RATCHET SCREWDRIVER TYPE HAND TOOL

Arden B. MacNeill, 63 Riverview Ave.,
Waltham, Mass. 02154
Filed Feb. 21, 1966, Ser. No. 538,499
6 Claims. (Cl. 145—72)

This invention relates to ratchet screwdriver type hand tools, and more particularly to an improved ratchet screwdriver type hand tool having compact and completely enclosed ratchet mechanism for insuring long trouble free life and capable of heavy torque loading.

Use of hand tools, such as in connection with automobile servicing, often involves rough treatment in work loading as well as contact contaminants such as road dirt on automobile components which tend to impair operating mechanism in the tools. These problems have been overcome in the present invention of a ratchet screwdriver type hand tool which also incorporates other desirable features and advantages that is of structural compactness for providing ease in use and storage. Other desirable features and advantages include that of selective right and left hand torque operation through a simple relative motion of an operating cam about the tool axis itself, and a cam position providing for locking the mechanism in place for both right and left hand torque operation with the single setting. Also, the present invention is constructed with inherent capacity for inexpensive, high production line manufacture and assembly for thereby meeting the requirements of a high quality tool at low cost.

A primary object of the present invention is the provision of an improved ratchet screwdriver type hand tool with completely inclosed, compact ratchet mechanism capable of selective right and left hand torque operation.

A further object is the provision of a ratchet screwdriver type hand tool wherein the right and left hand torque operation may be selected through the simple relative motion of an operating cam about the axis of the tool itself.

A further object is the provision of a ratchet screwdriver type hand tool wherein the operating cam has a position for locking the mechanism in place as a unitary structure for both right and left hand torque operation.

A still further object is the provision of a ratchet screwdriver type hand tool comprised of a relatively small number of components, all of which have a configuration lending themselves to inexpensive high production manufacture and assembly for thereby providing a high quality tool at low cost.

These and other features, objects and advantages are achieved generally by the provision of an elongated member or shaft with two ends and a longitudinal axis located centrally thereof, a work engaging formation at one end, a handle at the other end, torque transmitting spacer members fixed to the shaft adjacent the handle, a hollow ratchet wheel carried by the torque transmitting members for rotation about the axis and having ratchet teeth about the internal periphery of the hollow wheel, a pawl mechanism fixed to the torque transmitting members with capacity for pivoting into torque transmitting engagement with the ratchet teeth, a hand operable structure for causing the pawl mechanism to selectively engage the ratchet teeth for torque transmission in either left or right hand direction about the axis, and a lever extending from the hollow ratchet wheel in perpendicular relation to the axis for applying torque to the ratchet wheel for transmission through the pawl mechanism, torque transmitting members and shaft to the work engaging formation.

By making the pawl mechanism with a pair of pawl members mounted for pivotal movement outwardly in opposite directions from the axis so that one of the pawls engages the ratchet teeth for torque transmission in one direction and the other pawl engages the ratchet teeth for torque transmission in the opposite direction, a relatively simple arrangement for right and left hand torque transmitting operation is thereby achieved.

By making the selective structure with a hand operable cam mounted on the shaft for rotation about the axis and having a camming formation for selectively pivoting one or the other of the pawls in disengaged relation to the ratchet teeth a readily accessible, convenient and simple selective arrangement is thereby achieved.

By making the torque transmitting members as a series of thin discs and the pawl members as a series of thin plates, inexpensive mass stamping production capability for said members is thereby achieved.

By making said camming member as a simple recessed structure and providing tubular sleeve members for rigidly engaging the shaft at a swaged portion thereof, structures adaptable for sintered metal production and ease of assembly are thereby achieved.

These and other features, objects and advantages will be better understood from the following description taken in connection with the accompanying drawings of a preferred embodiment of the invention and wherein:

FIG. 1 is a partially side view and partially cutaway view of the preferred embodiment and taken on line 1—1 of FIG. 2;

FIG. 2 is a cross sectional view to enlarged scale taken on line 2—2 of FIG. 1;

FIG. 3 is a cross sectional view to enlarged scale taken on line 3—3 of FIG. 1;

FIG. 4 is a cross sectional view to enlarged scale taken on line 4—4 of FIG. 1.

Referring to the drawings in more detail, a ratchet screwdriver type handle tool in accordance with the present invention is designated generally by the numeral 10. The ratchet screwdriver type hand tool 10 has an elongated member or shaft 12 with a longitudinal axis 14 and a work engaging formation 16 at one end. A longitudinally swaged portion with longitudinally extending ears 18 and 20 are formed at the other end of the shaft 12. In the present instance, the work engaging formation 16 is in the nature of a square cross section adapter carrying a conventional spring ball 22 for use with socket type tools such as described and shown in my application for patent Serial No. 435,605 filed February 26, 1963 and my application for patent Serial No. 444,957 filed April 2, 1965. However, it should be understood that said work engaging formation 16 may also be directly, instead of an adapter, a screwdriver tip or socket wrench or other desired configuration.

Fitted onto the bottom portion of the longitudinally extending swaged ears 18 and 20 and against a shoulder 24 formed with the shaft 12 is a collar 26 and a sleeve 28, each having an internal configuration to fit the ears 18 and 20 and shaft 12. Rotatively mounted on the sleeve 28 is an operating cam structure 30 carrying internally thereof a circular cam surface 32 of a greater diameter than a second cam surface 34 separated by a stop member 36 for purposes to be hereinafter further described.

Resting on the sleeve 28 are a series of thin torque transmitting members 38, each having a central opening similar to that of the sleeve 28 for embracing the shaft 12 and ears 18 and 20 for integral movement with the shaft 12. A spacer sleeve 40, similar to the sleeve 28, rests on the torque transmitting members 38 and carries at its upper end a further series of torque transmitting members 42 identical in construction to the torque
transmitting members 38. A hollow ratchet wheel 44 is rotatively carried by the torque transmitting members 38 and 42. The hollow ratchet wheel 44 has a lug extension 46 on its outer periphery carrying a lever 48 having a knurled handle 50 and a threaded end 52 detachably screwed into a similarly threaded receptacle in the lug extension 46 so as to provide a manual torque applying lever 48 substantially at right angles to the axis 14 of the shaft 12. The hollow ratchet wheel 44 carries ratchet teeth 54 about the internal periphery thereof for receiving torque transmitting projections 56 and 58 on a pair of pawls 60 and 62 respectively pivotally mounted on pivot pins 64 and 68 anchored in the torque transmitting members 38 and 42. The pivot pins 64 and 68 permit the pawls 60 and 62 to swing inwardly toward the shaft 12 and outwardly toward the ratchet teeth 54 for engagement by torque transmitting faces 61 and 63 of the torque transmitting projections 56 and 58. The pawls 60 and 62 are normally urged outwardly toward the ratchet teeth 54 by the fingers of a coil spring 70 mounted on a spring carrying pin 72. The torque transmitting faces 61 and 63 are at an angle such that when engaging the side of a ratchet tooth 54 in manner shown by the torque transmitting face 63 in FIG. 2, the line of force perpendicular to the torque transmitting face, such as face 63, will preferably pass through the center of the associated pivot, such as pivot 68, or slightly to the far side of the associated pivot pin, such as the right of pin 68, so as to prevent a disengaging rotational torque on the associated pawl, such as pawl 62, about the pivot pin.

The pawls 60 and 62 also carry camming pins 74 and 76 respectively extending through clearance holes 78 and 80 in the torque transmitting members 38 and 42. The camming pins 74 and 76 extend downwardly into the camming recess of the rotatively mounted camming structure 30. When the camming structure is in the position shown in FIG. 4, the camming surface 34 will cause the camming pin 74 to push the pawl 60 inwardly toward the spacer sleeve 40 so as to disengage the torque transmitting projection 56 from the ratchet teeth 54. Also, in the position shown in FIG. 4, the camming pin 76 engages the camming surface 32 due to the pawl 62 being urged outwardly by the coil spring 70 and causing the torque transmitting extension 58 to engage the ratchet teeth 54. Thereby, in the position of the operating cam 30 shown in FIG. 4, a clockwise torque on the lever handle 12, as viewed in FIG. 2, will be transmitted through the torque transmitting projection 58, pawl 62, pivot pin 68, torque transmitting members 38 and 42 to the shaft 12 and thereby the work engaging formation 16.

A handle 79, preferably of a plastic material, is carried on the shaft 12 and conformed to longitudinally disposed ears 18 and 20 to form a substantially integral structure with the shaft 12 for manual torque transmission through the handle 79, the ears 18 and 20 and shaft 12 to the work engaging formation 16.

In the operation of the present ratchet screwdriver type hand tool, as explained above, when the rotatively mounted operating cam structure 30 is in the position shown in FIG. 4, clockwise torque on lever handle 12 is transmitted to the work engaging formation 16. Also, counterclockwise rotation of the lever 48 will cause the slant surface 82 on the back face 84 of the lever handle 12 to ride over the ratchet teeth 54 so as to push the pawl 62 inwardly against the coil spring 70 without the transmission of counterclockwise torque to the work engaging formation 16. This permits a backward and forward stroke motion of the lever 48 with only the forward or clockwise motion producing a torque to the work engaging formation 16.

When it is desired to produce a torque in a counterclockwise direction at the work engaging formation 16, the rotatively mounted operating cam 30 is rotated counterclockwise until the stop member 36 engages the camming pin 76. Thereby the camming surface 34 forces the camming pin 76 inwardly and carrying with it the pawl 62 inwardly toward the spacer sleeve 40 so as to disengage the torque transmitting projection 58 from the ratchet teeth 54. At the same time, now at the camming pin 74, permits the pawl 60 to swing outwardly so that the torque transmitting projection 56 engages the side of ratchet tooth 54 for transmission of counterclockwise torque from the lever 48 through ratchet teeth 54, projection 56, pawl 60, pivot pin 64, torque transmitting members 38 and 42, and shaft 12 to the work engaging formation 16. Also, in this new position, a clockwise rotation of lever 48 will cause the slant surface or back face 84 of the projection 56 to ride over the ratchet teeth 54 without the transmission of torque, thereby permitting short forward and backward strokes of the lever 48 with only the backward or counterclockwise strokes transmitting torque to the work engaging formation 16.

It has been found that by making the torque transmitting member 38 to closely embrace the ears 18 and 20 on the shaft 12 for integral rotation with the shaft 12 as explained above and of a width to provide a clearance 86 (FIG. 1) between the operating cam 30 and hollow ratchet wheel 44, the torque transmitting member 38 acts as a reaction washer for isolating the operating cam 30 from torque effects and relative rotation of the hollow ratchet wheel 44 as the lever handle 12 is rotated.

Thus, manual setting of the operating cam 30 remains undisturbed regardless of the above described relative rotary back and forth motion of the hollow ratchet wheel 44 by lever 48.

It should be noted that the collar 26, the sleeves 28 and 40 and the hollow ratchet wheel 44 together with the operating cam 30 are of a simple construction lending themselves to inexpensive sintered metal production. Also, the multiple thin plate construction of the torque transmitting members 38 and 42 and the pawls 60 and 62 lend themselves to high production power press manufacture.

The ratchet and pawl structure described above provides a completely enclosed mechanism with the hollow ratchet wheel 44, torque transmitting members 38 and 42 and cam 30 to effect a housing closure which prevents dirt and other contaminants from entering and impairing operation of the mechanism.

The lever 48 having a threaded end 52 permits disassembly from the hollow ratchet wheel 44 for convenient and compact storage of the hand tool, as in any conventional tool box.

It should be noted that by rotating the operating cam 30 to an intermediate position wherein camming pins 74 and 76 both engage the cam surface 32, both pawls 60 and 62 are thereby permitted to engage ratchet teeth 54 for transmission of torque in both clockwise and counterclockwise directions. The device thereby operates as a unitary structure for those instances where it is desirable to eliminate the ratchet action, as for example when the lever 48 is removed from the ratchet wheel 44 and the remaining tool is used with the handle 78 alone.

This invention is not limited to the particular details of construction and operation described as equivalents will suggest themselves to those skilled in the art.

What I claim is:

1. In a ratchet screwdriver type hand tool, the combination of a shaft with two ends and a longitudinal axis, a work engaging formation at one of said ends, a handle at the other of said ends, torque transmitting members fixed to said shaft adjacent said handle, a hollow ratchet wheel rotatably carried by said torque transmitting members for rotation about said axis and having ratchet teeth about the internal periphery of said hollow wheel, a pawl mechanism fixed to said torque transmitting members with capacity for pivoting into
3,330,316

torque transmitting engagement with said ratchet teeth, hand operable means for causing said pawl mechanism to selectively engage said ratchet teeth for torque transmission in either direction about said axis, and a lever extending from said hollow ratchet wheel in perpendicular relation to said axis for applying torque to said ratchet wheel for transmission through said pawl mechanism, torque transmitting member and shaft to said work engaging formation.

2. The combination as in claim 1 wherein said pawl mechanism includes a pair of pawl members mounted to said torque transmitting members for pivotal movement outwardly in opposite directions from said axis so that one of said pawls engages said ratchet teeth for torque transmission in one direction and the other pawl engages said ratchet teeth in torque transmitting engagement in the opposite direction.

3. The combination as in claim 2 wherein said hand operable means includes a hand operable cam mounted on said shaft for rotation about said axis and having a camming formation for selectively pivoting one and the other of said pawls in disengaged relation from said ratchet teeth.

4. The combination as in claim 2 wherein said torque transmitting members and pawls are of a plurality of thin plate-like elements.

5. The combination as in claim 3 wherein the torque transmitting member adjacent the operating cam embraces said shaft for integral rotation with said shaft about said axis, and having a width providing a clearance between said hand operable cam and hollow ratchet wheel for thereby isolating said cam from relative rotational influences of said hollow ratchet wheel.

6. The combination as in claim 3 wherein said hollow ratchet wheel and hand operable cam are of sintered metal.

References Cited

UNITED STATES PATENTS

1,258,582 3/1918 McGuffey 81—61
2,732,049 1/1956 De Liso 81—62 X
2,778,396 1/1957 Swain
3,256,966 6/1966 Angquist 81—62 X

WILLIAM FELDMAN, Primary Examiner.
R. V. PARKER, Jr., Assistant Examiner.