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POWER WRENCH

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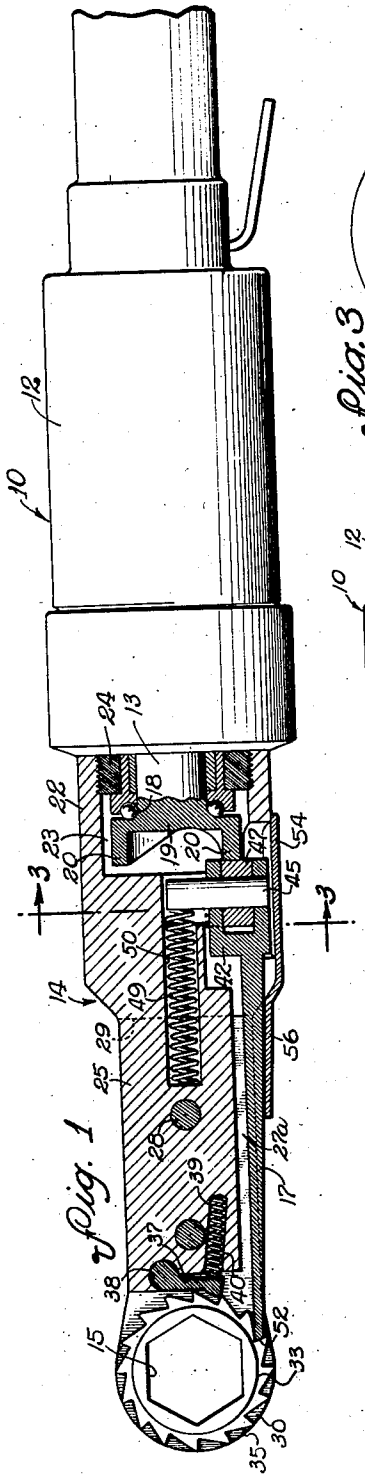


Fig. 1

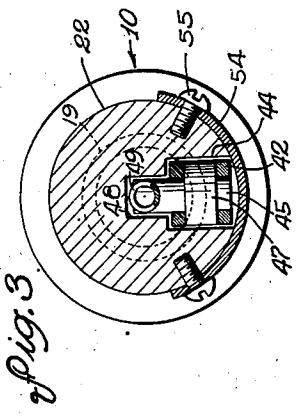


Fig. 3

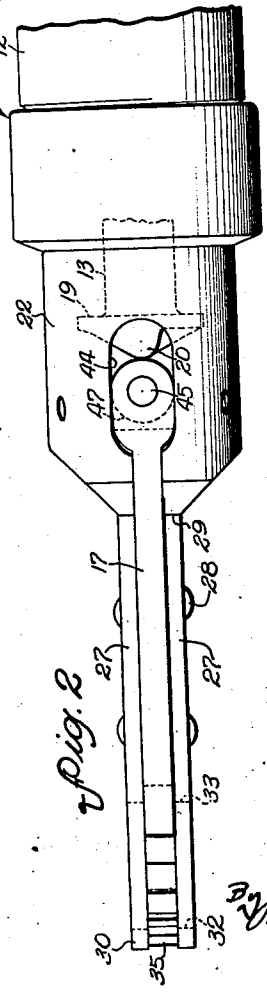


Fig. 2

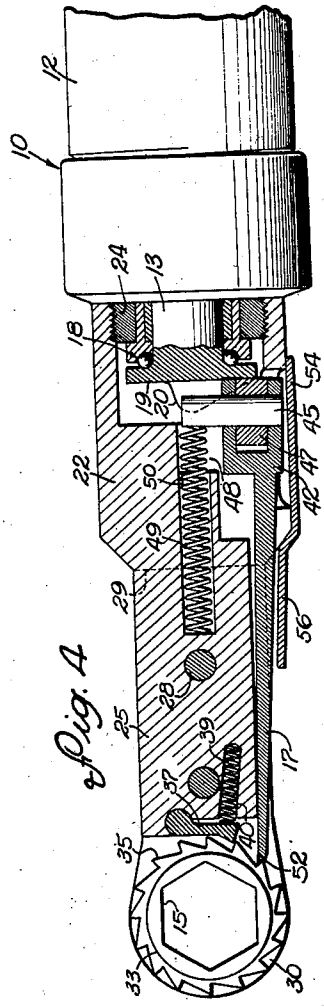


Fig. 4

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## POWER WRENCH

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3 Claims. (Cl. 81—54)

This invention relates to an improved wrench and more particularly concerns a wrench which is positively driven by suitable power means.

The principal object of the present invention is to provide a practical power wrench that may be used for setting and tightening threaded elements disposed in places of limited clearance.

Another object is to provide a power wrench in which a rotary spindle serves through the medium of smoothly operating transmission means to drive with considerable power a flat rotary tool element revolving on a transverse axis beyond the end of the spindle.

Another object resides in the provision of means reciprocally moved in a substantially rectilinear path by a rotary cam on a power driven spindle and adapted for rotating a tool socket substantially spaced from the end of the spindle.

Another object is to provide a power wrench as aforesaid, characterized by its light weight and ease of manipulation, its simplified arrangement of parts, ease of assembly or replacement, and its generally rugged and durable construction.

Other objects and advantages will become apparent from the following description and from the accompanying drawing, in which:

Figure 1 is a transverse sectional view through the tool showing details of construction and showing parts in one operative position.

Fig. 2 is a front elevational view of the tool.

Fig. 3 is a sectional view taken substantially along line 3—3 of Fig. 1.

Fig. 4 is a sectional view similar to Fig. 1 but showing the parts in another operative position.

While the invention is susceptible of various modifications and alternative constructions I have shown in the drawing and will herein describe in detail, the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

In the embodiment of the invention selected for purposes of illustration, the device includes a power unit 10 including a casing 12 housing suitable power means such as a pneumatic motor which serves to rotate a spindle 13. Extending substantially beyond the spindle end of the power unit is a tool unit 14 including a narrow thin portion which is adapted for engaging a threaded element to be driven and for this purpose supports a rotary ratchet socket 15 having its axis transversely disposed relative to the spindle 13. Power for rotatably driving the socket is received from the spindle through the medium of a reciprocable pawl 17 which forms an operating connection therebetween.

The spindle 13 may be rotatably mounted in the usual manner, the mounting being provided with friction reducing means such as a ball bearing 18. As here shown, the outer end of the spindle extends beyond the end of the power unit and is fashioned as a barrel cam 19 including a pair of opposite lobes 20.

In order to facilitate assembly or detachment, the tool unit 14 may be removably secured to the power unit 10. To this end, therefore, the inner end of the tool unit is fashioned as an annular housing 22 providing a chamber 23 and is internally threaded adjacent its edge to be screwed upon a threaded flange 24 on the power unit. The chamber 23 is dimensioned to receive the cam 19 with substantial clearance but occupies only a limited space within the housing, for in order to withstand great strains the housing is preferably of substantial structure.

Extending axially from the housing is an elongated flat portion providing the tool carrier of the device which is shown as comprising a nose 25 formed integrally with the housing which may be tapered gently toward the base of the nose. On the nose is secured a pair of similar bearing plates 27, the nose and plates being suitably apertured to receive the shanks of rivets 28 or other suitable fastening means. Preferably the inner ends of the clamping plates are in square abutment with shoulders 29 on the housing 22 at the sides of the nose, so that torsional strains to which the plates may be subjected in operation will not loosen the same

The outer ends 30 of the plates 27 project beyond the end of the nose 25 and are adapted for receiving therebetween tne socket 15. Thus these ends may be coaxially apertured as at 32 and the socket is provided with a hub 33 journaled therein. Medially on the hub is a series of peripheral ratchet teeth 35 of substantially the same width as the thickness of the nose 17 and lying between the ends 30 for defining the axial position of the socket. In order to insure that the rotary socket 15 will be maintained stationary against all but driven rotary movement, means is provided for successively engaging the ratchet teeth 35. Herein this means is shown as a holding pawl 37 having a rounded base seated within an annular slot 38 in the outer end of the nose 25. In order to urge the pawl constantly into engagement with the ratchet

teeth, an expansible spring 39 is seated within a bore 40 and presses the end of the pawl outwardly.

By the present invention, power supplied through the rotary spindle 13 and the cam 19 is transmitted by substantially rectilinear motion of the reciprocal pawl 17 to the socket 15. To the accomplishment of this purpose, the pawl is formed as an elongated arm disposed to one side of a plane through the axes of the spindle and socket. As shown, it is guided in a laterally opening groove or recess 27a formed between laterally extending edges of the plates 27. At its inner end it is provided with a follower engageable with the cam. Thus the arm is shaped to form a yoke 42 which is received and guided in an elongated slot 44 in one side of the housing 22. Coaxial apertures in the yoke receive a pin 45 which forms the bearing for a roller 47 mounted between the arms and adapted to ride upon the cam 19. At its inner end, the pin 45 extends beyond the yoke into a slot 48 and a spring 49, which is received in an axial bore 50, bears against the extended end of the pin to urge the same toward the end of the spindle 13. Under the influence of the spring, the roller 47 is at all times urged toward the spindle 13 and thus maintained in contact with the cam 19.

It will be apparent that in the rotation of the spindle 13 the pawl 17 will be caused to reciprocate in a path parallel to the axis of the spindle, the roller 47 following the contour of the cam 19. This reciprocatory movement carries the outer end of the pawl, which may be suitably rounded or beveled to form an engagement tip 52, successively behind the ratchet teeth 35, thereby rotating the socket by a succession of powerful thrusts. Satisfactory results have been obtained in practice by reciprocating the pawl 17 rapidly enough to cause the socket to rotate at about 200 revolutions per minute.

In the course of moving the tool ratchet, the tip 52 is caused to follow a slight arc following the rotary movement of the socket. In order to engage a succeeding tooth, therefore, the tip 52 must be moved laterally inwardly as an incident to reciprocation of the pawl. Accordingly, a rocking motion is imparted to the pawl arm so as to carry its tip 52 inwardly or in a direction toward the axis of the nose 25. As shown, the pawl is maintained in spaced relation to the adjoining edge of the nose 25, and the roller 47 is adapted to fulcrum on the cam 19 under the pressure of the spring 49 on the offset end of the pin 45. Thus in the retracting movement of the pawl, the spring 50 acts to swing the tip into position to engage a succeeding ratchet tooth.

It will be observed that the pawl 17 and the cam follower carried thereby constitute a floating unit guided by the groove or recess 27a and slot 44 and capable of easy removal. To retain it in position I provide a cover plate 54 which is secured over the slot 44 as by means of screws 55, and has a retaining guide finger 56 extending over the pawl.

In operation, the operator places the rotary socket 15, or an adapter socket such as is commonly employed for the purpose, in engagement with the threaded element to be secured and turns on the power to rotate the spindle 13. Thereupon the cam 19 causes the pawl 17 to reciprocate rapidly and thus rotate the socket 15 until the threaded element has been set. If desired, the power means may be of the type arranged to stall after the threaded element has been set with predetermined pressure. However, it is usually desirable to tighten the threaded element thoroughly in excess of the force the power means of the tool is adapted to furnish, and to this end the device is arranged so that manual force for tightening a threaded element may be exerted by moving the tool in the direction of rotation of the socket 15, the pawl 37 holding the socket stationary relative to the tool in the meanwhile. It is thus apparent that not only is the tool capable of rapidly setting the threaded element through power driven means, but it may also be used for manually tightening the element.

A further valuable feature of the present invention resides in the fact that in addition to its use for setting and tightening a threaded element, the tool may also be used for removing such an element. The latter end is attained by turning the flat tool unit over to reverse the position of the ratchet socket upon the threaded element manual force being available as desired to initially loosen the element.

It will thus be apparent that the present invention provides a power tool which is adapted for rapidly securing or removing threaded elements in places which are ordinarily difficult of access due to limited clearance. The tool embodies few and simple parts which may be assembled speedily and with ease, and the construction is efficient in use and of durable construction. Moreover, the present tool embodies advantages such as reversibility for either setting or removing a threaded element, and while the tool may be side operating in that the axis of the driving socket is transversely arranged relative to the axis of the tool body, power is supplied by any suitable economical rotary motor means.

I claim as my invention:

1. In combination in a power driven tool of the character described, a body housing rotary parts including a spindle, a narrow-wall barrel cam on the end of said spindle, means including an elongated flat tool portion providing an extension of said body and carrying a toothed rotary ratchet socket for engaging a threaded element to be tightened and mounted substantially beyond the end of said spindle for movement on a transverse axis relative to said spindle, means forming a driving connection between said spindle and socket and including a pawl arm slidably guided for rectilinear and rocking movement, one end of said arm being adapted for engaging the teeth of said ratchet socket and the other end having a rotary follower adapted for engaging said cam and including an offset part adjacent and to one side of the follower, and resilient means bearing against said offset part for causing said follower to fulcrum on said cam and rock said arm incident to rectilinear movement thereof.

2. A power wrench comprising, in combination, a power unit including a spindle and means for rotating said spindle, a tool unit secured to said power unit and extending substantially beyond the end of said spindle, an elongated flat portion on the outer end of said tool unit, a toothed rotary ratchet socket supported by said flat portion, a reciprocatory pawl arm disposed along one margin of said flat portion in engagement at one end with said ratchet socket and having a follower coacting with its opposite end, cam means upon the end of said spindle and cooperatively arranged in engagement with said follower for moving said arm in a reciprocatory path upon ro-

tation of said spindle, an offset part carried by said arm adjacent said follower and extending toward the axis of said flat portion, and means centrally disposed within said flat portion for resiliently urging said offset part toward said cam means, whereby to overbalance said arm and carry said one end thereof toward the axis of said flat portion so as to move the same positively into engagement with successive teeth of said ratchet socket.

3. In combination, in a wrench construction of the character described, a hollow housing having driving means therein and a nose portion projecting therefrom, said nose portion including a pair of flat plates having therebetween flat spacing means of substantial body, said spacing means having a generally longitudinally disposed bore opening toward the interior of said housing, a toothed rotary socket carried between the front ends of said spacing means, a pawl arm extending from said driving means to be moved thereby in a rectilinear path and engageable with the teeth of said socket for advancing the same rotatably, means projecting laterally from said arm between the opening of said bore and the interior of the housing, and compression means within said bore coacting with said laterally projecting means to move said arm in said rectilinear path in opposition to said driving means.

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