March 18, 1930. H. A. THOMPSON 1,750,825

POWER DRIVEN WRENCH

Filed Nov. 12, 1926

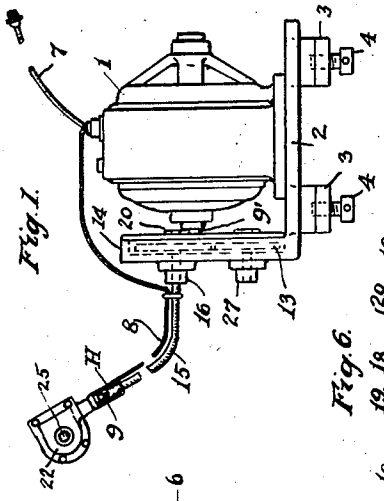


Fig. 1.

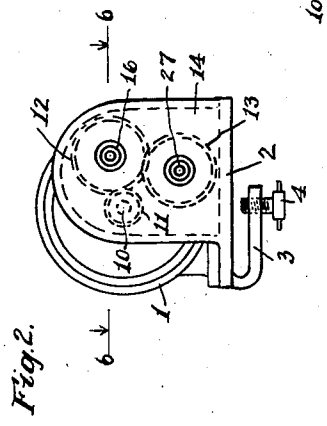


Fig. 2.

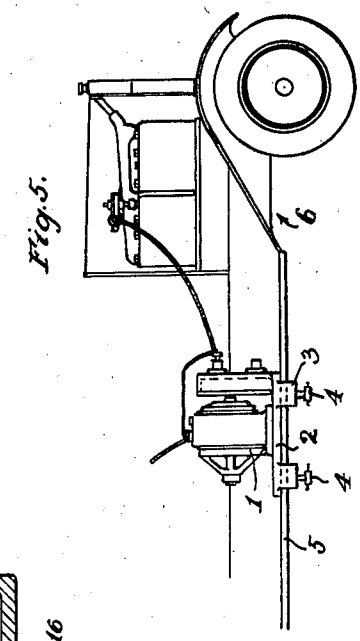


Fig. 5.

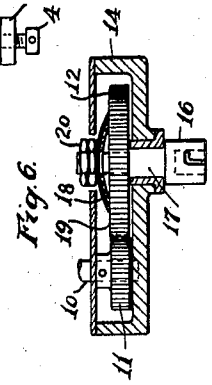


Fig. 6.

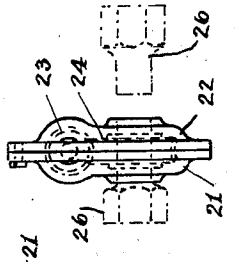


Fig. 4.

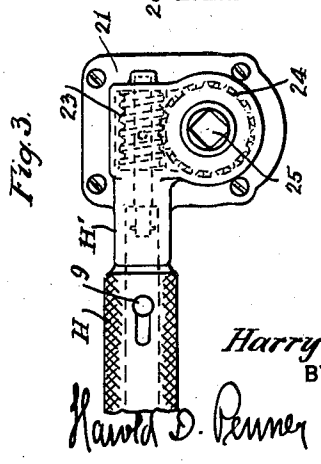


Fig. 3.

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UNITED STATES PATENT OFFICE

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POWER-DRIVEN WRENCH

Application filed November 12, 1926. Serial No. 147,973.

My present invention relates to an improvement in power actuated wrenches, and has for its object the provision of means whereby nuts and bolts may be set or removed by power actuated means at speed.

One advantage of this form of structure is that in most instances a large proportion of nuts and bolts on any machine assembly may be easily and quickly assembled and disassembled in desired locations.

Another advantage of my device is that owing to my construction right and left hand wrench motion is readily accomplished without having to change mechanisms therefor.

A further advantage relates to the manner in which by a simple speed reduction device, power is obtained to overcome the initial or final torsions required to start or tighten nuts and bolts, from a high initial speed device.

Due to the foregoing arrangement and the location of the reduction means, a flexible shaft may be used to transmit the power from a power source, without undue straining or overload.

Further advantages lie in the convenient arrangement of the control of the power source, and the provision of an adjustable means for setting the mechanism to accommodate overloads upon the drive shaft and wrench portions, permitting a slippage to automatically occur upon occasion of the sticking of nuts and bolts, beyond the capacity of the device to loosen or tighten the same.

These and other capabilities will be apprehended as the description proceeds, and I do not desire to be held to the details hereof, as it is obvious that modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

In the drawings accompanying, Fig. 1 is a side view of my apparatus in complete assembly;

Fig. 2 is a front or gear end view thereof;

Fig. 3 is a side view, enlarged of the wrench end;

Fig. 4 is an end view thereof;

Fig. 5 shows my device in operative position upon an automobile, as an instance of one form of use; and

Fig. 6 is an enlarged sectional view of the gear and clutch mechanism taken on the line 6—6, Fig. 2, looking in the direction of the arrows.

In my embodiment, and as a preferred form of primary power, I utilize an electric motor 1, of suitable power, this being suitably mounted upon a base plate 2, the base plate having a clamp means thereon comprising a pair of clamp arms 3 with clamping screws 4, whereby to affix the mounted assembly to some convenient anchorage, such as the running board 5 of an automobile 6.

The motor 1 is provided with a suitable electric current tapping means 7, this being a socket and lead wire, and an extension of this wiring, as at 8, Fig. 1, runs to the handle H of the wrench, there terminating in control, or button, switch 9. This provides means at the wrench end of my device to quickly and conveniently stop and start the motor, during operation. The motor, obviously, may be plugged in at any convenient tap.

The motor armature shaft 9′, Fig. 1, at its front end is provided with an extension 10, Fig. 6, which is keyed to the first gear 11 of a train of gears, including 12 and 13, all of which are mounted for rotation in bearings located in a gear housing 14, which is operatively mounted upon the base plate 2, in associated relation to the motor 1.

The gear train acts to partially reduce the rotative speed of the motor to a flexible power transmitting shaft 15, of desired length, by means of a shaft coupling 16, associated with gear 12, which gear is bored to rotatively receive therein the shank 17 of the coupling 16, the opposite end of which coupling is provided with a series of superimposed, flexible, cupped friction disks 18. The friction disks are held in tensioned relation to one face of the gear, as at 19, and are adjustably locked in desired friction driving relation thereto by means of nuts 20 upon the outer end of the coupling shank 17. The purpose of this is that when the flexible shaft 15 is coupled thereto, under load, the cou-

pling and shaft are driven by the frictional engagement between the disks 18 and the gear face 19.

Sudden starts or stops of the friction shaft by reason of the load thereon, are absorbed by this arrangement especially in tightening nuts into firm engagement upon their respective studs.

The wrench portion of my device, Figs. 3 and 4, comprises a split housing of two parts 21, 22 joined together by screws, as shown in Fig. 3, and rotatably mounts therein a worm 23 in mesh with a worm wheel 24. The worm wheel has, preferably, a squared bore 25 therein in which to receive, from either side suitable socket wrenches 26, shown dotted, the square shanks of which engage in said bore, to be driven by the rotation of the worm wheel.

The worm 23 is in operative engagement with the transmission shaft 15, Fig. 3, so that rotation of the motor 1, causes the wrench 26 to be powerfully turned, at reduced speed, through the gear train 11, 12 rotating in one direction, or 13 rotating in direction opposite to 12 and the worm gear reduction 23, 24.

The worm housing 21, 22 has an extension H', into which the flexible shaft 15 is borne, and said extension forms a handle whereby to manipulate the wrench as desired, and also provides a suitable support for the motor circuit switch 9 for ready manual manipulation and as shown at Fig. 1.

In a characteristic use of this device the drive apparatus may be clamped to the running board of a vehicle, Fig. 5, and a suitable standard socket wrench being selected, placed on the desired nut, the wrench 26 placed thereon and the motor started. This causes the nut to be turned, for loosening or tightening, in a rapid manner. When tightening nuts, upon the nut reaching a firm seat, the friction drive 18 slips, thus relieving the motor, after which the motor is stopped.

Right hand rotation of the wrench may be accomplished by coupling the flexible shaft 15 with the gear 12, the gear 13 then rotating idly; left hand rotation of the wrench may be accomplished by using the wrench itself from either side, turned about, or the flexible shaft 15 may be coupled with the gear 13 which is provided with a solid coupling 27 for the shaft 15, the gear 12 then serving for rotating the gear 13 by meshing therewith.

It will be noted, by viewing the end view of the wrench, Fig. 4, that the housing, in its transverse dimension is extremely narrow, to permit its introduction in many narrow places where nuts and bolts are met with in the average machine or motor design.

Further, owing to the great reduction by the use of a worm gear reduction in the wrench head, the flexible shaft is not overloaded, as the greater proportion of the strain is on the worm gear reduction due to its low gear ratio.

Having thus described my invention, what I claim is:

1. In combination, a support; a pair of rotary members mounted on said support; means for rotating the members in opposite directions; couplings respectively yieldably and rigidly mounted on said members; a flexible shaft adapted to interlock with either of said couplings; and a wrench driven by said shaft and including a member having oppositely opening sockets connected to said shaft.

2. In combination, a stationary housing; a pair of rotary members mounted in said housing; means in part in the housing for rotating the members in opposite directions; couplings respectively yieldably and rigidly mounted on said members; a flexible shaft adapted to interlock with either of said couplings and a wrench including a member driven by said shaft and having oppositely opening sockets; either socket being usable thereby to reverse the direction of the wrench whereby the wrench may co-operate with said couplings to drive positively or yieldably in either direction.

3. In combination, a support; a pair of rotary members mounted on said support; means for rotating the members in opposite directions; couplings respectively yieldably and rigidly mounted on said members; a flexible shaft having its drive element operatively engageable with either of said couplings to be yieldably driven by the yieldable coupling or positively driven by the solid coupling; and a wrench driven by said element comprising a housing having opposite lateral openings; a worm wheel mounted therein having central wrench sockets in said openings respectively; and a worm rotatably mounted therein meshing with said wheel and driven by said element.

4. In combination, a stationary housing with a large bearing bore and a large opening alined with said bore; a drive shaft having an extension in the housing; a drive pinion on said extension; an intermediate gear meshing with the pinion and having a hub in said bore; a yieldable coupling having a shank in said hub and a threaded end in said large opening; a friction disk on said shank engaging said gear; locking nuts on said threaded end pressing said disk and projecting through said large opening; a flexible shaft connected with said coupling; and a wrench driven by said shaft and having a rotary member driven by said shaft and having a wrench socket.

5. In combination, a base; a motor thereon; a housing mounted on the base including an upright supporting wall perpendicular to the motor shaft, and provided with a large bearing bore and upper and side flanges turned

toward the motor; a thin wall mounted on the edge faces of said flanges and provided with a large opening alined with said bore; the motor shaft being provided with a front extension passing through the thin wall into the supporting wall; a drive pinion on said extension in said housing; an intermediate gear larger than the pinion meshing with the pinion and having a flat face toward said wall, and provided with a flanged hub received in said bore; a yieldable coupling having a shank in said hub and a threaded end in said large opening; friction disk on said shank engaging said gear; locking nuts on said threaded end pressing said disk and projecting through said large opening; a flexible shaft adapted to interlock with said coupling and a wrench driven by said shaft.

6. In combination a pair of parallel shafts, a train of gears thereon, a pair of couplings on said shafts, means for yieldably driving one of said shafts and positively driving the other shaft with said gears and said couplings thereon, a flexible shaft, to be selectively interlocked at one end thereof with either coupling, thereby varying the speed of said flexible shaft, and a wrench having a socket member driven by the other end of said flexible shaft.

Signed at Bronxville in the county of Westchester and State of New York this 25th day of October A. D. 1926.

HARRY A. THOMPSON.