

March 12, 1968

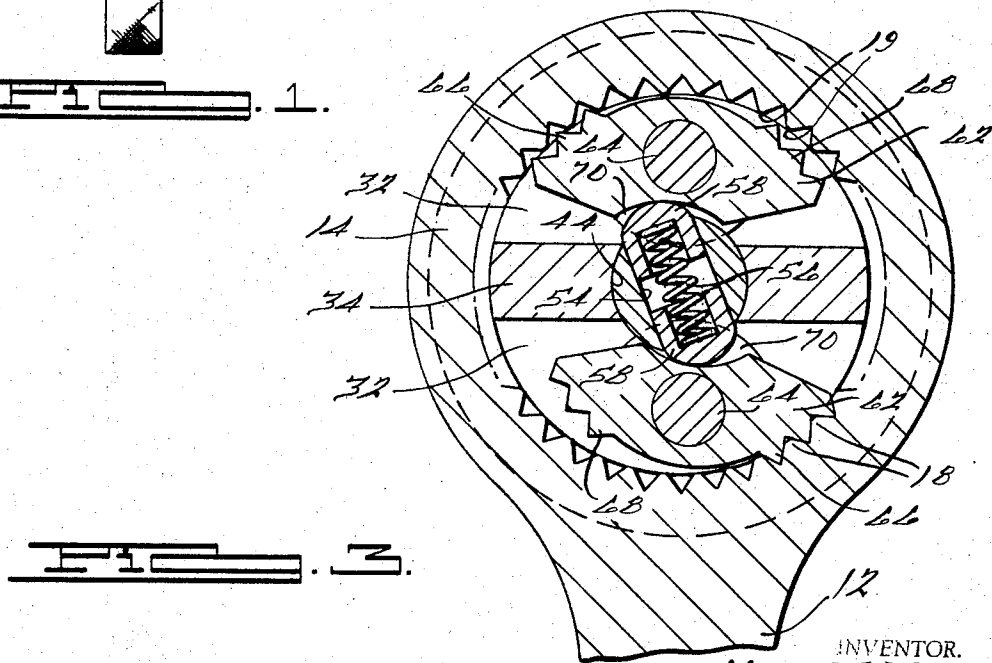
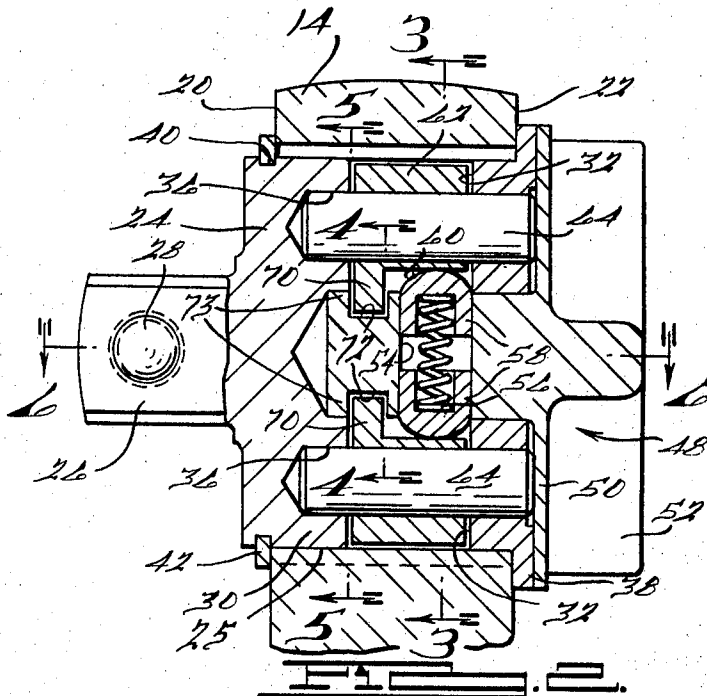
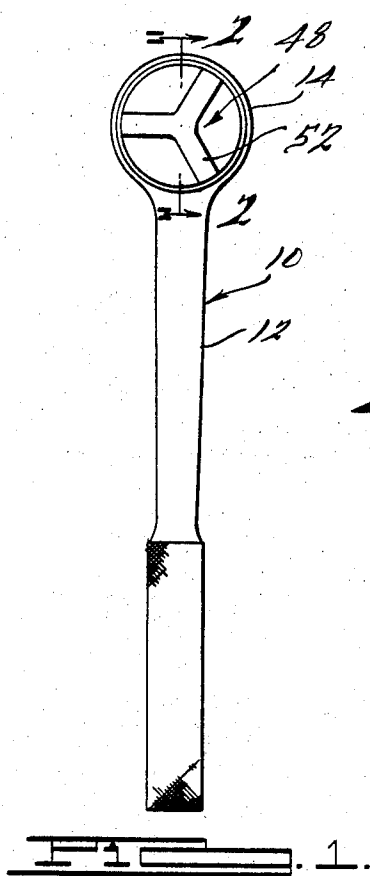
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3,372,612

PAWL TYPE RATCHET WRENCH

Filed April 4, 1966

2 Sheets-Sheet 1



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PAWL TYPE RATCHET WRENCH

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2 Sheets-Sheet 2

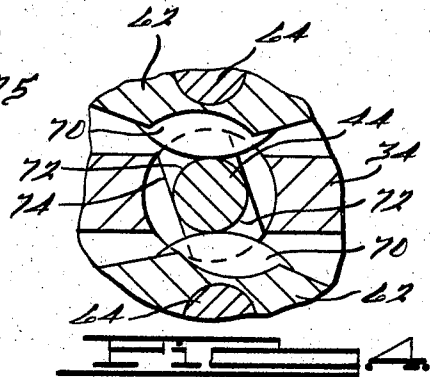
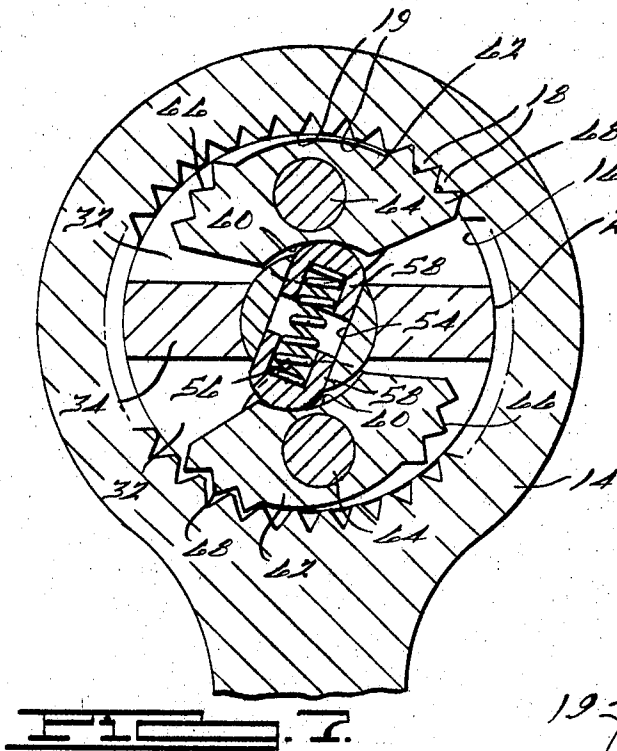


FIG. 3.

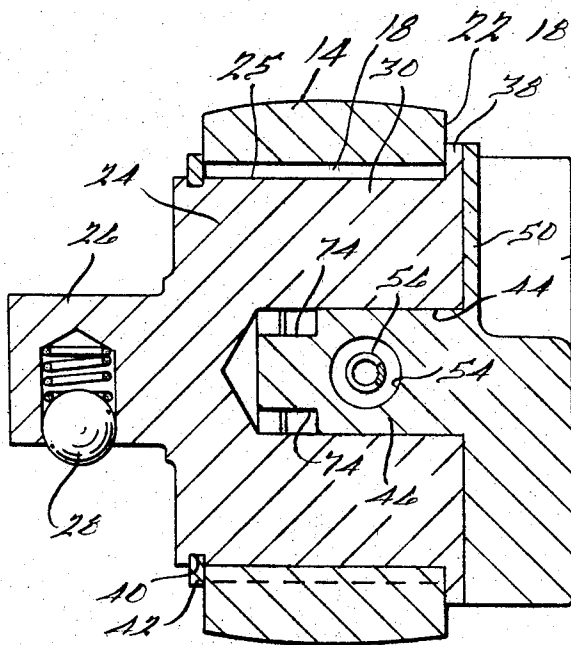
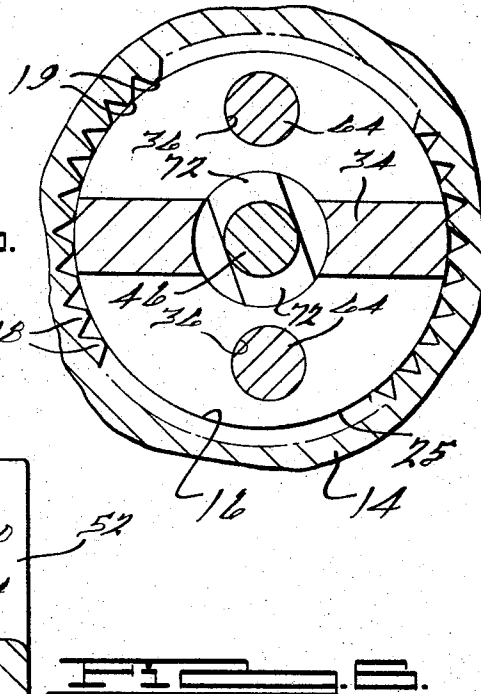


FIG. 6.

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3,372,612

PAWL TYPE RATCHET WRENCH

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4 Claims. (Cl. 81—62)

ABSTRACT OF THE DISCLOSURE

A ratchet wrench of the pawl type in which a driver is positioned within the head of a wrench body and carries a plurality of pawls to transmit torque between the driver and the wrench body. A selector is mounted on the driver and is angularly shiftable between two different positions to bias the pawls to a selected operating position. The selector is held in assembly with the driver by the engagement of the pawls with a shoulder on the selector. The driver is held in the wrench head by a shoulder on the selector and a retaining ring.

This invention relates to ratchet wrenches and particularly to a ratchet wrench of the pawl type.

It is an object of the present invention to provide a pawl type ratchet wrench which lends itself to the use of a plurality of pawls.

It is another object of the present invention to provide a ratchet wrench employing a wrench body which is relatively inexpensively fabricated, and particularly which employs a wrench body that is relatively easily machined.

It is another object of the present invention to provide a ratchet wrench which is easy to assemble, which is of strong, durable construction, which is reliable in use, and which is relatively simple in its construction.

These and other objects of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a plan view of a wrench embodying the principles of the present invention;

FIG. 2 is an enlarged sectional view of the structure illustrated in FIG. 1 taken along the line 2—2 thereof;

FIGS. 3, 4, 5 and 6 are sectional views of the structure illustrated in FIG. 2, taken along the lines 3—3, 4—4, 5—5, and 6—6 thereof, respectively; and

FIG. 7 is a view of the structure illustrated in FIG. 3 with the parts being shown in another position.

Referring now to the drawings, FIG. 1 illustrates a ratchet wrench body 10 which is of relatively conventional exterior appearance. The wrench body 10 will be seen to have a handle 12 and a head 14 which are integrally formed with one another. The head 14 is of generally cylindrical cross section and is provided with a generally cylindrical cavity 16 extending therethrough. The wall of the cavity 16 is formed with parallel teeth 18 extending parallel to the axis of the cavity 16 and equally spaced completely around the wall of the cavity 16. The teeth 18 are truncated to form end surfaces 19 lying on a common cylinder. The teeth 18 extend for the length of the cavity 16 and between opposite end faces 20 and 22 of the head 14.

A drive member 24 has the major portion of its length positioned within the cavity 16 with an outer peripheral surface 25 of a segmentally cylindrical portion 30 thereof snugly but rotatably engageable with the ends 19 of the teeth 18. A driving lug 26 projects from one end of the drive member 24. The driving lug 26 is of square cross section and is adapted to be attached to a conventional socket member (not shown). A ball detent 28 is carried by the lug 26 for retaining a socket thereon.

The segmentally cylindrical portion 30 of the drive member 24 is provided with a pair of opposite laterally outwardly open recesses 32 which are separated by a web section 34 of the portion 30. The portion 30 has axially extending bores 36 machined so that portions of each bore 36 lie at opposite ends of a recess 32. The end of the drive member 24 opposite from the lug 26 is provided with a flange 38 extending radially outwardly from the cylindrical portion 30 and engageable with an end face 22 of the head 14. The end of the cylindrical portion 30 adjacent the lug 26 has a groove 40 formed in the outer peripheral surface 25 thereof. A split retaining ring 42 is positioned in the groove 40 to engage the wrench head face 20 and hold the drive member 24 in the cavity 16 with its flange 38 positioned against the face 22.

The drive member 24 is additionally formed with a blind bore 44 extending inwardly from the end thereof adjacent the flange 38. The bore 44 is coaxial with the cylindrical outer peripheral surface 25 and serves to receive the segmentally cylindrical projection 46 of a selector member 48. The selector member 48 has a base portion 50 positioned flatly against the flange 38 of the drive member 24. The bore 44 serves to journal the selector member 48 for oscillation or angular movement about the axis of the cavity 16. Such angular movement is accomplished by manually gripping the selector member 48 at ribs 52 formed thereon.

The projection 46 of the selector member 48 is formed with a transverse through bore 54 disposed perpendicularly to the axis of the bore 44. A helical spring 56 is positioned in the bore 54 and is seated at its opposite end in recesses formed in a pair of abutment members 58. The abutment members 58 project from the opposite ends of the bore 54 and have rounded ends engageable with arcuate inner surfaces 60 of a pair of pawls 62. The pawls 62 are supported for pivotal movement about the pins 64 positioned in the bores 36. It will be seen that each pin 64 engages the blind bottom of its associated bore 36 at one end thereof and is held in said bore 36 by the selector member 48 which abuts the other end of each pin 64. The pawls 62 are of generally segmental shape and each pawl is provided with a first set of teeth 66 at one end of its outer periphery and a second set of teeth 68 at the other end of its outer periphery. Projecting radially inwardly from the inner side of each pawl 62 beneath the surface 60 is a rib 70. The ribs 70 are received in grooves 72 formed in the projection 46 of the selector member 48. The grooves 72 extend laterally inwardly from the outer periphery of the projection 46 and the ribs 70 are engageable with a pair of shoulder portions 73 formed at the end of the projection 46 to hold the selector member 48 against movement in an axial direction and thereby unite the selector member 48 to the drive member 24. As can be seen in FIG. 4, the end of the projection 46 has a pair of opposite flattened side walls 74 that are parallel to one another and parallel to the bore 54. The side walls 74 extend for the axial length of the grooves 72 and shoulder portions 73 and are spaced apart a distance equal to the thickness of web section 34. However, with the projection 46 in its normal angular orientation the shoulder portions 73 project from the web sections 34. The relationship of the groove 72 to the ribs 70 permits oscillation of the selector 48 through a given angle without interfering with this oscillatory movement.

It will be seen that the spring 56 serves a biasing function and applies a force to the pawls 62 through the abutment members 58 causing one or the other of its sets of teeth 66 and 68 to contact the teeth 18. In one position of the selector member 48, the bore 54 is aligned with a radius passing on one side of each pin 64. When the selector member 48 is shifted to its other

position, the axis of the bore 54 will lie on a radius disposed on the opposite side of each pin 64. By shifting the selector member 48 between its positions one may determine whether the teeth 66 or the teeth 68 will engage with the teeth 18 of the wrench body head 14. It will, of course, be apparent by comparison of FIGS. 3 and 7 that which of the teeth 66 or 68 are engaged is dependent upon the position of the selector 48. It will also be apparent that the selector member 48 determines the direction of rotation in which the wrench will be effective to turn the drive member 24. With the selector 48 in one position, the wrench body 10 will turn freely in one direction of rotation, with the pawl teeth 66 or 68 simply clicking over the teeth 18 without transmitting torque to the drive member 24. By reversing the position of the selector member 48 the driving and "free slipping" directions are reversed. The pivotal movement of the selector member 48 to these positions is limited by the engagement of the sides of the abutment members 58 with the web section 34 at the ends of the bore 54.

The spacing of the pawls 62 is such that the teeth 66 or 68 of only one pawl will mesh completely with the teeth 18 at a time. For example, looking at FIG. 3, it will be seen that the teeth 66 of the lower pawl 62 are meshing fully with the teeth 18. While the teeth 66 of the upper pawl 62 are contacting the teeth 18 they do not mesh fully with the teeth 18. In fact, the teeth 66 of the upper pawl 62 are located exactly midway between positions of full engagement with the teeth 18. This arrangement cuts in half the maximum arc through which the handle 12 must be swung in order to cause one or the other of the pawls 62 to drivingly engage the teeth 18 and thereby turn the drive member 24. In this respect, the location and alternative functioning of the pawls 62 is similar to the pawl construction shown in United States Patent No. 2,772,763. It is to be understood, however, that the pawls of a wrench built according to the present invention may be set to contact the teeth 18 of the wrench body simultaneously, if desired.

The ratchet wrench of the present invention is relatively inexpensively manufactured. It should be noted, in particular, that the cavity 16 can be machined by a simple broaching operation because it is of uniform cross-sectional shape at all locations along its length. In this connection it will be seen that the teeth end surfaces 19 form a bearing for the drive member 24 and the load on the drive member 24 is well distributed over such surfaces during use of the wrench.

The wrench of the present invention is also distinguished by the arrangement of the parts whereby said parts are held in assembly by a single retaining ring 42. The parts may be disassembled, for example, by removing the ring 42 and then pulling the drive member and all of its associated parts out of the cavity 16 from one end thereof. It is only necessary to push the abutment members 58 radially inwardly into the bore 54 by the use of small screw drivers or other elongated small diameter instruments, through the clearance space between the pawls 62 and the drive member web section 34. By this means the abutment members 58 are moved out of angular alignment with the web section 34, permitting the selector member 48 to be rotated to align the bore 54 with the web section 34 and position the abutment members 58 and shoulder portions 73 within the web section 34. The projection 46 can then be withdrawn from the bore 44 and the selector member 48 thus disassembled from the drive member 24.

It will be seen that in the normal assembled position of the parts the engagement of the pawl ribs 70 with the shoulder portions 73 prevents disassembly of the selector member 48. While the abutment members 58 also help serve this function, it has been found that they alone are not completely reliable for this purpose and

the parts could come apart when subjected to a heavy blow or the like if it were not for the ribs 70.

While the preferred form of the invention illustrated herein is well calculated to fulfill the object above stated, it will be apparent that the invention is susceptible of modification, variation and change without departing from the fair meaning or scope of the subjoined claims.

What is claimed is:

1. A ratchet wrench including a wrench body having a generally cylindrical opening extending therethrough and provided with teeth spaced circumferentially around the wall thereof, a drive member supported for rotation in said opening, a selector supported on said drive member and angularly shiftable between two different angular positions relative to said drive member, said selector having a portion projecting centrally into said drive member, a radially extending shoulder at one end of said projecting portion, at least one pawl pivotally supported on said drive member and engageable with said body teeth to transmit torque from said body to said drive member, a radially inwardly projecting rib on said pawl normally disposed in axial alignment with said shoulder to prevent withdrawal of said projecting portion from said drive member and means for holding said drive member in said opening.

2. The structure set forth in claim 1 including biasing means extending radially from said projecting portion and selectively operable to bias one end of said pawl into engagement with said body teeth, said biasing means being engageable with said drive member to limit angular shifting movement of said selector.

3. A ratchet wrench including a wrench body having a generally cylindrical opening extending therethrough and provided with teeth spaced circumferentially around the wall thereof, said teeth having bearing surfaces formed at the crests thereof, a drive member disposed in said opening and positioned by said bearing surfaces for rotation relative to said body, a selector angularly shiftable between two different positions relative to said drive member, said selector having a portion projecting centrally into said drive member, at least one pawl pivotally supported on said drive member and engageable with said body teeth to transmit torque from said body to said drive member, said at least one pawl having a radially inwardly extending rib thereon, a radially extending shoulder on said selector projecting portion lying in axial alignment with said rib and engageable by said rib to prevent withdrawal of said projecting portion from said drive member when said selector is in either of its two said positions, and a pair of means carried by said drive member and engaging said body on opposite sides thereof, at least one of said means being removable to permit withdrawal of said drive member and said selector from said body.

4. The structure set forth in claim 1 including an annular shoulder integrally formed on said selector and engageable with said wrench body on one side thereof and a retainer member removably secured to said drive member and engageable with said wrench body on the opposite side thereof from said annular shoulder whereby said drive member is held in said opening by said annular shoulder and said retainer.

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