

[54] **WARNING LIGHT FOR ELECTRICAL SWITCHES**

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[52] U.S. Cl. **340/252 R, 200/167 A, 200/2 MT**

[51] Int. Cl. **G08b 21/00**

[58] Field of Search **340/252, 255, 248 C; 200/167 A; 318/490; 317/18, 13, 51; 240/2 SP, 2 S, 2 MT, 2 VC**

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Primary Examiner—John W. Caldwell

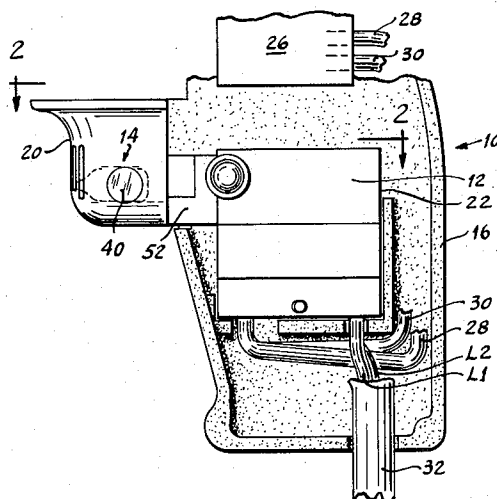
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[57] **ABSTRACT**

An apparatus for indicating that the power cord of an electric tool is plugged into a live electric power outlet. A warning light is integrally housed in the trigger switch of an appliance or tool and a transparent plastic window may be located in the trigger switch or tool handle to transmit such light and permit viewing thereof from all directions.

9 Claims, 12 Drawing Figures



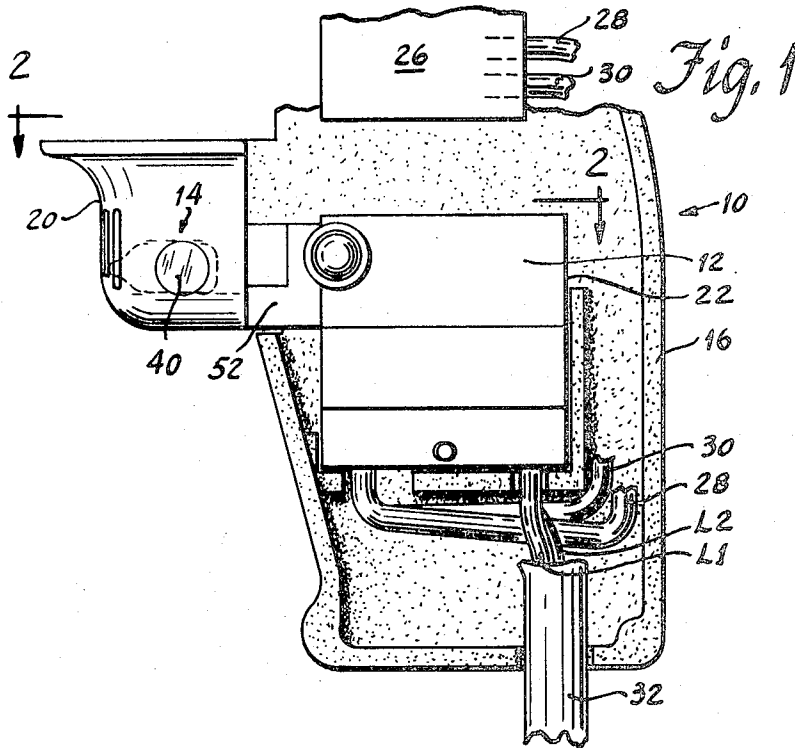
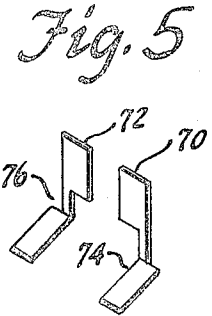
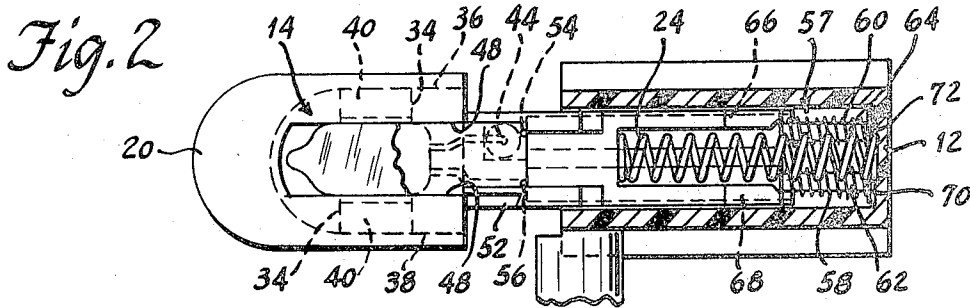


Fig. 4

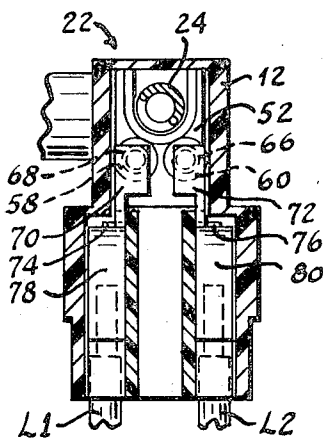


Fig. 3

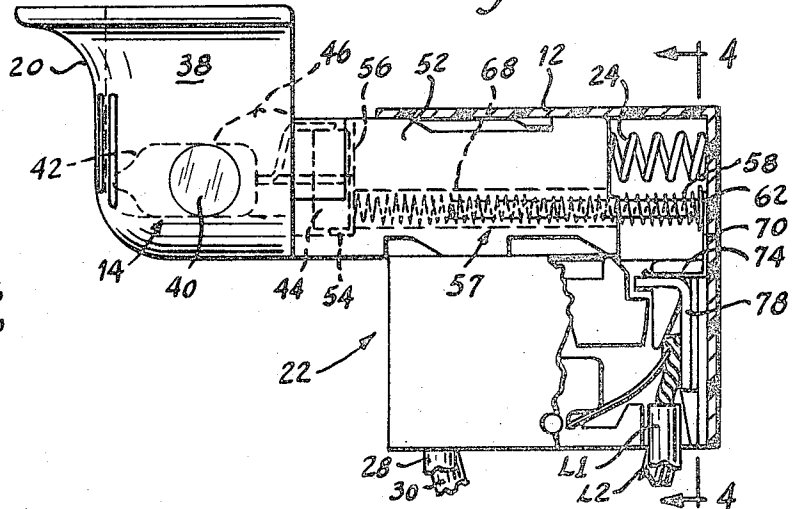


Fig. 6

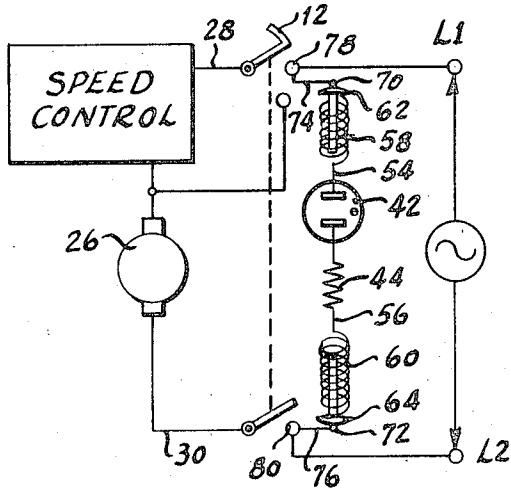


Fig. 12

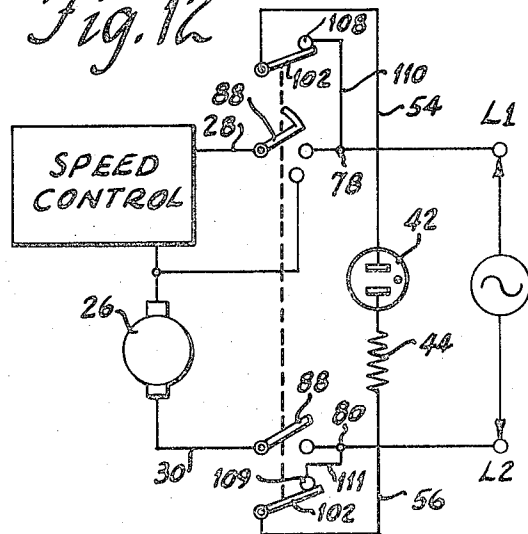


Fig. 7

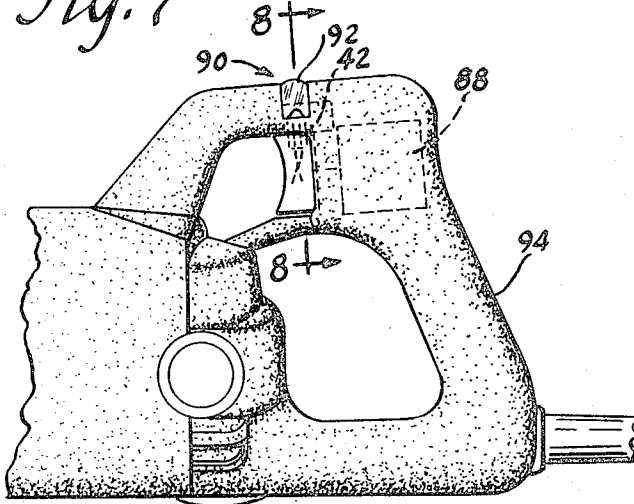


Fig. 8

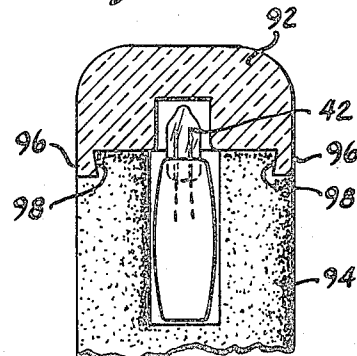


Fig. 9

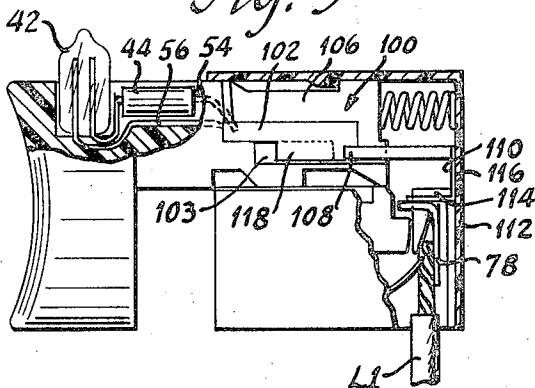


Fig. 10

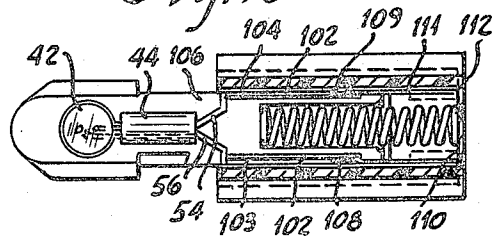
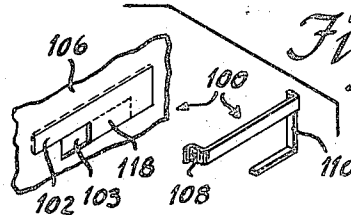


Fig. 11



WARNING LIGHT FOR ELECTRICAL SWITCHES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to electrical switches and more particularly to improvements in light indicators for such switches.

2. Description of the Prior Art

Various warning light devices have been devised for power tools and household appliances to indicate the position of switch actuation for such devices. Although these devices have generally served their purposes, they are not entirely satisfactory because they provide no indication or warning that the tool or appliance is plugged into a live circuit and ready to be energized prior to the actuation of the switch. Consequently, a person may proceed to adjust, repair or move the tool or appliance forgetting to unplug it and inadvertently be injured upon intentional or accidental switch actuation.

It is believed that injury from such a safety hazard can be reduced by the use of a warning device mounted integral with the appliance or tool which would forewarn the perspective user to be cautious prior to handling a tool or appliance by alerting him that such devices are in circuit with a live power outlet.

SUMMARY OF THE INVENTION

The general object of the present invention is to provide an improved warning indicator light for electrical tools and appliances which circumvents the problems heretofore noted.

More specifically it is an object of the present invention to provide an illuminated switch which is of relatively simple construction and which can readily be assembled integral with an appliance or tool and be operable to indicate live power condition to such devices.

A more specific object of the instant invention is to provide a compact warning light for tools and appliances which is capable of manufacture at low cost, has a minimum number of parts and so designed to be readily and easily assembled in mass production operation.

In achieving these and other objects as will become apparent hereinafter, one embodiment of the present invention provides for a switch assembly for a power tool including a generally hollow trigger actuator adapted to emit light to indicate power is supplied to the tool. For this purpose, a lamp, series dropping resistor and resilient conductors are mounted in circuit with power to the switch assembly inside the trigger cavity to illuminate the trigger whenever the tool power cord is inserted into a live outlet. The conductors are partially supported within bores in the trigger and extend therefrom to electrically connect the lamp to the switch assembly for any position of trigger actuation.

BRIEF DESCRIPTION OF THE DRAWINGS

In describing the present invention, reference will be made to the accompanying drawings forming a part of the instant invention wherein:

FIG. 1 is a side elevation view broken away of a power tool having an electrical switch embodying the warning light of the present invention.

FIG. 2 is a plan view partially in cross section of the warning light indicator shown in FIG. 1 taken along line 2—2.

FIG. 3 is a fragmentary side elevation view, partially in cross section, illustrating the warning light indicator in FIG. 2 taken along line 3—3.

FIG. 4 is a rear elevation view of the warning light indicator in FIG. 3 illustrating the resilient conductors of the instant invention.

FIG. 5 is a perspective view of the bridging conductors of the instant invention shown in FIG. 4.

FIG. 6 is a schematic circuit diagram embodying the indicating light of the present invention.

FIG. 7 is an elevation view broken away of a power tool having an electric switch embodying an alternate mounting for the warning light of the instant invention.

FIG. 8 is a cross-sectional view, partially broken away and taken along line 9—9 of the warning light indicator in FIG. 8.

FIG. 9 is a fragmentary side elevation view, partially in cross-section, illustrating the warning light in FIG. 8.

FIG. 10 is a plan view of the warning light indicator shown in FIG. 10 taken along line 11—11.

FIG. 11 is a perspective view of the bridging conductors of instant invention shown in FIG. 11, and

FIG. 12 is a schematic circuit diagram showing an alternate circuit embodying the indicating light of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1 of the drawings a portable electric tool indicated generally at 10 is used to illustrate one device using a trigger operated switch 12 for mounting a warning indicator light 14 constructed in accordance with the teaching of this invention.

Switch 12 is of the type disclosed and illustrated in my pending U.S. Pat. Application Ser. No. 233,621 filed Mar. 10, 1972 entitled "Butt-Contact Speed Control Trigger Switch" and assigned to the assignee of this invention. As shown in FIG. 1, switch 12 is mounted in a conventional manner within the handle 16 of tool 10 to expose a switch actuating member or trigger 20 therefrom for depression by the user. Trigger 20 is of hollow construction and is mounted for linear sliding movement into the switch frame 22 and is biased therefrom by spring 24 as shown in FIGS. 2 and 3.

Switch 12 controls actuation of load or tool motor 26 and is connected in circuit therewith via leads 28 and 30. Switch 12 is also connected to an energizing circuit (not shown) by leads L1 and L2 contained in cord 32. Leads 28 and L1 connect to one pole of switch 12 and are electrically connected to each other therein by butt action of a movable butt contact (not shown). Leads 20 and L2 connect to the second pole and are likewise electrically connected and butted therein to run tool motor 26.

Having briefly and generally described the construction and operational features of a known trigger switch for a conventional power tool, a unique and compact arrangement for mounting and electrically connecting an improved warning indicator light for electrical switches will now be described in more detail with like parts being indicated by like reference characters throughout the several views.

Referring further to FIGS. 2 and 3, trigger 20 is adapted to provide two window openings 34 on sides 36 and 38 thereof to house and retain circular translucent windows 40 which snap in place in interference fit therein. Windows 40 are colored plastic lenses designed to increase the angle at which light emitted therethrough can readily be seen.

A lamp 42 and attached series dropping resistor 44 are inserted within the trigger cavity in a position to readily emit light through windows 40 when energized. A clear cementitious compound 46 such as silicone rubber is applied to the lamp 42 and resistor 44 and cavity sidewalls 48 of trigger 20 as shown in FIGS. 2 and 3 to secure the lamp and resistor therein. Lamp 42 is a high-brightness neon light and is described along with resistor 44 in General Electric Company lamp catalog 3-6254 as a model no. A1C and is available through General Electric Company, Rochester, New York. Resistor 44 serves to limit current flow through lamp 42.

Lamp 42 is energized by a unique and compact arrangement of conducting components arranged to electrically connect lamp 42 to the energizing circuit within trigger block 52 as shown in FIGS. 2-5 and schematically depicted in FIG. 6. Leads 54 and 56 are connected to the lamp 42 and resistor 44, respectively, and to a resilient conductor means 57 including conducting springs 58 and 60 and spring loaded plungers 62 and 64 contained in bores 66 and 68 of trigger block 52. Springs 58 and 60 bias plungers 62 and 64 respectively into contact with metal extensions 70 and 72 of conductors 74 and 76. Conductors 74 and 76 are connected to stationary contacts 78 and 80 of switch 12 to which conductors L1 and L2 are attached.

Now let it be assumed cord 32 is plugged into an outlet (not shown) of a power source energizing conductors L1 and L2. The indicating lamp 42 will now be energized to illuminate transparent windows 40 indicating power is supplied to tool 10. Consequently, the tool user will be forewarned to unplug drill 10 before repairing the drill or attempting to change auxiliary tool parts or moving the tool to another location while it is capable of being energized.

An alternate form of the instant invention is shown in FIGS. 7 and 8 providing a switch 88 having a warning indicator light 90 with an indicating lens 92 mounted integral with tool handle 94 in close proximity to lamp 42. Lens 92, like windows 40, is formed of a colored plastic material designed to increase the angle at which light emitted therethrough can be readily seen and is inverted U-shape in cross-sectional configuration. Tabs 96 snap into recesses 98 to secure lens 92 to handle 94 as shown in FIG. 8.

Lamp 42 and resistor 44 are shown glued in position adjacent lens 92 in FIG. 7 and 9 within a modified trigger configuration of the switch disclosed in previously referenced U.S. Patent Application Ser. No. 233,621. Lamp 42 may be energized by the compact resilient conductor means 57 previously disclosed or by the use of the sliding contact arrangement 100 shown in FIGS. 9-11 which illustrates alternate structure for performing the energizing function of conductor means 57.

The sliding contact arrangement 100 includes a pair of sliding contacts 102 connected at one end thereof to leads 54 and 56 of lamp 42 and resistor 44, respectively. Contacts 102 are generally L-shaped in configuration and are press fit into depressions 103, 104 of

switch block 106 and are linear translated therewith in sliding contact with metal extensions 108, 109 as shown in FIGS. 9-10. Extensions 108, 109 are the forward projections of conductor strips 110, 111 which are electrically connected to the stationary contacts 78, 80 shown in FIGS. 4 and 9. Strips 110 and 111 are J-shaped in configuration and are spring-biased into position inside switch frame 112 upon insertion of stationary contacts 78 and 80 which causes strips 110, 111 to rest against stops 114 thereof and backwall 116.

As is readily apparent, the sliding contact arrangement like the resilient conductor means, functions to continuously energize light 90 for any position of switch actuation. It should be noted that light 90 can be designed to turn off upon switch actuation, if desired. Elimination of portion 118 of sliding contacts 102 in FIG. 9 results in an L-shaped configuration which is adapted to open the light circuit as contacts 102 move past metal extensions 108, 109 upon trigger actuation since contact therebetween opens. FIG. 12 schematically illustrates a circuit arrangement incorporating such structure to deenergize light 90 whenever switch 88 is actuated and to energize it once again when switch 88 is open. As shown therein, normally closed contacts 102 energize lamp 42 when normally open switch 88 is deenergized. Upon switch actuation contacts 102 are open deenergizing lamp 42.

It is to be noted that modification to trigger 26 hereinbefore described and shown in FIG. 1 may also be made. For example a translucent or transparent colored plastic insulating material may be used to mold trigger 26 negating the need for windows 40 as the entire trigger will glow when lamp 42 is in circuit with a live power supply. Moreover, light transmitting fiber optic material may also be utilized to transmit lamp light to remote lens locations where it may be impractical to mount lamp 42 adjacent thereto. Furthermore, indicating means such as a conventional buzzer may also be substituted for the light device described.

It is to be still further noted that use of the various illustrated forms of the instant invention are applicable to various other types of switches which may be of single or multipole construction or which may include reversing or other variable speed arrangements also integral with the switch.

From the foregoing, it will be appreciated by one skilled in the art that the present invention provides an inexpensive warning light to enhance safe use of power tools and appliances by indicating such devices are in circuit with a live power source prior to their actuation. A person is thereby alerted to proceed with caution, and preferably, to unplug the device before adjusting, repairing or handling the device. Also it can be seen that the compact design of the warning light assembly permits packaging of such device integral within readily available space in the trigger block of a conventional trigger switch in a position readily visible to an operator. The compact and integral design eliminates the necessity of having to separately wire and assemble the warning light to the tool handle or wire such device to the switch from a location remote therefrom on the appliance or tool. The compact design also negates the need for increasing tool or appliance handle size to accommodate the warning light indicator.

As is evidenced in the foregoing description and drawings, the present invention provides a substantial safety improvement in the operation, maintenance and

repair of electric power tools and appliances. It is also apparent that details of the illustrated forms of the present invention may be varied without departing from the inventive concept. It will accordingly be understood that it is intended to embrace within the scope of this invention such modifications that may be embraced by the skill of the art.

I claim:

1. The combination in an electrical switch for mounting in the housing of an electric power tool and controlling the supply of electrical power to the driving motor thereof, of terminal means for attachment to a source of electrical power, a trigger actuator operable to initiate closing and opening power circuits to said driving motor, an electric lamp mounted in and movable with said trigger actuator, and resilient conductor means in circuit with said terminal means and said lamp for maintaining circuit therebetween in various positions of said actuator.

2. An electrical switch according to claim 1 wherein said resilient conductor means includes coacting spring means and plunger means, wherein said trigger actuator is internally formed to mount said spring means and plunger means for relative motion therewith and wherein said spring means are in circuit with said lamp and urge said movable plunger means in circuit with said terminal means for all positions of said actuator.

3. An electrical switch according to claim 1 wherein said actuator includes a window positioned therein to readily transmit light from said lamp to indicate the presence of live power to said switch.

4. An electrical switch according to claim 1 wherein said actuator is constructed of insulating material capable of glowing in response to energization of said lamp to indicate the presence of live power to said switch means.

5. An electrical switch according to claim 1 further including switch means in circuit with said terminal means and said lamp and being operable to deenergize said lamp upon operation of said actuator.

6. An electrical switch according to claim 5 wherein said switch means includes stationary contact means in said housing in circuit with said conductor means and movable contact means on said actuator in circuit with said lamp and wherein operation of said actuator causes said movable contact means to disengage from said stationary contact means to deenergize said lamp.

7. The combination with an electric motor driven power tool having a housing and a trigger actuator electric switch mounted in said housing for energizing and deenergizing said motor and having terminal means for connection to an external source of electrical power, of a lamp mounted in and movable with the switch actuator, resilient conductor means in circuit with said terminal means and said lamp, and indicating lens means mounted in said housing in alignment with said lamp in extended position of said trigger actuator.

8. The combination according to claim 7 together with switch means in circuit with said terminal means and said lamp and being operable to deenergize said lamp upon actuation of said trigger actuator.

9. The combination according to claim 8 wherein said switch means includes stationary contact means in circuit with said terminal means and movable contact means on said trigger actuator in circuit with said lamp and normally engaging said stationary contact means and wherein actuation of said trigger actuator causes said movable contact means to disengage from said stationary contact means.

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