ABSTRACT

A portable electric tool including a reversible rotary electric motor and switch mechanism for reversing the direction of rotation of the motor. The switch mechanism includes a rotary holder member and an operating lever for the rotary holder member of the reversing switch mechanism. The lever extends obliquely outwardly relative to the rotary axis of the holder member and toward the rear side of the tool and slot means are provided on the lever coacting with projection means on the holder member for causing rotation of the holder member upon pivotal movement of the lever, to thus cause reversal of the direction of rotation of the motor.

9 Claims, 6 Drawing Figures
REVERSING SWITCH LEVER

This invention relates in general to a compact electrical switch for a power tool, utensil or other electric motor-driven device, and more particularly to a compact reversing switch for reversing the direction of rotation of the electric motor in combination with a rearwardly projecting operating lever for the switch, which lever is pivoted relative to the switch and is so constructed and arranged so as to provide for expedient reversal of the direction of rotation of the electric motor.

BACKGROUND OF THE INVENTION

In U.S. Pat. No. 3,467,801 issued Sept. 16, 1969 in the name of Benjamin H. Matthews, and entitled "Reversing Switch" there is disclosed a reversing switch mechanism having a movable contact element which is movable generally linearly, to reverse the direction of rotation of the associated motor, and wherein a compound lever means is mounted on the switch housing and coacts with the movable contact element of the switch for accomplishing reversal of the electric motor. In copending application Ser. No. 110,515 filed Jan. 28, 1971 now U.S. Pat. No. 3,691,322 in the name of Benjamin H. Matthews and entitled "Reversing Switch" there is disclosed a reversing switch wherein a rotary holder is provided for rotary movement of contact elements with respect of stationary contacts of the switch, for accomplishing reversal to the electric power applied to the motor, and wherein there is disclosed an operating lever secured to the rotary holder member and projecting rearwardly of the power tool housing, for accomplishing rotary movement of the holder member and thus reversal of the direction of rotation of the motor.

SUMMARY OF THE INVENTION

The present invention provides a lever mechanism for use with a reversing switch of the general type of aforementioned U.S. Pat. No. 3,691,322, which provides for more convenient accessibility of the lever to the finger of the operator and more expeditious movement of the rotary holder member of the reversing switch, for improving the motor reversing operation.

Accordingly, an object of the present invention is to provide a reversing switch mechanism for an electric motor of a power tool or utensil, or the like which includes a reversing lever projecting rearwardly of the handle of the tool or utensil, and so constructed and arranged to provide for expedient reversal of the direction of rotation of the electric motor.

Another object of the invention is to provide a reversing switch-operating lever combination of the above discussed type wherein the operating lever extends obliquely outwardly relative to the switch for convenient accessibility by the operator's finger, and wherein the lever coacts in an expeditious manner with the reversing switch mechanism, for accomplishing reversal of the direction of rotation of an electric motor. A still further object of the invention is to provide a reversing switch-operating lever combination in accordance with the above wherein the reversing switch includes a rotary holder which is rotatable about an axis disposed generally perpendicular to the plane of rotation of the holder, and wherein the holder includes a projection thereon which is offset laterally of the axis of rotary movement of the rotary holder, and which coacts with means on the operating lever for causing the rotary movement or the rotary holder member, to cause reversal of the direction of rotation of the electric motor, upon predetermined pivotal movement of the operating lever.

A still further object of the invention is to provide an electric motor driven mechanism, such as a power tool, or utensil, having an operating trigger, and a reversing switch mechanism of the above discussed type in conjunction with an operating lever for the reversing switch mechanism, and wherein the lever projects rearwardly of the tool, and coacts in an expeditious manner with the reversing switch mechanism, for causing reversal of the direction of rotation of the motor of the tool.

Other objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary, side elevational view of the handle of a portable electric tool, or utensil, embodying the present invention, with the portion of the tool illustrated being shown in phantom lines, and with the trigger and switch assembly embodying the reversing lever being illustrated in full lines;

FIG. 2 is a partially broken side elevational view of the trigger and switch assembly, taken from the opposite side of that FIG. 1;

FIG. 3 is an enlarged, fragmentary, top plan view of the FIG. 2 trigger and switch assembly, with the pivotal operating lever for actuating the rotary holder of the reversing switch section of the switch mechanism having been removed;

FIG. 4 is a fragmentary, rear end, elevational view of the switch assembly taken generally along the plane of line 4--4 of FIG. 3, looking in the direction of the arrows;

FIG. 5 is an enlarged, side elevational view of the rotary holder member of the reversing switch mechanism;

FIG. 6 is an enlarged, top plan view and an end elevational view of the operating lever for the reversing section of the switch assembly shown in FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now again to the drawings, FIG. 1 illustrates for exemplary purposes, a power tool with which the present invention may be incorporated. The tool may be of a portable type which includes a depending pistol grip-like handle 10, having a trigger-switch assembly 12 mounted thereon, which is adapted to control the operation of electric motor 13, such as, for instance, a universal electric motor of the tool. The trigger or actuator 14 may be of the reciprocal, spring loaded type, and may coact with speed control section 16 of the trigger-switch assembly in a manner known in the art for controlling the speed of electric motor 13. The trigger-switch assembly may also include a locking mechanism including a reciprocal pin 17 (FIGS. 1 and 3) for locking the trigger 14 in its full inward or maximum "on" position.

The speed control switch section 16 is of known construction, and may be of the general type shown, for instance, in U.S. Pat. No. 3,536,973 issued Oct. 27, 1970 to Benjamin H. Matthews et al., for varying the speed of an electric motor in accordance with inward movement of the trigger, from a completely outward off position to a completely inward or on position.
The trigger-switch assembly 12 in the embodiment illustrated also includes a reversing switch section 18 which includes a rotary holder member 20, adapted for rotary movement about generally vertical axis X—X. Rotary holder member 20 is adapted for movement from one active position (shown, for instance, in full lines in FIG. 3) to another active position, and vice versa, to cause reversal of the direction of rotation of motor 13. Rotary holder member 20 may include spaced lateral electrical contacts 22 (FIG. 5) mounted thereon, which are adapted to engage with stationary contacts of the reversing switch mechanism in a predetermined pattern whereby the direction of current flow through the switch may be reversed depending upon the position of the rotary holder with respect to the stationary contacts of the switch.

As can be seen, the rotary holder member 20 includes a body portion 24 which mounts the aforementioned contacts 22 therein, and a generally flat head portion 26 rigidly attached to the body portion 24, for rotary movement about axis X—X. Reference may be had to the aforementioned U.S. Patent application Ser. No. 110,515, for a description of the operation of the reversing section of the switch of this general type, and including a description of the operation of the switch in reverting the direction of current flow through the switch, for causing reversal of the rotary movement of the electric motor.

Holder 20, in the embodiment illustrated, has a forwardly disposed upstanding projection 28 thereon, extending upwardly from the head portion 26 which projection 28 is preferably of cylindrical configuration, as can be best seen in FIG. 3.

The switch assembly may include a housing or wrapping 30, formed of any suitable material, such as, for instance, moldable plastic material, with the housing having an opening 32 at its rearward end (FIG. 4) for convenient slideable insertion therein of the components forming the reversing switch section 18, and as disclosed in aforementioned United States patent application Ser. No. 110,515.

Housing 30 has a forwardly arranged support platform 34 provide thereon, on which is adapted for pivotal mounting the actuating or operating lever 36 for the reversing switch section 18 of the switch mechanism. Lever 36 may be pivoted to platform 34 as by means of head fastener 38, and extends obliquely rearwardly with respect to the handle 10 of the tool, to exteriorly of the rearward surface of the tool handle for convenient accessibility to the operator's thumb or other finger, for expeditiously reversing the direction of rotary movement of the motor 13.

Lever 36 comprises a base section 40 (FIG. 6) having an opening 42 therethrough for receiving the aforementioned fastener 38 for mounting the lever on the support 34, and an upwardly extending body portion 44 which may include rib sections 44a, for strengthening the body portion, and a tab portion 46 disposed at the distal end of the body portion, with tab portion being preferably provided with vertically extending serrations 48, for convenient movement of the operating lever by the operator's finger. The underside of body portion 44 is provided with a forwardly extending slot 50 therein, which opens rearwardly and which is adapted to receive in relatively loose slip fit relation the aforementioned upstanding embossment or projection 28 on the holder member 20 of the reversing switch section of the switch mechanism. Tab portion 46 may have indicia 51 thereon for indicating the direction of rotation of motor 13 due to pivoting of lever 36.

Lever 36 is pivotal between two positions for reversing the direction of rotation of the motor 13. It will be seen that swinging the lever 36 from the one position Y, as shown in FIG. 3, to position Z as shown in FIG. 3 would cause movement of the rotary holder 20 from the full line position shown in FIG. 3, to its other rotated position (wherein the position of projection 28 is shown in dashed lines) thereby causing reversal of the current flow through the switch mechanism to cause reversal of the rotary movement of the electric motor. Reference may be had to the aforementioned U.S. Patent application Ser. No. 110,515 for a detailed description of movement of the switch contacts during rotary movement of holder member 20. It will be seen that while the pivotal axis 38 of the operating lever 36 for the reversing switch section of the switch mechanism is disposed generally at the longitudinal vertical center plane of the switch mechanism and in line with the rotary axis X—X of the holder 20, the projection 28 on the holder 20 is normally disposed to one or the other side of the aforementioned longitudinal vertical center plane as can be seen from FIG. 3. The lever is of simple construction and positions the finger tab portion 46 at optimum location with respect to the handle of the tool, for expeditious engagement by the thumb of the operator, so that he can control energization of the electric motor by means of the trigger 14 together with reversal of the electric motor in an expeditious manner, and which can be done during use of the tool in either the left or the right hand.

From the foregoing description and accompanying drawings it will be seen that the invention provides a reversing switch mechanism for a hand powered tool or utensil, which includes an operating lever extending rearwardly with respect to the tool for convenient accessibility for the finger of the operator, and wherein the operating lever has means thereon coating directly with the means on the holder member of the reversing switch, for rotating the holder member upon pivotal movement of the lever to cause rotation of the holder, and thus reversal of the direction of rotation of the electric motor mounted in the tool housing.

The terms and expressions which have been used are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of any of the features shown, or described, or portions thereof, and it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:
1. In a portable electric device including a housing and a reversible rotary electric motor in said housing, switch mechanism mounted on said housing, said switch mechanism including an actuator operable by an operator's finger for actuating said switch mechanism to control said motor, means on said switch mechanism for reversing the direction of rotation of said motor, said reversing switch means comprising a rotary holder rotatably movable about an axis disposed generally perpendicular to the plane of rotary movement of said holder and having a plurality of spaced electrical contacts thereon, said rotary holder being movable into several operative positions wherein said contacts determine the direction of current flow through the switch.
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5 mechanism for controlling the direction of rotation of said motor, the combination therewith of an operating lever for said reversing switch means, said lever projecting rearwardly of said housing and including an elongated body portion which extends obliquely outwardly relative to said axis, means disposed forwardly of said axis pivotally mounting said lever relative to said housing for pivotal movement about an axis extending in the same general direction as the first mentioned axis, said holder having means thereon offset laterally from said axis of rotation of said holder and disposed between transverse planes passing through said axes, and means on said lever coacting with said means on said holder whereby pivotal movement of said lever about its pivotal axis causes predetermined rotary movement of said rotary holder to one of said positions for causing reversal of the direction of rotation of said motor.

2. The combination in accordance with claim 1 wherein said actuator comprises a linearly movable trigger arranged to be operated by the operator's finger for actuating the switch mechanism, said axes being disposed generally perpendicular to the plane of movement of said trigger, the last mentioned switch mechanism including means for selectively varying the speed of said motor.

3. The combination in accordance with claim 1 wherein said lever includes a serrated tab on the distal end thereof.

4. The combination in accordance with claim 3 wherein said housing includes a pistol grip type handle portion, said handle portion including a recessed section in which said tab is disposed.

5. The combination in accordance with claim 1 wherein said operating lever includes a base portion for supporting the lever on said switch mechanism, and said lever pivotal mounting means coacting with said base portion for providing for pivotal movement of said lever relative to the switch mechanism.

6. The combination in accordance with claim 1 including rib means on said body portion for strengthening said lever.

7. The combination in accordance with claim 1 wherein the switch mechanism includes speed control means for controlling the speed of said motor, said speed control means being actuated and deactivated by said actuator.

8. The combination in accordance with claim 1 wherein said switch mechanism includes an enclosure therefor, said holder includes an upstanding projection comprising said means thereon and which is normally disposed to one or the other side of the longitudinal vertical center plane of said switch mechanism in upwardly projecting relation to said enclosure, and wherein said lever is pivoted to said enclosure at approximately said longitudinal vertical center plane whereby the lever is normally swung to one or the other side of said longitudinal vertical center plane to reverse the direction of rotation of said motor.

9. The combination in accordance with claim 1 wherein said switch mechanism includes an enclosure therefor, said enclosure including a platform portion disposed forwardly of the first mentioned axis for pivoting said lever thereon by said lever pivotal mounting means, said means on said holder comprising an upstanding projection on said holder, said platform portion being disposed below the level of the uppermost end of said projection on said holder, said means on said lever being disposed along the lengthwise axis thereof and comprising a slot receiving therein in relatively movable relation said projection on said holder, the defining walls of said slot being adapted to engage said projection on said holder for causing rotary movement of said holder about said first mentioned axis to actuate the reversing switch means upon predetermined pivotal movement of said lever.