Oct. 30, 1951 W. R. MACLAY 2,573,469

RATCHET WRENCH

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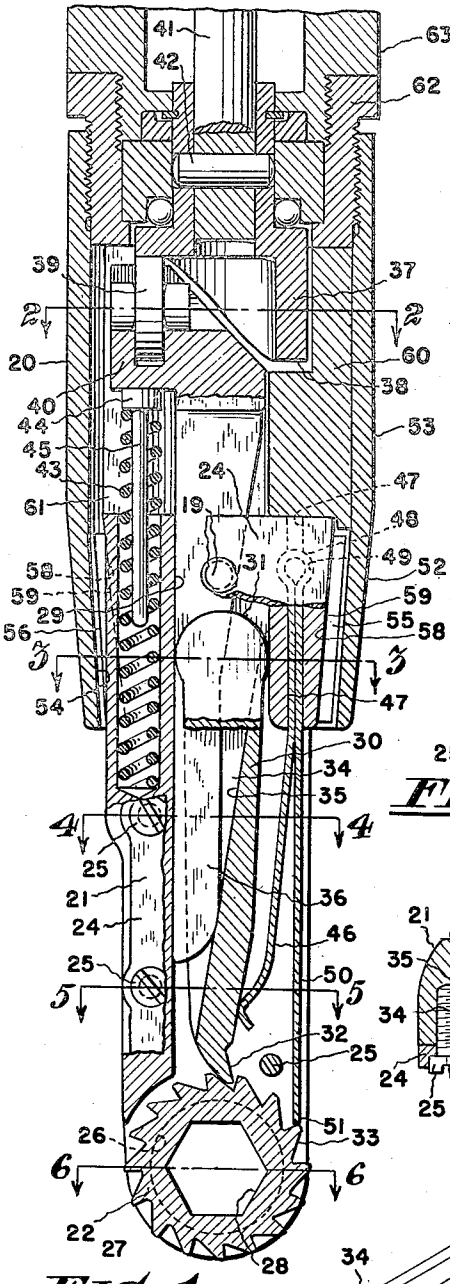


FIG.-1.

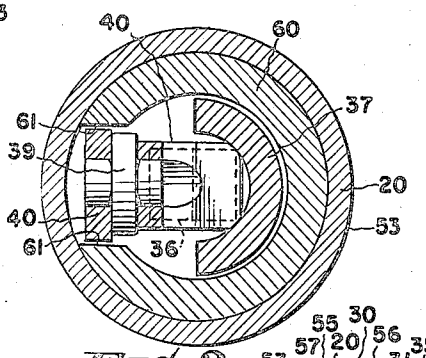


FIG.-2.

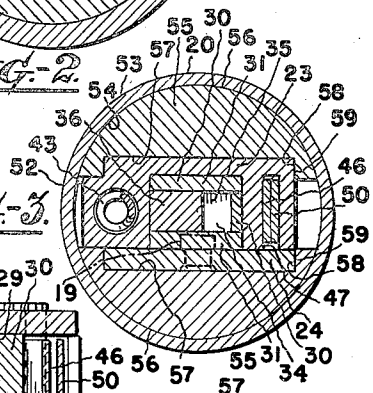


FIG.-3.

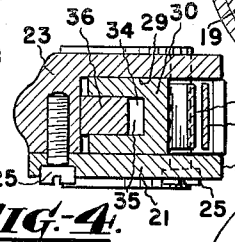


FIG.-4.

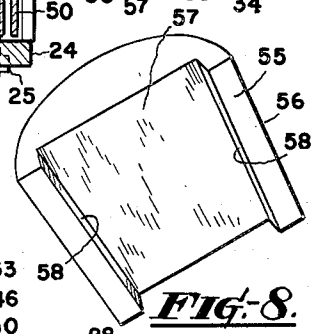


FIG.-8.

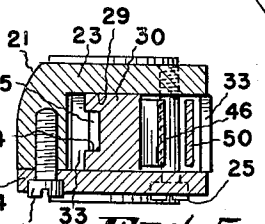


FIG.-5.

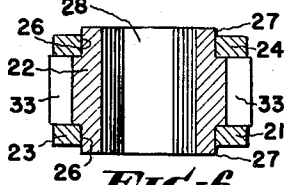


FIG.-6.

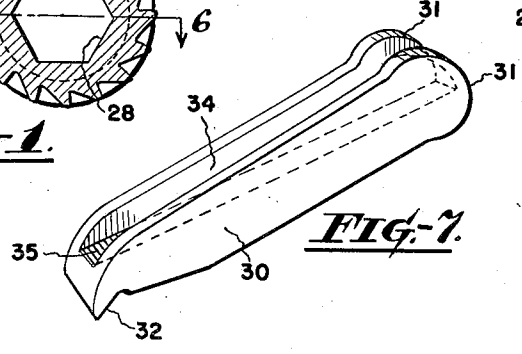


FIG.-7.

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RATCHET WRENCH

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4 Claims. (Cl. 74—156)

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This invention relates to power tools, and more particularly to a ratchet wrench actuated in step-by-step fashion by a suitable power device.

One object of the invention is to facilitate the manipulation of nuts, bolts and the like, in close quarters where it is difficult to maneuver a wrench bodily.

Another object is to apply powerful and positive turning movement to a bolt or nut.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is an elevation, partly in section, of so much of a ratchet wrench assembly as will serve to illustrate the invention,

Figures 2, 3, 4, 5 and 6 are transverse views taken through Figure 1 on the lines 2—2, 3—3, 4—4, 5—5 and 6—6, respectively, and

Figures 7 and 8 are perspective views of details of the invention.

Referring more particularly to the drawings, 20 designates, in general, the power unit of the ratchet wrench and 21 an extension for the power unit 20 carrying a tool member 22 which is actuated by the power unit.

The extension 21 consists of an elongated recessed block 23 and a flat cover plate 24 of substantially the same width and length as the block 23 and secured thereto by a series of screws 25. The front ends of the plate 24 and the block 23 are rounded and have coaxial apertures 26 to receive, rotatably, the trunnions 27 on the ends of the tool member 22, and within the tool member 22 is a socket 28 of hexagonal shape for the accommodation of either a tool shank, a nut or the head of a bolt.

The interior of the block 23 constitutes a guideway 29 that extends longitudinally through the block and contains a pawl 30 for rotating the tool member 22. On the rearward end of the pawl 30 is a partly cylindrical head 31 of a diameter larger than the width of the body portion of the pawl and slightly smaller than the guideway 29 so that it may rotate and slide freely therein. The opposite end, or tip, 32 of the pawl is suitably shaped for entrance into the spaces between ratchet teeth 33 on the periphery of the tool member 22. The pawl is, moreover, free to slide endwise in the guideway to enable the tip 32 to slide into and out of engagement with the ratchet teeth 33 and has a slot 34 extending longitudinally therethrough the bottom 35 of which is inclined for engagement with a

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rounded surface at the free end of a plunger 36 reciprocable in the guideway 29 to swing the pawl 30 transversely of the guideway for rotating the tool member 22.

Being in frictional engagement with the plunger the pawl 30 tends to reciprocate therewith and in order to limit its movement in a rearwardly direction to the distance required for releasing the ratchet teeth a stop member 19 is placed in the guideway 29. The stop member 19, shown in Figure 1 and in dot-dash lines in Figure 2, is in the form of a pin seated in the plate 24 to act as an abutment for the head 31 and to thereby prevent the pawl from being dragged upwardly throughout the entire retractive stroke of the plunger 36.

The force serving to effect such movement of the tool member 22 is applied to the plunger 36 by a rotary cam 37, of the barrel type, the forward edge 38 of which rides over a follower 39 journaled in a head 40 on the plunger. The cam 37 is rotated by a suitable motor (not shown) connected to a shaft 41 and keyed to the cam 37 by a pin 42. Movement of the plunger 36 in the opposite direction is effected by a spring 43 seated partly within the block 23 and acting against the head 44 of a spring centralizing rod 45 which abuts the forward surface of the head 40.

A spring, designated 46, also serves to shift the pawl 30 from one tooth engaging position to another and to return the pawl for retaining the inclined surface in the path of movement of the plunger 36. The spring 46 lies in a slot 47 in the block 23 and extends along a side of the pawl. It is of substantially hairpin shape and the bend 48 thereof is preferably of circular form to lie within semi-circular apertures 49 in the walls of the slot 47 for retaining the spring in the assembled position. The spring 46 is suitably bowed for constant engagement with the forward end portion of the pawl and its other leg 50 extends downwardly through the guideway 29 to the tool member 22 so that its free end 51 will lie within the path of movement of the ratchet teeth 33 in position for engagement with the radial side thereof to prevent reverse rotation of the tool member 22.

The extension 21 is readily attachable and detachable to and from the power unit and is shown extending into the front end portion 52 of the casing 53 of the power unit. The inner surface of this portion of the casing is of conical shape and constitutes a seating surface 54 for clutch members 55 which serve to secure the extension fixedly to the power unit 20. The outer surfaces 56 of

the clutch members 55 are shaped to conform with the seating surface 54, and in the inner surfaces of the clutch members are recesses 57 to receive the block 23 and the plate 24 and have inclined side surfaces 58 to co-operate with correspondingly inclined surfaces 59 on the edges of the block 23 and the plate 24 for holding the extension 21 securely against movement in a forwardly direction.

The clutch members 55 are of somewhat less length than the portion of the casing 53 defining the conical seating surface 54 to prevent engagement thereof with a bushing 60, in the casing 53, which seats against the rearward end of the extension 21 to press the inclined surfaces 58—59 and the conical surfaces 55—56 firmly against each other. The bushing 60 has an opening 61 in the side thereof for the accommodation of the cam follower 39 and the portion of the head 40 supporting it and is clamped firmly against the extension 21 by a sleeve 62 that is threadedly connected to the rearward end of the casing 53 and to the portion 63 of said casing which houses the shaft 41.

In the operation of the device, the cam 37 rolls over the follower 39 and causes the plunger 36 to be thrust outwardly toward the tool member 22. The rounded surface at the forward end of the plunger will then ride downwardly over the inclined surface 35 and thrust the pawl 30 transversely of the guideway 29, thereby imparting a partial rotary movement to the tool member 22, and when the extended portion of the cam 37 moves off of the follower 39 the plunger 36 will be moved rearwardly along the inclined surface 35 by the spring 43. The spring 46 will then tilt the pawl in the opposite direction within the guideway 29, as permitted by the front end of the plunger 36, and at the same time cause the tip 32 of the pawl to ride up over the inclined surface of the adjacent ratchet tooth 33 to a position for engagement with another tooth.

During the initial portion of the subsequent forward stroke of the plunger 36 said plunger, being in frictional engagement with the inclined surface 35, will thrust the pawl 30 forwardly the slight distance required to effect interlocking engagement of the tip with a ratchet tooth and during the remaining portion of the stroke the tool member 22 will describe another partial revolution. This cycle of operation will be repeated until a nut or bolt has been set or unscrewed, depending upon which end of the socket 28 engages such nut or bolt.

I claim:

1. In apparatus of the character described, a casing having a guideway, a rotary member in the casing, ratchet teeth on the rotary member, a pawl disposed loosely in the guideway and slidable endwise thereof for engagement with the ratchet teeth, means reciprocable between the pawl and a wall of the guideway for rocking the pawl in one direction transversely of the guideway to rotate the rotary member, and a spring for rocking the pawl in the opposite direction.

2. In apparatus of the character described, a casing having a guideway, a rotary member in the casing at one end of the guideway, ratchet teeth on the rotary member, a pawl disposed loosely in the guideway and slidable endwise thereof for engagement with the ratchet teeth, a head on the pawl for engagement with the walls of the guideway to serve as a pivot for the pawl, and means reciprocable in the guideway along the pawl to impart swinging movement to the pawl for rotating the rotary member.

3. In apparatus of the character described, a casing having a guideway, a rotary member journaled in the casing at one end of the guideway, ratchet teeth on the rotary member, a pawl disposed loosely in the guideway and slidable endwise thereof for engagement with the ratchet teeth, means reciprocable in the guideway and in the pawl for swinging the pawl in one direction to rotate the rotary member, and a spring for swinging the pawl in the opposite direction.

4. In apparatus of the character described, a casing having a guideway, a rotary member in the casing rotatable about an axis transverse to the longitudinal plane of the guideway, ratchet teeth on the rotary member, a pawl disposed loosely in the guideway and slidable endwise thereof for engagement with the ratchet teeth and having a surface inclined with respect to the guideway, a head on the pawl for engagement with the walls of the guideway to serve as a pivot for the pawl, and a plunger reciprocable in the guideway to ride over the surface for actuating the pawl transversely of the guideway to rotate the rotary member.

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