April 30, 1968 W. D. ABELL ETAL 3,381,104

HANDLE AND TRIGGER CONSTRUCTION FOR ONE-HAND PORTABLE TOOL

Filed Aug. 29, 1966

FIG. 1

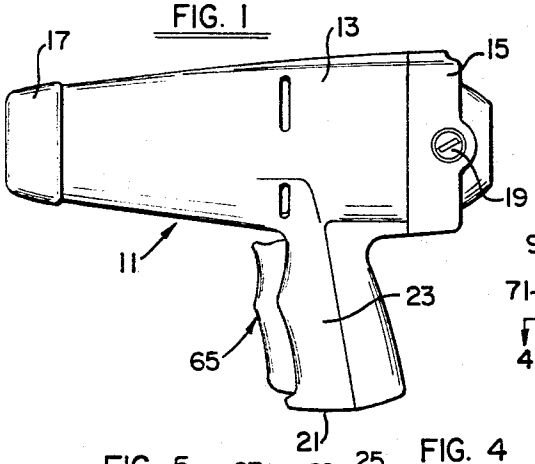


FIG. 2

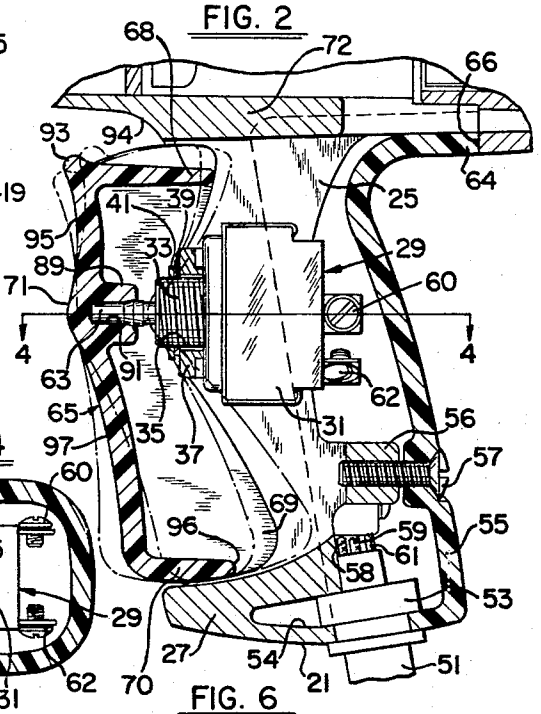


FIG. 5

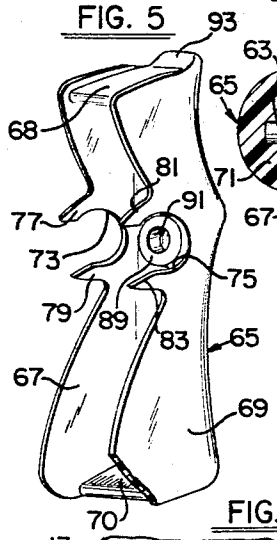


FIG. 4

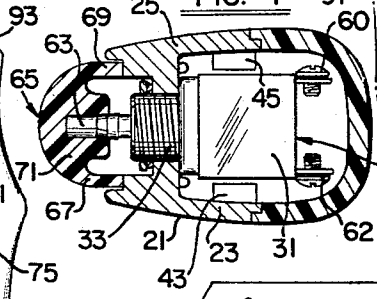


FIG. 6

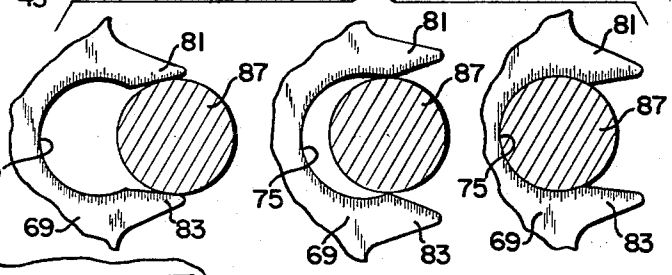


FIG. 3

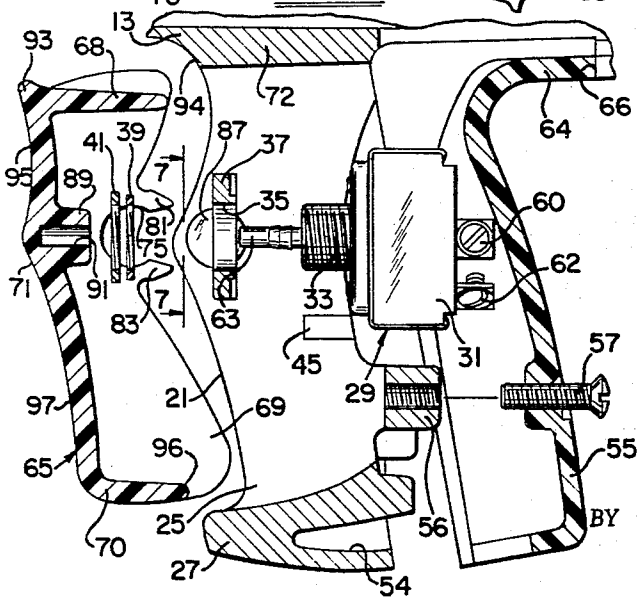
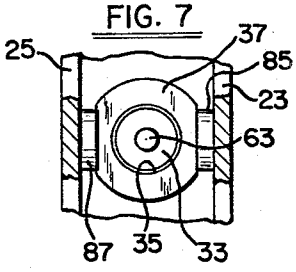


FIG. 7



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HANDLE AND TRIGGER CONSTRUCTION FOR ONE-HAND PORTABLE TOOL

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ABSTRACT OF THE DISCLOSURE

The device disclosed herein is a portable, electric power tool including a housing having a hollow, depending, pistol-type handle. A control switch is mounted in the handle and is actuated by a one-piece, pivotal trigger detachably secured in snap-on fashion to the handle. The handle also has a detachable cover permitting free access to the switch.

This invention relates generally to rotary power devices, and particularly to an improved handle and trigger construction which facilitates "one-hand" operation of portable, reversible or two-speed electric power tools.

An important object of the present invention is to provide an improved handle and trigger construction for reversible or two-speed portable, electric power tools which construction facilitates true "one-hand" tool operation and employs a minimum of individual parts.

Additional important objects of the present invention are to provide an improved handle and trigger construction of the above character wherein the connection therebetween is effected by component portions integral therewith and which portions togther with a reversing or speed control switch for the tool motor are concealed in assembly to provide an aesthetically pleasing device.

Further important objects of the present invention include the provision of a handle and trigger construction of the above character which is of primary simplicity to assemble and disassemble, relatively inexpensive to manufacture, rugged in construction and reliable in use.

Other objects and advantages of the present invention will become more apparent from a consideration of the following detailed description taken in conjunction with the drawings in which:

FIG. 1 is a side elevational view illustrating a typical portable electric power tool embodying the present invention;

FIG. 2 is an enlarged vertical sectional view of the handle and trigger structure of FIG. 1;

FIG. 3 is an exploded view of the structure of FIG. 2;

FIG. 4 is a sectional view of FIG. 2 taken along the line 4—4 thereof;

FIG. 5 is a perspective view illustrating the trigger handle of the present invention;

FIG. 6 is a progressive illustration of the steps of assembly of the trigger to the handle; and

FIG. 7 is a sectional view of FIG. 3 taken along the line 7—7 thereof.

Broadly described, the present invention includes an integral handle frame having laterally spaced side walls, a switch carried by said handle frame and having an actuating lever extending forwardly thereof, said side walls having a pair of opposed, arcuate cross-sectional bosses formed integrally thereon and projecting inwardly of said handle frame from the inner surface of said side walls, respectively, a one-piece trigger handle having laterally spaced side walls partially received in said handle frame and closely disposed relative to said handle frame side walls, said trigger handle side walls having a pair of arcuate slots formed therein generally complementary

to said bosses and adapted to receive said bosses in smooth, pivotal relation, a pair of ears projecting from each said trigger handle side wall and integral therewith, each pair of ears defining an entry to a respective one of said slots of a dimension less than the lateral dimension of said bosses, said ears being adapted to guidingly receive and snap over said bosses as said bosses move into said slots whereby to pivotally retain said trigger handle to said handle frame, and means interconnecting said trigger handle and said switch lever.

Referring now more specifically to the drawings, a reversible impact wrench, which is one typical device with which the present invention finds use, is illustrated generally at 11 in FIG. 1 and is seen to include a motor and transmission housing 13 having an end cover 15 removably secured thereto at its rear end and a resilient bumper 17 mounted on the forward end thereof. A suitable electric drive motor (not shown) or other drive source is positioned within the housing 13 and the end cover 15 has a pair of brush holders 19 (only one of which is shown) which carry brushes (not shown) engageable with the motor commutator (not shown) in the usual manner. The drive motor rotatably drives a tool bit (not shown) such as, for example, a nut socket through a suitable gear transmission (not shown) also located in the housing 13. Impact wrench drive mechanisms of this type are well known in the art and since this structure forms no part of the present invention, it is not illustrated nor described further here. Reference, however, may be made to the copending application Ser. No. 553,383, filed May 27, 1966 under the name of George E. Maffey, Jr. et al. and owned by the assignee of the present application for a better understanding of this mechanism.

The housing 13 is provided with a dependent handle frame 21 which may either be integral with or otherwise suitably fixed to the housing 13. For example, the housing 13 and handle frame 21 may be integrally cast aluminum, or they may be molded using a suitable plastic or glass fiber material as is customary. The handle frame 21 preferably is hollow in construction having spaced, generally parallel side walls 23, 25 interconnected at their lower ends by a base 27.

A reversing switch 29 for the electric drive motor (not shown) is positioned within and removably secured to the handle frame 21. The switch 29 is seen to include a switch body 31 provided with a threaded mounting stud 33 extending forwardly thereof. A strut 37 is formed integral with the handle frame 21 bridging the side walls 23, 25 thereof and is provided with a central opening 35 which freely receives the stud 33. A pair of lock nuts 39, 41 are threaded on the end of the stud 33 to secure the switch body 31 to the strut 37 and the body 31 is angularly located by boss like projections 43, 45 formed integrally on the frame side walls 23, 25 which are positioned adjacent the switch body 31.

A power line cord 51 is provided with a mounting flange 53 adapted to be partially received in a recess 54 in the handle frame 21 and the flange 53 is removably held in place by a molded plastic rear handle cap 55. The handle cap 55 has an upper, curved portion 64 receivable in a recess 66 in the housing 13 and the handle frame 21 has a rearwardly projecting boss 56 threadedly receiving a screw 57 extending through the cap 55. The line cord 51 carries a pair of power leads 58, 59 adapted to be connected to one of a pair of terminal connectors 60, 62 on the switch 29 and to the electric drive motor (not shown), respectively. The other of the terminal connectors 60, 62 is connected in use directly to the drive motor (not shown) in the usual manner. The line cord 51 also carries a ground lead 61 adapted for connection directly to the handle frame 21.

The switch 29 preferably is of conventional toggle-type

construction and is provided with a pivotal lever 63 extending forwardly through the mounting stud 33. The lever 63 has three pivotal positions, i.e., a neutral "off" position illustrated in FIGS. 2–4, and upwardly and downwardly pivoted "on" positions relative to the neutral position shown. The switch lever 63 is normally resiliently biased toward the neutral "off" position and the upwardly and downwardly pivoted "on" positions can be used to provide forward and reverse motor and tool operation or alternatively, they can provide high and low speed unidirectional operation thereof.

A novel trigger handle 65 is provided to control pivoted positioning of the switch lever 63 and is seen to preferably be constructed of one-piece, molded plastic material, for example, nylon, and has a generally U-shaped cross-sectional configuration as seen in FIGS. 4 and 5. The trigger handle 65 has a pair of side walls 67, 69 partly received between the handle from side walls 23, 25 and a front wall 71 interconnecting the side walls 67, 69. The trigger handle 65 also has a top and bottom wall 68, 70 partly receivable in the handle frame 21 and closely adjacent an upper frame wall 72 and the handle base 27 respectively, and which together with the front and side walls thereof serve to conceal the switch 29 and protect the operator during tool use.

The side walls 67, 69 are provided with aligned arcuately shaped slots 73, 75 adapted to pivotally receive a pair of bosses 85, 87 integrally formed on the handle frame side walls 23, 25, respectively, and between which the strut 37 extends. A pair of ears 77, 79 extend rearwardly from the side wall 67 to either side of the slot 73 and are tapered outwardly to snap over and hold the boss 85 within the slot 73. Similarly, another pair of ears 81, 83 extend rearwardly from the side wall 69 to either side of the slot 75 and are adapted to snap over and hold the boss 87 in the slot 75.

The trigger handle 65 is formed with a boss 89 between and substantially aligned with the slots 73, 75 and the boss has a central recess 91 adapted to snugly receive the switch lever 63. As shown, the switch lever 63 may be serrated to provide secure positioning thereof within the recess 91.

In use, when the trigger handle 65 is pivoted on the bosses 85, 87 to the two positions illustrated by dot-dash lines in FIG. 2, the switch lever 63 is moved to its upward and downward pivoted "on" positions. Clockwise pivotal movement of the trigger handle 65, as seen in FIG. 2, is limited by engagement between a projecting stop 93 on the trigger handle and a curved shoulder 94 on the housing 13 while counterclockwise pivotal movement is limited by engagement between an end 96 of the trigger bottom wall 70 and the handle frame boss 56. Thus, the trigger handle 65 is prevented from pivoting to an extent where the switch 29 might be damaged. The normal, spring biased neutral "off" position of the switch lever 63 holds the trigger handle 65 in the position shown in full lines in FIG. 2 when no pivoting force is applied thereto.

As described above, the trigger handle 65 is constructed to snap on and is held in place by the handle frame bosses 85, 87. Thus, to install the trigger handle 65, the outwardly tapered ears 77, 79 and 81, 83 are placed against the bosses 85, 87, respectively, as shown in the first sequence of FIG. 6. Pressure is then applied to the trigger handle front wall 71 and the ears 77, 79 and 81, 83 begin to flex outwardly as they move past the bosses 85, 87 as illustrated in the second sequence and ultimately, the bosses 85, 87 snap into the arcuate recesses 73, 75, respectively, as seen in the third sequence of the figure.

This construction obviates the need for pivot pins or the like to mount the trigger handle 65 in place and provides a highly inexpensive, simple and aesthetically pleasing handle and trigger construction. In addition, to service the switch 29, the trigger handle 65 is easily removable from the handle frame 21 simply by pulling the trigger handle outwardly with one's fingers or by using a suitable tool, or, alternatively, the rear cap 55 can be removed and the trigger handle can be pushed out of the handle frame 21. If the handle rear end cap 55 is removed from the handle frame 21, the switch 29 can either be serviced in the handle frame 21 or easily removed therefrom if desired.

As shown best in FIGS. 2 and 3, the trigger handle front wall 71 is formed with upper and lower concave portions 95, 97 adapted for easily finger placement and trigger handle manipulation during use. For example, when it is desired to energize the tool for forward or high speed operation, defending upon whether the tool is of the reversible or two-speed type, the operator grasps the upper trigger handle portion 95 tightly with his forefinger and middle finger, for example, while lightly holding the lower concave portion 97 with his last two fingers. This causes the trigger handle 65 to pivot in a clockwise direction about the bosses 85, 87, as seen in FIG. 2, and swings the switch lever 63 upwardly. On the other hand, when it is desired to reverse the tool or employ low speed rotation thereof, the operator shifts the pressure emphasis on the trigger handle 65 applying pressure with his last two fingers on the lower concave portion 97 while lightly holding the upper concave portion 95 with his forefinger and middle finger. This causes the trigger handle 65 to pivot in a counter-clockwise direction, as seen in the figure, and moves the switch lever 63 downwardly. To stop the tool, the operator relaxes his fingers and the switch spring returns the switch lever 63 and the trigger handle 65 to the position shown in full lines in FIG. 2. Alternatively, an exterior spring such as, for example, a leaf spring can be provided in the handle frame 21 and positioned to engage the trigger handle 65 and normally bias it to the position shown in full lines in FIG. 2.

It will be appreciated that manipulation and tool operation from "off," to forward or high speed, to reverse or low speed is effected with one-hand gripping pressure on the tool handle alone and without the need for the operator moving this hand or bringing his other hand across his body. Thus, this construction provides for one-hand tool operation and control in the true sense of the word thereby making use of the tool easier and less time consuming.

By the foregoing, there has been disclosed an improved handle and trigger construction calculated to fulfill the inventive objects set forth hereinabove, and while a preferred embodiment of the present invention has been illustrated and described in detail, various additions, substitutions, modifications and omissions may be made thereto without departing from the spirit of the invention as encompassed by the appended claims.

We claim:

1. A tool handle and trigger construction comprising an integral handle frame having laterally spaced side walls, a switch carried by said handle frame and having an actuating lever extending forwardly thereof, said side walls having a pair of opposed, arcuate cross-sectional bosses formed integrally thereon and projecting inwardly of said handle frame from the inner surface of said side walls, respectively, a one-piece trigger handle having laterally spaced side walls partially received in said handle frame and closely disposed relative to said handle frame side walls, said trigger handle side walls having a pair of arcuate slots formed therein generally complementary to said bosses and adapted to receive said bosses in smooth, pivotal relation, a pair of ears projecting from each said trigger handle side wall and integral therewith, each pair of ears defining an entry to a respective one of said slots of a dimension less than the lateral dimension of said bosses, said ears being adapted to guidingly receive and snap over said bosses as said bosses move into said slots whereby to pivotally retain said trigger handle to said handle frame, and means interconnecting said trigger handle and said switch lever.

2. A construction as defined in claim 1 wherein said

switch is of the toggle-type, said trigger handle having a recess adapted to receive said switch actuating lever, whereby pivotal movement of said trigger handle is effective to pivot said lever.

3. A construction as defined in claim 1 wherein said bosses are generally circular in cross-section.

4. A construction as defined in claim 1 wherein said handle frame includes a strut bridging said side walls and integral therewith, said switch being detachably secured to said strut.

5. A construction as defined in claim 1 which includes a one-piece cap spanning said handle frame side walls opposite said trigger handle and detachably secured thereto, said handle frame including a base bridging said side walls, said trigger handle extending substantially from the top of said handle frame side walls to said base whereby said switch is substantially completely enclosed.

6. A construction as defined in claim 1 wherein said handle frame is integral with a tool housing, said trigger handle including stop means cooperable with said housing and handle to limit pivotal movement thereof in both directions.

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