March 30, 1965 C. A. BERGQUIST 3,175,434

RATCHET WRENCH WITH IMPROVED PAWL RELEASE MEANS

Filed March 28, 1962

Fig. 1

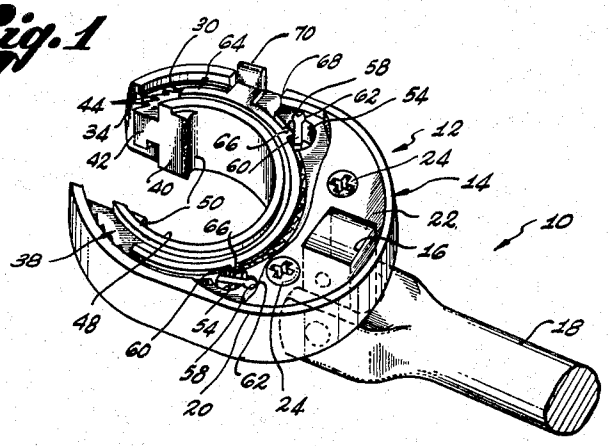


Fig. 3

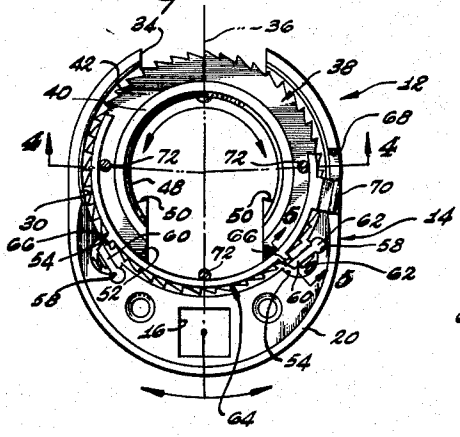


Fig. 2

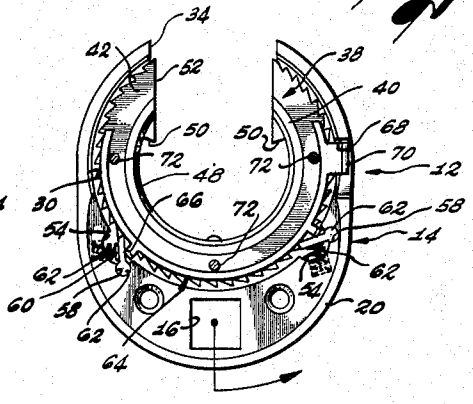


Fig. 4

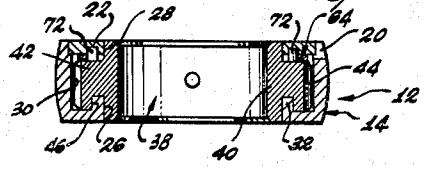
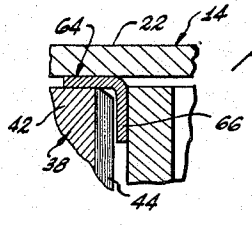


Fig. 5



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RATCHET WRENCH WITH IMPROVED PAWL RELEASE MEANS

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3 Claims. (Cl. 81—58.2)

This invention relates generally to ratchet wrenches and, particularly, to a ratchet wrench with an improved pawl release.

Ratchet wrenches are widely used and are especially convenient when working in confined spaces. In many cases, removal of a ratchet wrench from a work element in a confined space is facilitated or can be accomplished only if the ratchet pawls can be released to permit the ratchet wheel to turn freely in the ratchet head. This is especially true in the case of an open end ratchet wrench in which the ratchet wheel must be turned to align its slot with that in the ratchet head before the wrench can be removed from the work.

A general object of this invention is to provide a ratchet wrench with improved pawl release means.

Another object of the invention is to provide a ratchet wrench of the character described wherein the pawl release member is supported in the ratchet head in such a way as to eliminate the possibility of rotation of the ratchet wheel causing accidental shifting of the pawl release member.

A further object of the invention is to provide a ratchet wrench of the character described which is relatively simple in construction, economical to manufacture, and otherwise ideally suited to its intended purposes.

Other objects, advantages, and features of the invention will become readily evident as the description proceeds.

A presently preferred embodiment of the present ratchet wrench will now be described in detail by reference to the attached drawing, wherein:

FIG. 1 is a perspective view of the wrench with a cover plate thereof broken away for clarity;

FIG. 2 is a plan view of the wrench with the cover plate removed and showing the pawl release member in its inoperative position to permit normal ratcheting operation of the wrench;

FIG. 3 is a view similar to FIG. 2 showing the pawl release member shifted to its operative position wherein the ratchet pawls are retracted to permit free rotation of the ratchet wheel in either direction in the ratchet head;

FIG. 4 is a section taken along line 4—4 in FIG. 3; and

FIG. 5 is an enlarged section taken along line 5—5 in FIG. 3.

The ratchet wrench 10 illustrated in this drawing comprises a ratchet head structure 12 including a body 14 having a square hole 16 to receive a handle 18 for turning the head structure. One side face of body 14 is recessed, leaving a projecting lip 20 about the edge of the body. Fitting in and complementing this body recess and actually forming a part of the body is a cover plate 22. Cover plate 22 is fixed to the wrench body 14 by screws 24.

Extending into the other side face of the wrench body 14 is a generally circular opening 26. Cover plate 22 has a generally circular opening 28 equal in diameter to and coaxial with the body opening 26. The inner end of body opening 26 continues in a radially enlarged, coaxial recess 30 within the wrench body 14. The inner surface of the cover plate 22 forms one wall of this recess. Recess 30 defines with the body opening 26 an upstanding bearing flange or shoulder 32 about and coaxial with the latter opening.

The illustrated wrench is an open end ratchet wrench so that the wrench body 14 has a slot 34 which opens to the body opening 26 and recess 30 and through the edge of the body. The cover plate 22 also has a slot (not shown) aligned with and equal in width to the body slot 34 and which opens to the plate opening 28 and through the edge of the cover plate. The wrench body and cover plate are substantially symmetrical about the longitudinal center line 36 of the slot 34.

Within the wrench body 14 is a ratchet wheel 38. Ratchet wheel 38 has a generally circular hub 40, opposite ends of which are received in the openings 26 and 28 of the wrench body and cover plate 22, respectively. About and extending radially from the hub 40, between the ends of the latter, is a coaxial flange 42. Flange 42 extends into the body recess 30 and has ratchet teeth 44 about its periphery.

Extending axially into one side face of the wheel flange 42 is a coaxial bearing groove 46 which slidably receives the bearing flange 32 on the wrench body. The ratchet wheel 38, then, is rotatably supported in the wrench body 14 by the bearing flange 32.

Extending coaxially through the ratchet wheel 38 is a generally circular opening 48 with internal drive shoulders 50. The wheel also has a slot 52 of approximately the same width as the body slot 32. This wheel slot opens to the wheel opening 48 and through the edge of the wheel flange 42. When the wheel occupies its angular position of FIG. 2, the body and wheel slots are aligned.

Two generally semicircular pawl recesses 54 extend into the body 14, parallel to the axis of the body opening 26 and recess 30. These pawl recesses are located approximately 45 degrees to either side of the center line 36 of the body slot 34 and open radially to the body recess 30. Also extending through the body 14, parallel to and adjacent each pawl recess 54, is journal bore 58. Each journal bore opens radially to the adjacent pawl recess so that the cylindrical wall of each journal bore is less than 360 degrees in extent.

Indicated at 60 are two generally flat and rectangular ratchet pawls, within the pawl recesses 54, respectively, each having along one edge a cylindric journal portion pivotally received in the respective journal bore 58. The ratchet pawls are thereby pivotally supported in the wrench body 14 for pivotal movement into and out of ratcheting engagement with the ratchet teeth 44 on the ratchet wheel 38. Springs 62 acting between the wrench body 14 and the pawls 60 yieldably urge the latter into engagement with the ratchet teeth 44. The pawl recesses 54 and pawl journal bores 58 open axially through the bottom face of the body recess containing the cover plate 22 so that the pawls 60 may be inserted or removed when the cover plate is removed.

The wrench thus far described is conventional and is used with an axially slotted socket or the like (not shown) which is inserted through the ratchet wheel opening 48 and has longitudinal edges engageable with the wheel shoulders 50 to provide a driving connection between the wheel and socket.

From the description thus far, it is evident that when the ratchet pawls 60 engage the ratchet teeth 44, the wrench body 14 can be rotated in one direction with respect to the ratchet wheel 38 but is locked against rotation in the opposite direction with respect to the wheel. In the illustrated position of the wrench, then, the latter can be used to apply a torque in one direction to a work element. If the wrench is turned over, a torque may be applied in the opposite direction.

The improvements of this invention reside in a generally semicircular pawl release member 64. This member,

which can be simply stamped from sheet metal, for example, rests on the upper side face of the ratchet wheel 38, as the tool is viewed in the drawing, and has, along its outer edge, two right angularly bent fingers 66. These fingers extend axially across the toothed edge of the ratchet wheel flange 42 into the pawl recess 54 and between the wheel flange and the pawls 60. Accessible through a slot 68 in the body lip 20 and an aligned slot (not shown) in the cover plate 22 is a finger grip 70 by which the pawl release member 64 may be rotated, within the limits permitted by the slot 68, about the axis of the ratchet wheel 38.

Rotation of the pawl release member 64 in one direction (i.e., the clockwise direction as the tool is viewed in the drawing) brings the pawl release fingers 66 into engagement with the pawls 60, thereby swinging the latter out of engagement with the ratchet teeth 44 and releasing the ratchet wheel 38 for free turning in either direction in the body 14, as shown in FIG. 3. Rotation of the pawl release member 64 in the opposite direction retracts the pawl release fingers 66 out of engagement with the pawls 60, whereupon the latter are urged into engagement with the ratchet teeth 44 by their springs 62, as shown in FIG. 2.

It will be observed that unless the pawl release member is restrained against radial movement toward the ratchet wheel hub 40, the pawl release fingers 66 could catch in the ratchet teeth 44, which might result in the member being pulled around with the ratchet wheel or prevent free rotation of the wheel. This is especially true when the pawl release member is shifted to its pawl releasing, or operative, position of FIG. 3 wherein the pawl springs 62 urge the pawl release fingers 66 toward the ratchet teeth. Inward movement of the pawl release fingers into engagement with the ratchet teeth could be prevented, of course, by having the inner circular edge of the member bear against the ratchet wheel hub 40. In this case, however, the friction between the hub and pawl release member, resulting from the pawl springs pressing the member against the hub when the member is in its operative position of FIG. 3, would cause the member to be rotated to its inoperative position of FIG. 2 during relative rotation of the ratchet wheel in the corresponding direction with respect to the body 14. This, of course, would result in re-engagement of the ratchet teeth.

According to the present invention, the foregoing problems are avoided by providing bearing means 72 which project from that wall of the body recess 30 which confronts the face of the ratchet wheel flange 40 slidably supporting pawl release member 64, i.e., the inner surface of cover plate 22, into the space between the ratchet wheel hub 40 and the pawl release member. Bearing means 72 are thereby disposed for engagement by the inner cylindrical surface of the member to maintain the latter out of contact with the hub 40 and the pawl release fingers 66 out of contact with the ratchet teeth 44. In the illustrative embodiment of the invention, bearing means 72 comprise three projections or pins carried on and extending from the inner surface of the cover plate 22. One of these pins is situated approximately on the center line of the body slot 34, between the pawls 60, and the remaining two pins are situated at opposite sides of the ratchet wheel 38, slightly greater than 90 degrees away from the center pin, as shown. The three pins, then, also guide the pawl release member 64 in its rotational movement. The gap in the semicircular pawl release member is aligned with the body slot 34, as shown, so as to not interfere with placing the wrench about a workpiece.

From the foregoing description, it is evident that the bearing pins 72 restrain the pawl release member 64 against radially inward movement toward the ratchet wheel hub 40 to prevent contact between the member and hub and between the ratchet release fingers 66 and

ratchet teeth 44 and thereby prevent the member from being pulled around with the ratchet wheel. It is obvious, of course, that the above function could be accomplished by bearing means other than pins, such as a circular flange on the cover plate, for example.

Clearly, then, the invention herein described and illustrated is fully capable of attaining the objects and advantages preliminarily set forth.

What is claimed is:

1. A ratchet wrench comprising:
a body having opposite side faces and a generally circular opening entering the body through a side face thereof,
a ratchet wheel rotatably mounted in said body opening including a generally cylindrical hub and a radially enlarged, generally circular flange about and projecting radially from said hub,
a cover plate seating on said side face of said body and having an opening receiving said hub,
means securing said cover plate to said body, said cover plate overlying said flange to retain said ratchet wheel in said body opening,
means on said wheel for connection to an element to be rotated,
ratchet teeth about the periphery of said flange,
a ratchet pawl within said body opening and pivoted on said body for swinging on an axis parallel to the rotation axis of said wheel into engagement with said ratchet teeth to lock said wheel against rotation in one direction with respect to said body and out of engagement with said teeth to permit said wheel to turn freely in either direction in said body,
a spring acting between said body and pawl for urging the latter into engagement with said teeth,
a circularly curved pawl release member coaxially encircling said hub between said cover plate and one side face of said wheel flange, said member being located radially inward of the periphery of said flange and slidably seating on said one side face of said flange,
said member including a finger extending from the outer edge of the member in the plane thereof radially out to the periphery of said flange and then axially across the periphery of the flange for movement into engagement with said pawl to retract the latter out of engagement with said teeth and out of engagement with said pawl to release the latter for movement into engagement with said teeth by rotational movement of said member about the axis of said wheel,
means on said member accessible exteriorly of said body for rotating the member,
said member being yieldably urged by said spring toward said hub when said pawl is retracted by said finger and the member having an inner cylindrically curved surface facing and radially spaced from said hub, and
means projecting from said cover plate toward said one flange face and into the space between said hub and the inner surface of said member for guiding said member in its rotational movement and retaining said member out of contact with said hub.

2. A ratchet wrench comprising:
a body having opposite side faces and a generally circular opening entering the body through a side face thereof,
a ratchet wheel rotatably mounted in said body opening including a generally cylindrical hub and a radially enlarged, generally circular flange about and projecting radially from said hub,
a cover plate seating on said side face of said body and having an opening receiving said hub,
means securing said cover plate to said body, said cover plate overlying said flange to retain said ratchet wheel in said body opening,

means on said wheel for connection to an element to be rotated,

ratchet teeth about the periphery of said flange,

a ratchet pawl within said body opening and pivoted on said body for swinging on an axis parallel to the rotation axis of said wheel into engagement with said ratchet teeth to lock said wheel against rotation in one direction with respect to said body and out of engagement with said teeth to permit said wheel to turn freely in either direction in said body,

a spring acting between said body and pawl for urging the latter into engagement with said teeth,

a circularly curved pawl release member coaxially encircling said hub between said cover plate and one side face of said wheel flange, said member being located radially inward of the periphery of said flange and slidably seating on said one side face of said flange,

said member including a finger extending from the outer edge of the member in the plane thereof radially out to the periphery of said flange and then axially across the periphery of the flange for movement into engagement with said pawl to retract the latter out of engagement with said teeth and out of engagement with said pawl to release the latter for movement into engagement with said teeth by rotational movement of said member about the axis of said wheel,

said member further including a fingerpiece extending from the outer edge of the member in the plane thereof and to the exterior of said body through a slot in an edge wall thereof for rotating the member, said fingerpiece terminating substantially flush with the outer surface of the body,

said member being yieldably urged by said spring toward said hub when said pawl is retracted by said finger and the member having an inner cylindrically curved surface facing and radially spaced from said hub, and

a multiplicity of pins projecting from said cover plate parallel to the ratchet wheel axis toward said one flange face and into the space between said hub and the inner surface of said member and disposed at a generally uniform radial distance from said wheel axis for guiding said member in its rotational movement and retaining said member out of contact with said hub.

3. A ratchet wrench comprising:

a body having opposite side faces and a generally circular opening entering the body through a side face thereof,

a ratchet wheel rotatably mounted in said body opening including a generally cylindrical hub and a radially enlarged, generally circular flange about and projecting radially from said hub,

a cover plate seating on said side face of said body and having an opening receiving said hub,

means securing said cover plate to said body, said cover plate overlying said flange to retain said ratchet wheel in said body opening,

means on said wheel for connection to an element to be rotated,

ratchet teeth about the periphery of said flange,

a ratchet pawl within said body opening and pivoted on said body for swinging on an axis parallel to the rotation axis of said wheel into engagement with said ratchet teeth to lock said wheel against rotation in one direction with respect to said body and out of engagement with said teeth to permit said wheel to turn freely in either direction in said body,

a spring acting between said body and pawl for urging the latter into engagement with said teeth,

a circularly curved pawl release member coaxially encircling said hub between said cover plate and one side face of said wheel flange, said member being located radially inward of the periphery of said flange and slidably seating on said one side face of said flange,

said member including a finger extending from the outer edge of the member in the plane thereof radially out to the periphery of said flange and then axially across the periphery of the flange for movement into engagement with said pawl to retract the latter out of engagement with said teeth and out of engagement with said pawl to release the latter for movement into engagement with said teeth by rotational movement of said member about the axis of said wheel,

said member further including a fingerpiece extending from the outer edge of the member in the plane thereof and to the exterior of said body through a slot in an edge wall thereof for rotating the member, said fingerpiece terminating substantially flush with the outer surface of the body,

said member being yieldably urged by said spring toward said hub when said pawl is retracted by said finger and the member having an inner cylindrically curved surface facing and radially spaced from said hub,

three pins projecting from said cover plate parallel to the ratchet wheel axis toward said one flange face and into the space between said hub and the inner surface of said member and disposed at a generally uniform radial distance from said wheel axis for guiding said member in its rotational movement and retaining said member out of contact with said hub, and

the angular spacing between said pins being approximately 90 degrees and said member being of more than 180 degrees angular extent.

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