

[54] **SOCKET EJECTING MECHANISM FOR
RATCHET WRENCHES**

[75] Inventor: **Richard B. Wright**, Akron, Ohio

[73] Assignee: **The Wright Tool & Forge Co.**,
Barberton, Ohio

[22] Filed: **Mar. 5, 1974**

[21] Appl. No.: **448,189**

[52] U.S. Cl..... **81/63; 81/177 G; 81/180 R**

[51] Int. Cl..... **B25b 13/46**

[58] Field of Search ... 81/61, 62, 63.2, 63, 177.6 G,
81/121.1, 180 R

[56] **References Cited**

UNITED STATES PATENTS

271,549	1/1883	True	81/124.1
1,509,680	9/1924	Meek	81/124.1
2,607,620	8/1952	Oliveri	81/124.1

3,138,984	6/1964	Penner	81/177 G
3,393,587	7/1968	Jolliff et al.	81/63.2

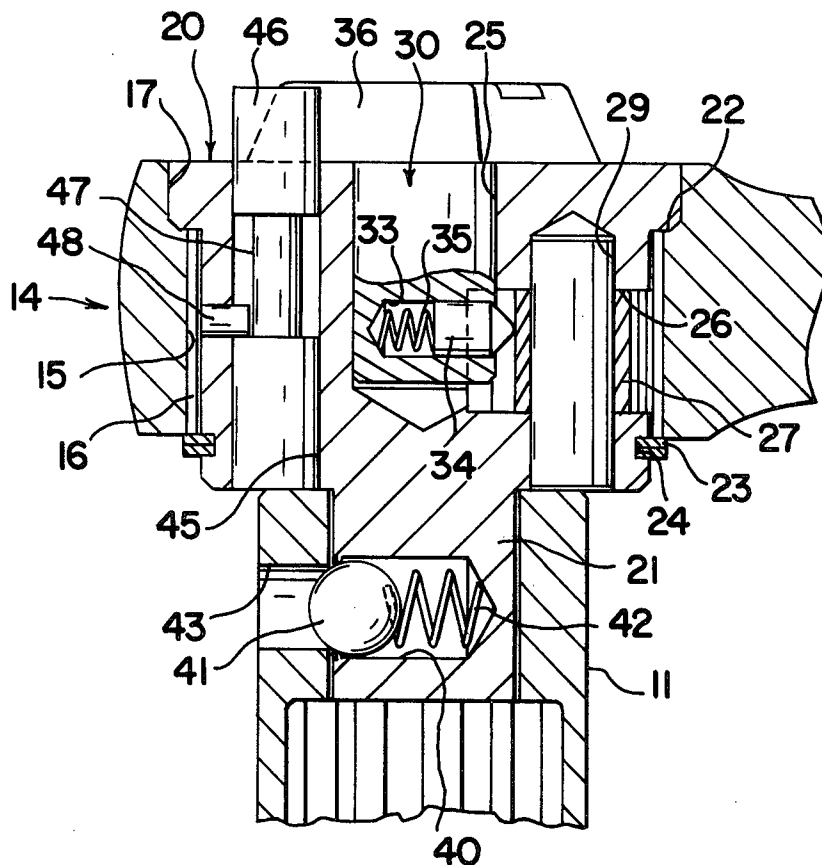
Primary Examiner—James L. Jones, Jr.

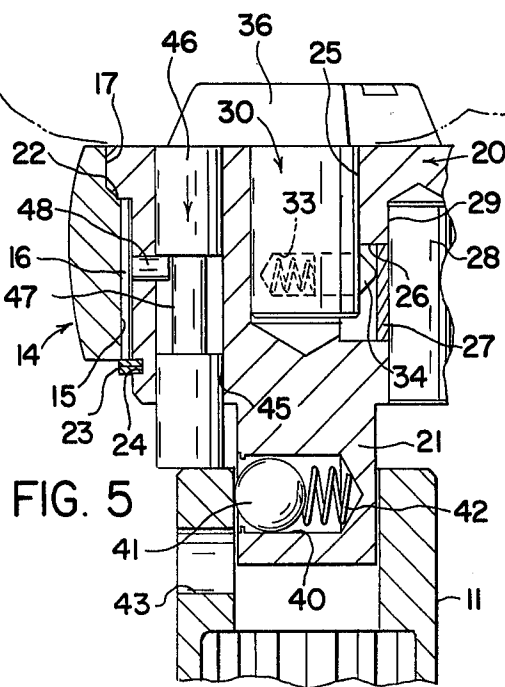
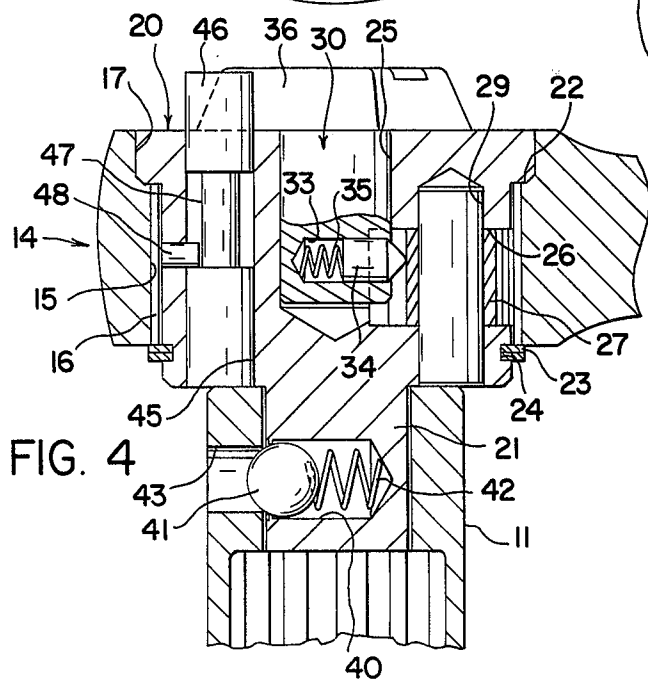
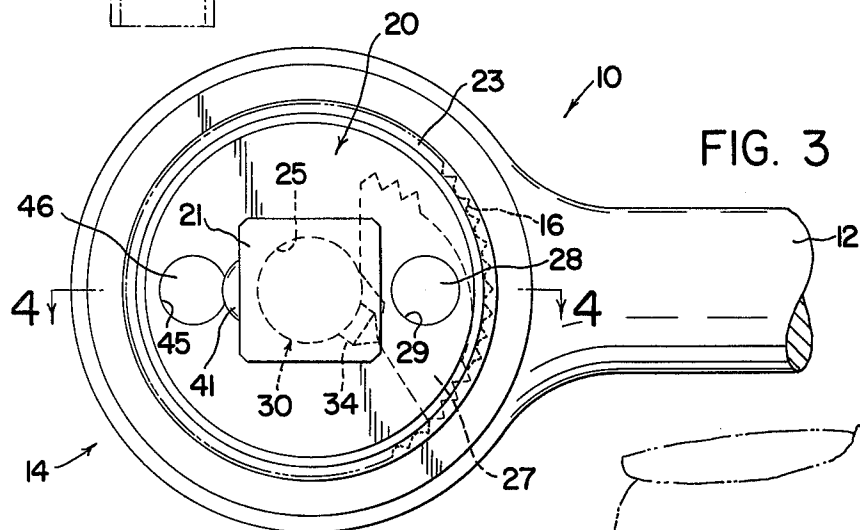
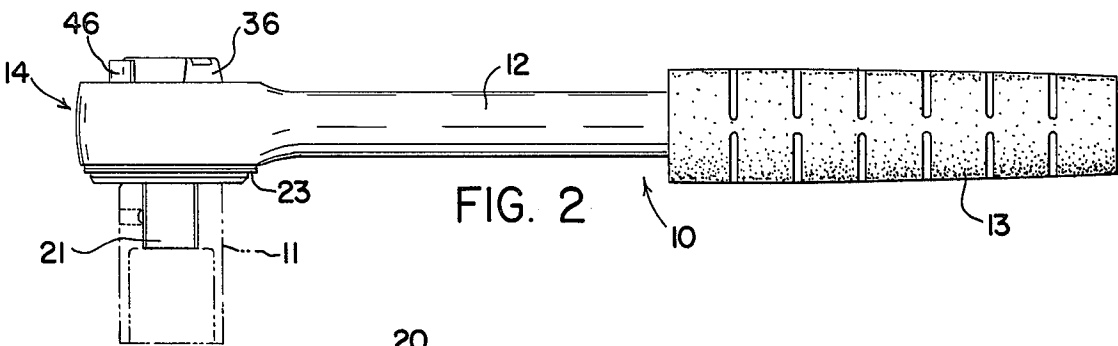
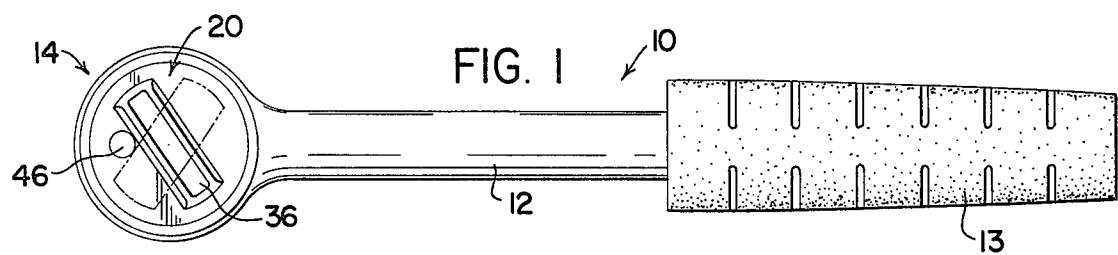
[57]

ABSTRACT

A lever-type socket wrench with a reversing ratchet for driving interchangeable socket heads. One end of the wrench serves as a handle and the other end is provided with internal ratchet teeth formed about the axis of turn and with a rotatable socket carrier having a protruding stud for receiving the socket head. The ratchet teeth are engaged by a double pawl element that is urged to either a forward drive or reverse drive position by a selector element. A socket head ejector plunger is mounted in the socket carrier for limited sliding movement parallel to the socket axis and is adapted when pressed by the tool operator to positively eject the socket head from the stud.

7 Claims, 5 Drawing Figures





SOCKET EJECTING MECHANISM FOR RATCHET WRENCHES

BACKGROUND OF THE INVENTION

This invention relates to socket wrenches for turning threaded connectors such as machine screws, bolts and nuts, especially to lever-type socket wrenches with reversing ratchet for gripping a hexagonal bolt head or the like. More particularly, the invention relates to a ratchet-drive-type wrench assembly for various socket heads with a special provision for positively ejecting the socket head from the male square or stud without requiring the tool operator to touch or grip the socket head itself.

Socket wrenches with reversing ratchet drive are well known in the art and are commonly used with lever-type handles. The inner end or fulcrum end of the lever usually has a male type connector or stud that fits in a square female recess in the various socket heads with which the wrench is to be used. One wrench of this type of construction is disclosed in U.S. Pat. No. 3,393,587.

Usually the socket head is retained on the male square or stud by a detent means such as a spring loaded ball positioned in either the male square or in the socket head. The ball is urged into a cooperating seat in the opposite member by resilient means such as a helical spring. While attachment and removal of the socket head can easily be accomplished under ideal circumstances, it becomes more difficult under certain working conditions. The worker's hand and also the socket head itself are often covered with grease or oil and it is difficult to get a good finger grip on the socket head to pull it off.

One partial solution to this problem is disclosed in U.S. Pat. No. 3,393,587 wherein provision is made for releasing the detent means by manual shifting an easily actuated member that disengages the ball from its seat.

Another detent releasing device for a socket wrench is shown in U.S. Pat. No. 3,208,318. Both of these approaches to the problem result in the release of the detent means but do not cause positive removal of the socket head from the stud. Since the socket head usually fits too snugly to fall off as a result of gravity alone, the tool operator must still manually remove the socket head. This is not always easily accomplished because dirt, a burr, or grease may cause the socket head to stick.

Another disadvantage of prior art detent release mechanisms is the reduction in strength of the stud that results when such mechanisms are incorporated. Usually machining is required with the consequent removal of material from either the male square or the ratchet mechanism. High strength is extremely important in socket wrenches in view of the high torque often applied.

Still another disadvantage with prior art devices is the danger of jamming or other type of malfunction that can occur where the release mechanism is complex.

The lever type socket wrench of the present invention provides positive ejection of the socket head, however, and affords other features and advantages heretofore not obtainable.

SUMMARY OF THE INVENTION

It is among the objects of the invention to positively eject a socket head from a ratchet type socket wrench

without requiring that the operator manually grip the socket head to effect its removal.

Another object of the invention is to provide a mechanism for positively ejecting a socket head from a ratchet type socket wrench without requiring extensive machining and which minimizes any danger of malfunction.

These and other objects and advantages are achieved by the unique construction of the ratchet-type socket wrench of the invention as adapted for use with a variety of interchangeable socket heads. The assembly includes a lever adapted to be turned about the axis of the socket head, with a handle at one end and means defining internal ratchet teeth in the other end about the axis of turn. A socket carrier is mounted within the ratchet teeth for rotation relative to the lever about the axis of turn. The socket carrier has a stud extending downwardly for receiving and retaining a socket head.

A double pawl element is mounted in the socket carrier for pivotal movement between forward drive and reverse drive engagement with the ratchet teeth depending upon the position of a selector element that is operated to select either a forward or reverse drive condition. Slidably mounted in the socket carrier is a socket head ejector pin adapted for limited endwise sliding movement parallel to the axis of turn and adapted to engage the socket head received on the male square and to be depressed by the tool operator to positively eject the socket head from the male square.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a ratchet type socket wrench with means for positively ejecting a socket head therefrom in accordance with the invention;

FIG. 2 is a side elevation of the socket wrench of FIG. 1;

FIG. 3 is a fragmentary elevation on an enlarged scale of the socket wrench of FIGS. 1 and 2 taken from below with the socket head removed;

FIG. 4 is a fragmentary sectional view taken on the line 4—4 of FIG. 3 and showing the positive socket ejector plunger in its retracted position; and

FIG. 5 is a fragmentary elevational view similar to FIG. 4 showing the positive ejection plunger pressed to its extended position to positively force a socket head from the drive stud.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, there is shown a ratchet wrench 10 embodying the invention and adapted to drive one of several interchangeable socket heads of standard construction, such as the socket head 11 shown in dashed lines in FIG. 2 and in solid lines in FIGS. 4 and 5. The wrench 10 comprises a lever 12 with a handle 13 at one end and having at the fulcrum end 14 a circular opening 15. The opening 15 is provided with internal ratchet teeth 16 and also has on the upper side, as viewed in FIGS. 4 and 5, a smooth counterbore 17.

Rotatably mounted within the opening 15 is a socket carrier 20 having a male square 21 or stud extending downwardly and adapted to fit in a mating female recess in the socket head 11. The socket carrier 20 has an annular shoulder 22 that seats in the counterbore 17, and the socket carrier 20 is retained in position by

means of lockrings 23 seated in an annular groove 24 in the lower end of the socket carrier 20.

The socket carrier 20 has an axial bore 25 (FIGS. 4 and 5) formed therein and a lateral slot 26 cut perpendicular to the axis of the socket carrier 20 and extending to the axial bore 25. Pivotaly mounted within the slot 26 is a double pawl element 27 with its teeth at the opposite ends thereof adapted for selective driving engagement with the ratchet teeth 16 of the fulcrum end 14. The pawl element 27 is pivotaly connected to the socket interior 20 by a pivot pin 28 extending therethrough and having its opposite ends received in opposite ends of a bore 29 in the socket carrier 20.

Referring to FIG. 3, it will be seen that the double pawl element 27 is capable of limited pivotal movement between a forward drive position illustrated in FIG. 3 wherein the handle 13 drives the socket 11 when turned clockwise and ratchets when turned counterclockwise, and a reverse drive position (not shown).

A ratchet drive selector element 30 is used with associated parts to control the position of the double pawl element 27 to provide either forward or reverse ratchet drive. The element 30 is pivotaly mounted in the axial bore 25 in the socket carrier 20 and has a transverse bore 33 that receives a plunger 34 and a helical spring 35. The helical spring 35 bears at one end against the wall of the transverse bore 33 and at the other end against the plunger 34 to urge the plunger radially outward against the double pawl element 27 (FIGS. 3, 4 and 5).

The upper end of the ratchet drive selector 30 has a selector button 36 that rests against the top surface of the socket carrier 20. The selector button 36 may be turned within limits of about 30° of pivotal movement between the positions shown in solid lines and dashed lines respectively in FIG. 1. When the selector button 36 is moved to the position shown in solid lines in FIG. 1, the pawl will be urged to its forward drive position. When the selector button 36 is moved to the position shown in dashed lines in FIG. 1, the double pawl element 27 will be in its reverse ratchet drive position.

The male square 21 is provided with a lateral bore 40 that receives a detent ball 41 and a helical spring 42. The spring 42 bears between the floor of the bore 40 and the ball 41 to urge the ball 41 outwardly to the position shown in FIG. 4. The ball 41 is limited in its outward movement by a restrictor ring that is seated in an annular groove in the bore 40.

The socket head 11 has a cooperating lateral detent bore 43 formed in the wall of the matching female receptacle so that when the socket head 11 is in its fully attached position illustrated in FIG. 4 the ball 41 registers with the detent bore 43 to retain the socket head on the male square 21. During attachment and removal of the socket head, however, the ball 41 is forced inwardly against the spring to the position shown in FIG. 5.

In accordance with the invention, the socket carrier 20 is provided with a bore 45 extending therethrough and parallel to the axis of turn. The bore 45 receives a positive ejection plunger 46 which is slidable therein and has a central neck portion 47 of reduced diameter. A lateral bore is formed through the socket carrier 20 to the bore 45 and receives a limit pin 48 that is fixed in position and which projects into the space between the central neck portion 47 of the plunger 46 and the wall of the bore 45. Thus, the pin 48 serves to limit the

axial movement of the plunger 46 to the retracted position shown in FIG. 4 and the extended position shown in FIG. 5.

When a socket head is mounted on the male square 21, the plunger will be in a retracted position shown in FIG. 4 and in this position it serves as a reference for the drive selector 30 to aid the person using the wrench to visually determine whether the drive selector is in the forward drive position or the reverse drive position. Without the reference it would be necessary to test the wrench manually in order to determine the ratchet condition.

The principal function of the positive ejection plunger 46 is that of positively removing the socket head 11 from the male square 21 for replacement or storage. Unlike prior art socket release devices the plunger 46 does not serve to disable the detent mechanism but rather positively forces the socket head 11 from the male square 21 and thus, forcefully overrides the detent mechanism. It will be noted that the positive ejection is accomplished by the operator merely by pressing the upper end of the plunger 46 downward with a finger to the position shown in FIG. 5.

An alternate form of the device has a longer plunger that extends upwardly above the top face of the socket carrier 20 about twice as high as that illustrated in FIG. 4 so that when it is depressed it does not become flush with the top face of the socket carrier as illustrated in FIG. 5 but rather continues to project upwardly somewhat to act as a positive stop for the selector button 36.

While the invention has been shown and described with respect to specific embodiments thereof this is intended for the purpose of illustration rather than limitation and other variations and modifications of a specific device herein shown and described will be apparent to those skilled in the art all within the intended spirit and scope of the invention. Accordingly, the patent is not to be limited to the specific embodiment herein shown and described nor in any other way that is inconsistent with the extent to which the progress in the art has been advanced by the invention.

What is claimed is:

1. A ratchet wrench for driving interchangeable socket heads removably attachable thereto, comprising:

a lever,

a socket carrier mounted in an end of said lever for rotation relative to said lever and including a stud extending downwardly from said lever for receiving and retaining said socket head,

ratchet drive means operatively located between said socket carrier and said lever,

a socket head ejector element extending through said socket carrier for limited endwise sliding movement parallel to the axis of said rotation and adapted to engage a socket received on said stud and to be depressed by the tool user to positively eject said socket head from said stud.

2. A ratchet wrench as defined in claim 1 wherein said ejector element is of elongated cylindrical shape with upper end and a lower end adjacent said stud, and has an axial length substantially greater than the axial thickness of said socket carrier and wherein said ejector element is axially slidable between a retracted limit position with said upper end projecting outwardly from said socket carrier and adapted to be engaged and depressed by a tool user, and an extended limit position

5

with said lower end projecting outwardly sufficiently to positively eject a socket head from said stud.

3. A ratchet wrench as defined in claim 2 including stop means located within said socket carrier and operatively engageable with said ejector element to limit endwise sliding movement thereof to said limit positions.

4. A ratchet wrench as defined in claim 3 wherein said ejector element has a central neck portion of lesser diameter than said end portions and wherein said stop means projects radially inward toward said neck portion to engage said ejector element at the opposite ends of said neck portion.

5. A ratchet wrench as defined in claim 1 wherein said ratchet drive means comprises a reversing ratchet drive and a pivotable selector element located on said socket carrier.

6. A ratchet wrench as defined in claim 5 wherein said ejector element limits the pivotal movement of said selector element between its forward drive and reverse drive positions.

7. A wrench assembly with a reversing ratchet drive for a socket head removably attached thereto, comprising:

a lever adapted to be turned about the axis of turn of said socket head and including

6

a handle at one end, and

means defining internal ratchet teeth in the other end about said axis of turn,

a socket carrier mounted in said other end for rotation relative to said lever about said axis of turn and including:

a stud extending downwardly from said lever for receiving and retaining said socket head,

a double pawl element mounted in said socket carrier for pivotal movement between forward drive and reverse drive engagement with said ratchet teeth,

selector means operatively connected to said socket carrier and pivotable about said axis of turn between a position urging said pawl element to said forward drive position and a position urging said pawl element to said reverse drive position,

a socket head ejector element extending through said socket carrier for limited endwise sliding movement parallel to said axis of turn and adapted to engage a socket received on said stud and to be depressed by the tool user to positively eject said socket head from said stud.

* * * * *

30

35

40

45

50

55

60

65