

April 19, 1955

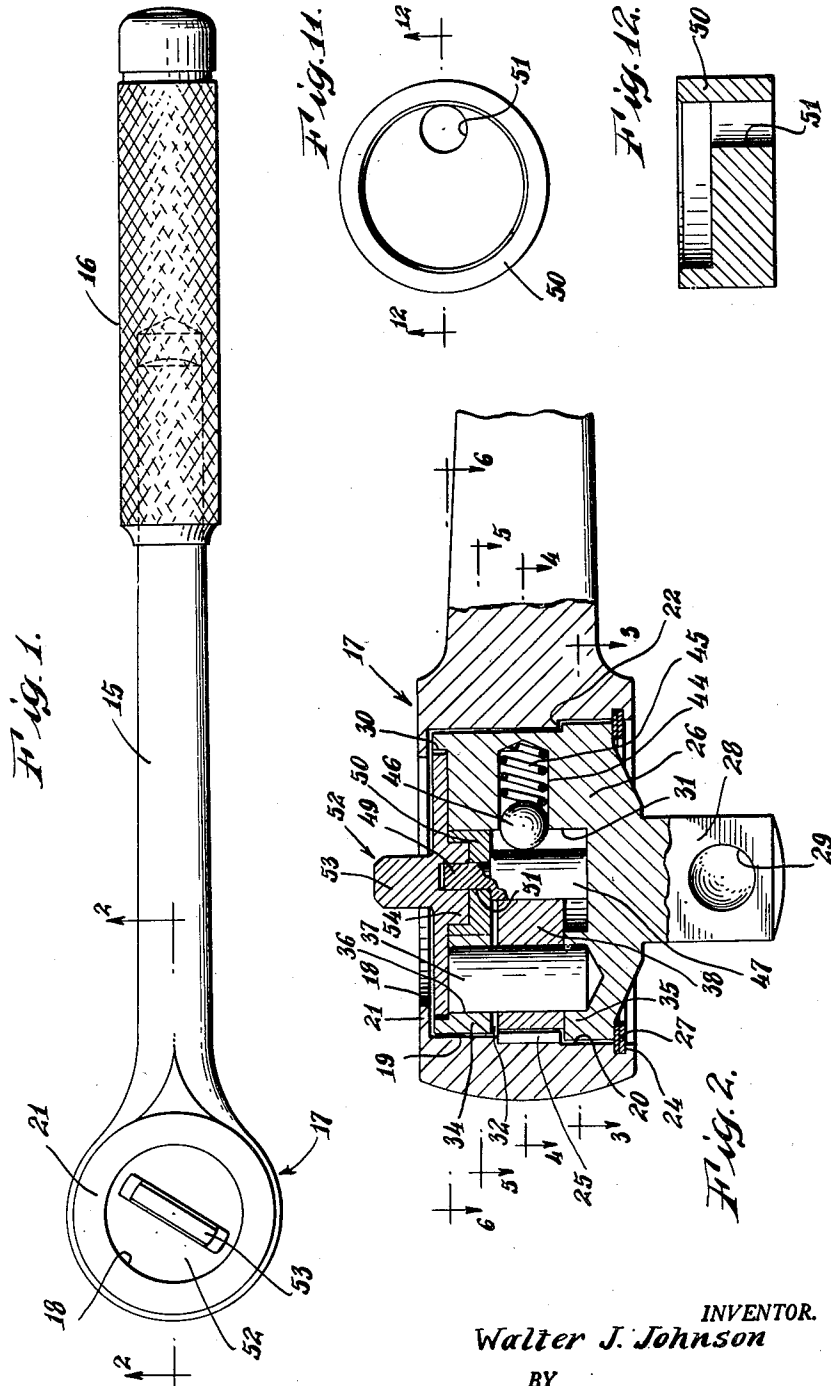
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2,706,424

REVERSIBLE RATCHET WRENCH

Filed April 20, 1953

2 Sheets-Sheet 1



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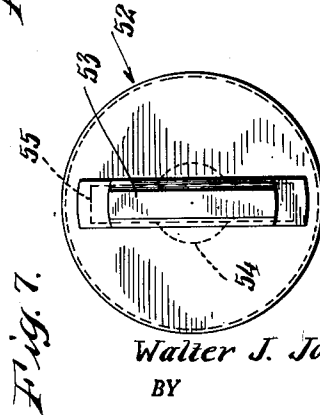
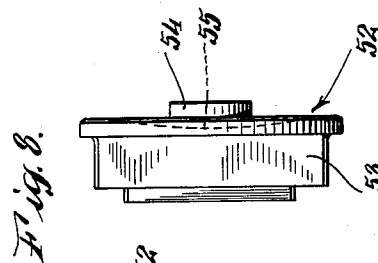
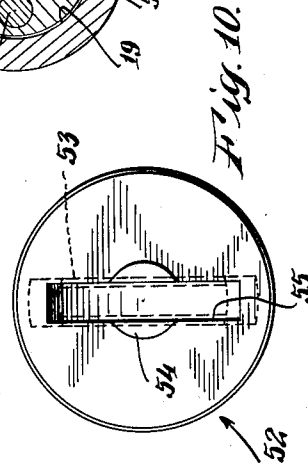
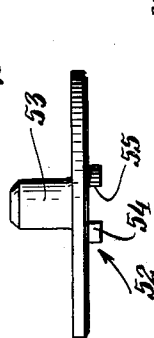
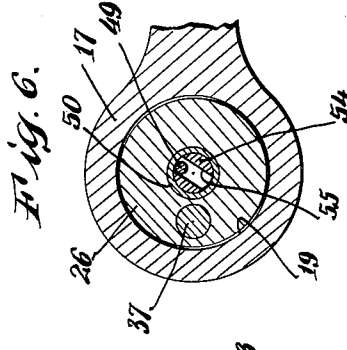
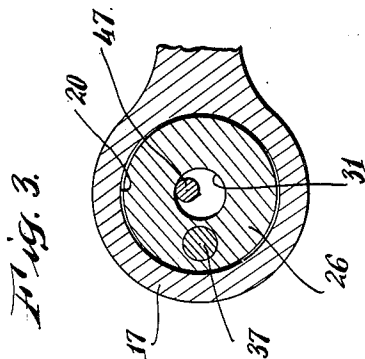
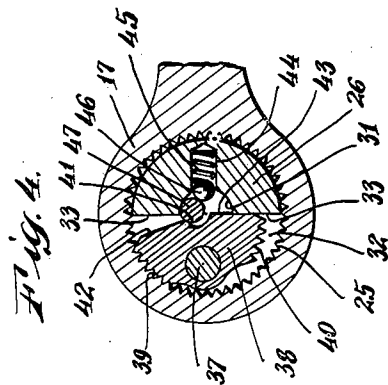
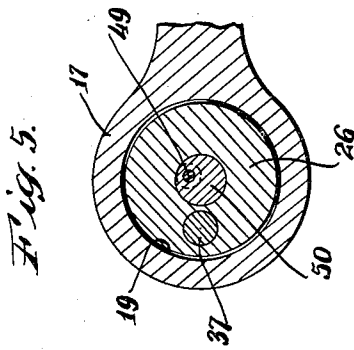
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REVERSIBLE RATCHET WRENCH

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2 Sheets-Sheet 2



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2,706,424

REVERSIBLE RATCHET WRENCH

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6 Claims. (Cl. 81—63)

My present invention relates to reversible ratchet wrenches or the like and aims to provide certain improvements therein. More particularly it relates to ratchet wrenches of the type in which a driving member carried by a handle is operatively connected with a rotatable runner or driven member by a pawl and ratchet mechanism, so constructed that the driven member may be rotated in reverse directions by manipulation of a shifter device.

The objects of the invention are to generally improve and simplify the construction and operative efficiency of such wrenches.

The foregoing and other objects of the invention not specifically enumerated I accomplish by incorporating into a wrench of the type set forth: (a) a novel means of transferring compression spring force to an oscillatable pawl through an intermediate transfer shaft; (b) utilizing the transfer shaft as a means for reversing the oscillatable pawl; (c) stabilizing the transfer shaft axially and controlling the path of its oscillatory arc by means of a transfer sleeve or roller; and (d) so relating the pawl and the pawl receiving groove in the driven member that approximately 50% of the circular cross-section of the driven member remains intact for restricting the motion of the pawl, thereby diminishing the tensile stresses within the driven member and transferring said stresses into greater shear of the teeth, thereby permitting the pawl and driven member to absorb some of the stresses which otherwise would be placed on the pawl shaft in direct shear. The invention as a whole, as well as the various novel elements and combinations thereof, will be better understood from the detailed description which follows, when considered in connection with the accompanying drawings showing a preferred embodiment and wherein:

Figure 1 is a top plan view of a ratchet wrench embodying my invention.

Fig. 2 is a sectional view taken along the plane of the line 2—2 of Fig. 1.

Figs. 3, 4, 5 and 6 are sections taken respectively along the planes of the lines 3—3, 4—4, 5—5, and 6—6 of Fig. 2.

Fig. 7 is a top plan view of the shifter member.

Fig. 8 is a side elevation of the shifter member as viewed from the right of Fig. 7.

Fig. 9 is a side elevation of the shifter member as viewed from the front of Fig. 7.

Fig. 10 is a bottom plan view of the shifter member.

Fig. 11 is a top plan view of a transfer roller forming part of the invention.

Fig. 12 is a section taken along the plane of the line 12—12 of Fig. 11.

Referring to the drawings, in the various figures of which the same reference characters are employed to designate corresponding parts, the reference numeral 15 is applied to an operating handle having a hand gripping portion 16 and a substantially cylindrical or barrel head 17 having a through bore of various diameters 18, 19 and 20, the bore portions 18 and 19 providing an overhanging flange 21 and the different diameters of the bore portions 19 and 20 providing a shoulder 22. The wall of the bore portion 20 is formed with an annular groove 24 and the wall of bore portion 19 is formed with internal ratchet teeth 25 extending inwardly from the shoulder 22. The parts 15 to 25, inclusive, constitute the driving member of the ratchet wrench.

Mounted within the head 17 for rotative movement by the driving member is a driven member 26 which is

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supported and held within the driving member by a split spring retainer ring 27. The driven member is formed at its lower end with a work-engaging head or shank 28 having a socket 29 therein within which is usually mounted a spring-impelled ball detent (not shown). The driven member is formed at its top with a rabbet groove 30 and with a cylindrical socket 31 extending axially inwardly from said groove. Intermediate its top and bottom, the driven member also has formed therein a transverse groove 32, which extends from the periphery thereof, through the longitudinal axis of the wrench to a shouldered surface 33, which surface is located substantially in the axial plane of a diameter of the driven member. The groove 32 provides the driven member with flanks 34 and 35 and through the former and into the latter a hole 36 is drilled for accommodating a pivot pin 37 upon which is mounted a double-ended symmetrical pawl 38, the ends of which are each formed with a plurality of teeth 39 and 40. The pawl at its inner wall midway between its ends is formed with a camming surface or groove 41 and with divergent flat faces 42 and 43 leading from said camming surface to the ends of the pawl. The driven member 26 is also formed with a radial socket 44, the axis of which lies in a common plane with the pivotal axis of the pawl but at a right angle thereto. Mounted within the socket 44 is a helical spring 45 which biases a ball 46, the function for which will presently appear.

Mounted within the socket 31 is a transfer shaft 47 of substantially smaller diameter than said socket and capable of arcuate movement therein, one end of said transfer shaft being flat and bearing on the base of the socket 31 and the opposite end being of reduced diameter to provide a stub shaft 49. Supported by the transfer shaft 47 and snugly fitting within the socket 31 is a cupped roller 50 having an eccentric hole 51 extending through the base thereof and through which snugly fits the stub shaft 49. Mounted within the cupped roller and bearing against the top of the driven member 26 within the rabbet groove 30 is a disc-shaped shifter member 52 formed on its top side with a diametrically-extending, finger-engaging rib 53 and on its underside with an axial cylindrical projection 54 of a diameter to snugly fit within the cupped roller, the underside of the shifter member 52 having cut therein a diametrical groove 55 extending along the same diameter as the rib 53, the groove extending through the cylindrical projection 54. The groove 55 is of a width to freely accommodate the end of the stub shaft 49 and, as said stub shaft is eccentrically disposed with respect to the shifter member 52, it will be apparent that when the shifter member is rotated it will rotate the transfer shaft 47 in an arc within the socket 31.

Operation

With the parts of the wrench in the relative positions depicted in the drawings, i. e., with the teeth 39 of the pawl in engagement with the teeth 25 of the driving member and with the transfer shaft 47 resiliently holding said teeth in engagement through the agency of the spring-biased ball 46 and with the face 43 of the pawl seating against the wall or shoulder 33 of the driven member, movement of the handle 15 in a counter-clockwise direction will operate to drive the driven member 26 in a corresponding direction while permitting slippage of the driving member relatively to the driven member upon rotation of the handle in a clockwise direction. To effect a change of driving action of the driven member the rib 53 is rotated in a clockwise direction, in the course of which the transfer shaft will move in an arc, moving with it the pawl about its pivot, depressing the spring-pressed ball 46 until the shaft passes the axis of the socket 44, whereupon the spring-biased ball 46 will snap to the left of the shaft to resiliently lock it in position where the toothed end 40 of the pawl will be in engagement with the teeth 25 of the driving member. In other words, the direction in which the shifter member is rotated corresponds to the direction of drive desired. The extent of the oscillating arc through which the transfer shaft must be moved to effect a reversal in

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operation of the wrench can be controlled by the transfer roller.

Although I have shown and described a preferred embodiment of my invention, it is to be understood that changes in details of construction may be made therein within the range of engineering skill without departing from the spirit of the invention as claimed.

What I claim is:

1. In a ratchet wrench or the like, the combination of a driving member having an internally toothed cylindrical wall, a driven member rotatably mounted in the driving member, said driven member having therein a transverse groove, an axial socket and a radial socket, a double-ended multi-toothed pawl pivotally mounted in said transverse groove of the driven member, said pawl having a camming surface on its inner wall intermediate its ends, a transfer shaft of smaller diameter than said axial socket disposed in said socket and capable of arcuate movement therein, a spring within said radial socket, a ball biased by said spring against said transfer shaft to resiliently hold said shaft in either of two limiting positions with respect to the camming surface on the pawl for selectively holding a toothed end of the pawl in either of two limiting positions in engagement with the teeth of the driving member, and means in engagement with the transfer shaft and operable from the exterior of the wrench for moving said shaft in an arc against the force of the spring-pressed ball to pivot the pawl to either of its two limiting positions.

2. A ratchet wrench according to claim 1 wherein the axis of the radial socket and the pivotal axis of the pawl lie in a common plane.

3. A ratchet wrench according to claim 1 wherein the means in engagement with the transfer shaft for moving said shaft in an arc comprises a roller mounted in the axial socket in the driven member, and eccentrically connected to said shaft.

4. A ratchet wrench according to claim 3 wherein the roller has a hole eccentrically therethrough, the transfer shaft has a part extending through the eccentric hole in the roller, a shifter disc mounted for coaxial rotation relatively to the roller and having a diametrical groove in its underface within which extends the extending part of the transfer shaft.

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5. In a ratchet wrench or the like, the combination of a driving member having an internally-toothed cylindrical wall, a driven member rotatably mounted in the driving member, said driven member having therein a transverse groove, an axial socket and a radial socket, the transverse groove extending from the periphery of the driven member and terminating in an inner wall located approximately in an axial plane of a diameter of said member, a double-ended symmetrical multi-toothed pawl pivotally mounted in said transverse groove of the driven member, said pawl having on its inner wall midway between the toothed ends a camming surface and divergent faces leading away from the camming surface, a movable member within the axial socket for camming the respective ends of the pawl into cooperative relation with the teeth on the driving member, spring-pressed means within said radial socket operatively engaging said movable member to hold it in either of two limiting positions with respect to the camming surface on the pawl, the angularity between said divergent faces on the pawl being such as to provide seating engagement of the pawl on the diametrical wall of the transverse groove to increase the resistance to torsional deformation of the driven member when the wrench is subjected to stress, and means in engagement with the movable member and operable from the exterior of the wrench for moving said member in an arc against the force of the spring-pressed means.

6. A ratchet wrench according to claim 5 wherein the movable member is a transfer shaft of smaller diameter than said axial socket capable of arcuate movement therein and the spring-pressed means comprises a helical spring in said radial socket and a ball biased by said spring against said transfer shaft.

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