on its rear end, a reduced threaded front end 45 threaded into the socket 8 and securing a removable ball bearing unit 47 in said socket 5 against the shoulder 9, said handle having an internally threaded socket 49 in its rear end provided with another ball bearing unit 51 therein.

A drive shaft 55 extends through and out of the handle. The drive shaft 55 has a reduced front end 57 journaled in the ball bearing unit 47 and which is removably inserted with a spline driving connection, as at 59, in the hub 15 of the bevel gear 13. A reduced rear end 61 on the drive shaft 55 is journaled in the ball bearing unit 51 and through the bearing 53.

An electric motor 63 of any conventional type extends rearwardly from the handle 41 and has its power shaft 65 drivingly detachably connected to the rear end 61 of the drive shaft 55 by a suitable spline connection 66 and a suitable chuck designated 67 having a reduced end 68 threaded into the socket 49 against the ball bearing unit 51.

A ratchet toothed bar 69 is pivoted at one end, as at 71, in the head 1 to engage the teeth of the bevel gear 17 and is locked by a leaf spring 73 thereon fastened, as at 75, to the head 1 so that rotation of the head 1 in one direction rotates the bevel gear 17 in the same direction.

To shorten the wrench, the motor 63 is detached from the handle 41, the handle 41 is detached from the socket 5, which is to say the neck 3, the drive shaft 55 is pulled loose from the hub 15 of the bevel gear 13 and chuck 67 unscrewed from the socket 49. A shorter drive shaft 77 is substituted for the drive shaft 55 a plug 53 is screwed into the socket 5 to hold the ball bearing unit 47 in place. An electric motor 79 is provided in this instance having a reduced bored front end 81 adapted to be screwed over the drive shaft 77 and threaded into the socket 5 as shown in Figure 5 so that the motor 79 serves as a short handle for the head 1. The motor 79 is provided with a power shaft 83 having a front end splined socket 85 adapted to slip over a splined rear end 87 on the drive shaft 77.

In operation the handle 41 or motor 79 is swung clockwise as indicated by the arrows in Figures 1 and 3 to correspondingly rotate the head 1 as indicated by the
The ratchet bar 69 rotates the bevel gear 17 correspondingly to rotate the socket driving shaft 33. Under swinging of the handle 41 or motor 79 in the opposite direction, the ratchet bar 63 ratchets over the bevel gear 17. Thus the wrench is usable as a hand wrench.

The motors 63, 79 operate the drive shafts 55, 77 in a direction to rotate the bevel gear clockwise as viewed in Figure 3 for corresponding rotation of the socket driving shaft 33, the ratchet bar 69 ratcheting over said gear 17 but acting as a brake to retard idle spinning of the gear 17 and socket driving shaft 33.

As will be clear the socket driving shaft is inserted in the socket 31 from one end of the head for power drive clockwise but may be inserted from the other end and the wrench inverted for power drive of said shaft 33 counter-clockwise.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A wrench including a tubular head having a radial neck, a pair of spaced anti-friction bearing units secured in opposite ends of said head each having a rotary inner race member, a bevelled gear in said head having a hub bearing against one inner race member, a sleeve between said hub and the other inner race member bearing against and spacing the inner race members and maintaining the hub against the first named inner race member, said inner race members, hub and sleeve being internally polygonal to form a polygonal rotary driving socket for a polygonal wrench socket driving shaft slideable into the polygonal socket from either end of the head, pins fixed to said inner race members and extending through said hub and sleeve to maintain said inner race members, hub and sleeve in socket forming alignment, and a power shaft for driving said socket driving shaft extending through and out of said neck and operably connected to said bevelled gear within said head.

2. A wrench as in claim 1, said annular plates fixed in the ends of said head and coaxially apertured to receive the polygonal driving shaft for securing said bearing units in the head.

3. A wrench as in claim 2, and a pivoted stop disc on each of said plates swingable over the aperture therein for closing the polygonal socket at that end of the head to form an abutment for said polygonal shaft at either end of the tubular head.

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