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SWITCH OPERATING TRIGGER WITH SLIDING LOCK

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FIG. 1.

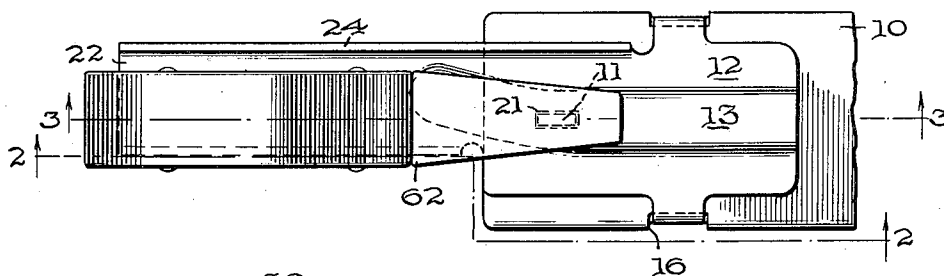


FIG. 2.

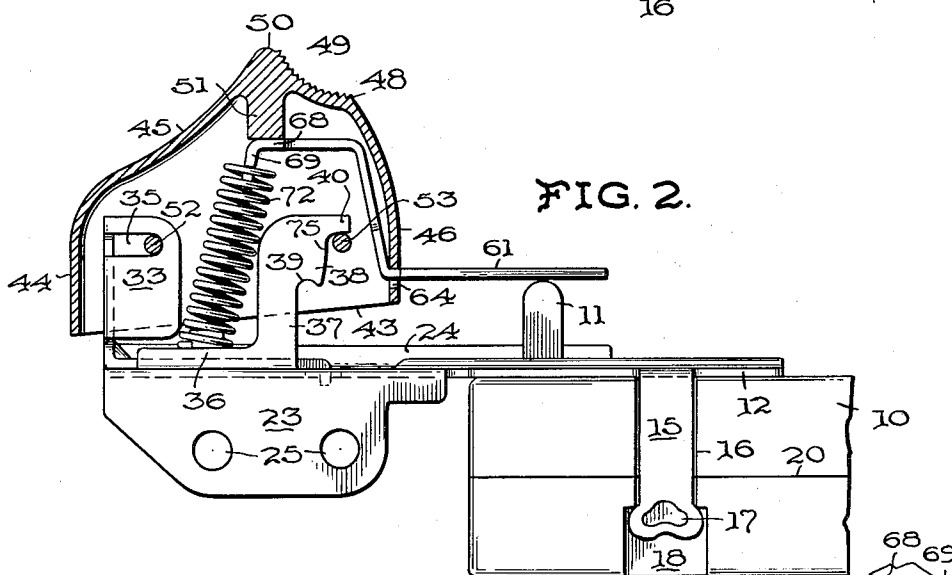


FIG. 4.

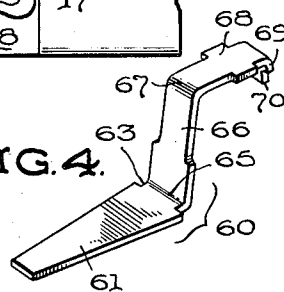
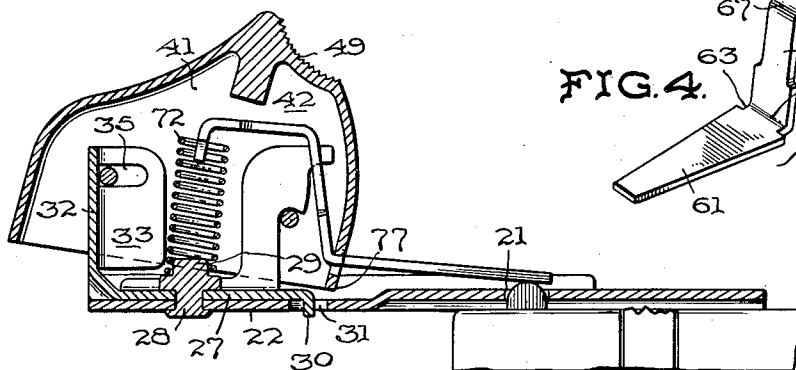


FIG. 3.



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## SWITCH OPERATING TRIGGER WITH SLIDING LOCK

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19 Claims. (Cl. 200—172)

This invention relates to switch mechanism and more particularly to mechanism for operating and mounting switches of the spring biased type.

It is a general object of the present invention to provide an improved mechanism for operating and mounting switches of the spring biased type.

More particularly it is an object of this invention to provide a novel and improved trigger type operating and mounting mechanism for quick acting switches of the self biased type.

It is an important object of the present invention to provide a novel combination of switch, operating mechanism of the trigger type and mounting and assembling means for the same.

Another important object of the invention resides in the arrangement and construction of a switch operating trigger assembly providing for trigger over-travel without damage to the switch.

Still another important object of the invention resides in the arrangement of parts whereby over-travel is resiliently absorbed by the same spring which returns the trigger to the released position thereof.

A further important object of the invention resides in the construction and cooperation of the hinged trigger element and the switch operating lever carried thereby and the use of the trigger return spring to maintain the assembly of the two parts.

A still further object of the invention consists in the fulcruming of the switch operating lever on the movable trigger element and applying the trigger return spring between a stationary part of the assembly and one end of said lever whereby the lever is maintained in position and provided with relative movement in respect to the trigger when meeting resistance to movement.

A still further important object of this invention resides in the manner of assembling the trigger frame and extending cover plate with the switch housing to provide operating relationship between the switch plunger and the trigger lever and to afford mounting means for the whole assembly.

Another and further important object of the present invention resides in the locking mechanism for holding the trigger in its depressed or switch actuating position and involves the use of a sliding fulcrum for the trigger and selective stop means acting between it and its mounting base.

Other and further objects and features of the invention will be more apparent to those skilled in the art upon consideration of the accompanying drawings and following specification wherein is disclosed a single exemplary embodiment of the invention with the understanding that such changes may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawings:

Fig. 1 is a top plan view of a trigger type switch operator and switch mounting shown assembled with a typical switch;

Fig. 2 is a side elevation thereof, a portion of the trigger and trigger mounting frame being shown in longitudinal vertical section on broken line 2—2 of Fig. 1 to illustrate the lever mounting arrangement, the switch being shown in the "off" position;

Fig. 3 is a view similar to Fig. 2 but showing the parts moved to the switch "on" position, the section being taken on line 3—3 of Fig. 1; and

Fig. 4 is a perspective view of the trigger lever.

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The mechanism of the present invention is primarily intended for but not necessarily restricted to use in the handle of a portable tool or like device whereby the current for operating the same is under the control of the operator grasping the handle, by the simple manipulation of the trigger.

Referring now to the drawings, the assembled mechanism is shown in combination with a relatively small switch 10, preferably actuated by means of a plunger 11 extending through the upper face thereof. The frame of the mechanism is connected to and supports the switch and is itself intended to be connected to the tool handle or similar part. For assembly with the switch there is provided a plate 12 of relatively heavy sheet metal stiffened by a longitudinal rib 13 and adapted to bear on top of the switch housing 10. Integral straps 15 are turned down from the edges of the sheet metal plate 12 and received in channels 16 in the side walls of the switch. The ends of these straps are deformed as shown at 17 after being positioned in order to flare them into engagement with shoulders at the junctions of the channels 16 with widened portions 18 thereof, whereby the switch is not only mounted securely against the plate 12 but the two parts of the switch housing, normally parted on the line 20 are secured together. The plate 12 is perforated at 21 for the passage of the plunger 11. A gasket, not shown, of some resilient material may be arranged closely to engage the walls of the plunger beneath plate 12 to exclude dirt and dust from the switch mechanism.

Plate 12 extends to the left and is narrowed into the principal trigger mechanism frame member 22 comprising a narrow elongated plate coplanar with plate 12 and having parallel edges respectively contiguous with upwardly directed narrow stiffening flange 24 and downturned wide flange 23 perforated at 25 to receive mounting bolts or the like whereby the whole assembly may be attached to a tool handle or other support.

Mounted on the upper face of the frame plate extension 22 is the pivot and latch arm unit, a stamping of sheet metal having a base 27 overlying the end of 22 and secured by rivet 28, the upper head of which is topped by a reduced diameter stud 29. The right end of base 27 has a downturned tab 30 projecting through a closely fitting aperture 31 in the member 22 to prevent relative rotation about the rivet. The left end of base 27 is bent up 90° to form a front 32 each perpendicular edge of which has a rearwardly extending wing 33. These wings are parallel to each other and near their tops are horizontally slotted as at 35 for a purpose to later appear. The sides of the base are bent upwardly to form the shallow reinforcing ribs 36, which at the ends nearer the switch are extended upwardly as legs 37 to the height of wing 33 and are given the peculiar shape seen best in Fig. 2. This includes an overhang 38 providing the undercut latching notch 39 and a longer overhang 40 having a substantially horizontal under surface providing the limit stop for the trigger now about to be described.

The trigger proper 41 is shown as a shell-like casting but could as well be made from sheet metal or the like. In elevation it is dome-like while in plan and end view it is narrow with flat parallel sides 42 spaced apart just sufficiently to have a working clearance over wings 33 and stop legs 37. The bottoms of the side walls and the curved end walls preferably terminate in a plane 43.

The end walls are non-symmetrical, that to the left rising from the base at approximately 90° to provide the front closure 44 then sloping toward the switch in the concave finger engaging depression 45 normally used when the trigger is actuated to operate the switch without locking. The end wall 46 facing toward the switch is convex in elevation as it rises from the bottom and from the point 48 is concave as at 49, this area between 48 and the peak 50 being transversely serrated for better gripping by the operator's finger. Depending from the peak 50 on the inside of the trigger shell is the abutment 51 for a purpose later to be described.

The side walls of the trigger shell are connected by a pair of spaced rivets, that numbered 52 being the pivot and passing through the fulcrum slots 35 in the wings 33, and freely slidable therein, while the other 52 somewhat closer to the bottom is adapted to cooperate with the under sur-

face of overhangs 40 as shown in Fig. 2 to limit the amount of counterclockwise movement permitted to the trigger, or to engage in the notches 39 to hold the trigger in its maximum stressed clockwise position.

For operation of the spring projected switch plunger 11, which for the purpose of this explanation and in no limiting sense, closes the circuit when depressed, the trigger is equipped with operating lever 60, seen in detail in Fig. 4 and formed of a sheet metal stamping of irregular form. It has the outer portion 61 extending from the face 46 of the trigger over the end of plunger 11 to depress the same when the trigger is pulled. This portion 61 flares from the narrow free end to a width substantially that of the trigger, as seen at 62 in Fig. 1. It is then sharply narrowed as at 63 so that when passed through slot 64 near the bottom of the front wall 46 of the trigger, as seen in Figs. 2 and 3, it just clears the trigger walls 42. The shoulders resulting from the narrowing limit movement of the lever into the trigger.

At a distance from the shoulders 63 just slightly greater than the thickness of the metal of the front wall of the trigger the lever is bent upwardly substantially 90°, as seen at 65, to prevent movement of the lever out of the trigger and to carry the narrowed portion 66 well up inside the trigger and along close to curved wall 46. This bent-up portion is reversely bent at 67 to provide a top arm 68 substantially parallel to the part 61 and properly positioned so that its outer end engages beneath the abutment 51, as seen in Fig. 2, to limit counterclockwise movement of the lever in respect to the trigger about the fulcrum at the upper edge of the opening 64 in the trigger front wall.

The extreme end of the lever is bent downwardly to form the tab 69 having the lowermost portion reduced in width as at 70 to fit within the upper end of open coil helical spring 72. The shoulders at the junction of 69 and 70 bear on the end turn of the spring so that when the latter is compressed by placing its lower end over the stud 29 on the rivet it urges the portion 68 of the lever against the stop abutment 51.

The spring has a second purpose, to urge the trigger assembly counterclockwise about its fulcrum 52 to release the switch. A third purpose of the spring is to maintain the trigger with its rivet 52 in the right ends of the slots 35, and this is achieved by the inclined position of the spring, as shown. With the trigger thus endeavoring to move counterclockwise its stop rivet 53 engages beneath the overhangs 40 on arms 37 and limits the movement to the amount shown in Fig. 2, where the lever 61 just loosely engages the top of the switch operating plunger 11.

Under the conditions just outlined, the operator, wishing to close the switch, presses on the portion 45 of the trigger which is intermediate the fulcrum 52 and the lever 61 so that clockwise motion is imparted to the trigger and its lever assembly, thus lowering the switch plunger and actuating whatever instrument may be controlled by the switch. The range of plunger 11 is limited by internal switch structure, but if the operator in his zeal should squeeze the trigger too tightly no damage to the switch will result since lever 60 will fulcrum about the upper edge of slot 64 in the trigger front wall, rotating counterclockwise relative thereto, additionally compressing spring 72, as seen in Fig. 3, whereby overtravel of the trigger is permitted without damaging force being applied to the switch.

Within all but the last small arc of movement of the trigger the stop rivet 53 travels close to or against the arcuate surfaces 75 between the overhangs 40 and the notches 39 and the trigger, no matter how handled is prevented from moving bodily to the left. When, however, the rivet 53 passes under the projection between the surfaces 75 and the notches 39 the trigger may be slid toward the left and the rivet 53 hooked in the notches 39, as seen in Fig. 3. Finger pressure may now be released and the trigger will retain this position, holding the switch in operative condition.

Normally with the finger applied to the portion 45, pressure on the trigger is in such a direction that it is not moved toward the left and hence will not lock. The finger is always applied in this manner for momentary or temporary operation of the switch. If it is the operator's intent to lock the trigger down, he initially applies his finger to the serrated area 49, the switch being so mounted in respect to the hand grip which he has on the tool that there is a component of pressure toward the left from the

mere gripping of the trigger, so that movement to lock the trigger is almost automatic as it reaches the end of its stroke.

To release the trigger and open the switch circuit pressure is applied at 45 which serves to slide the trigger toward the right, unhook the rivet 43 and permit the trigger to return to the position where it is stopped by the overhangs 40.

Application of too great a pressure on the trigger merely results in the lower forward edge 77 engaging against the top of the base plate 22 which serves to limit its movement.

We claim:

1. In a device of the type described, in combination, a cover plate and housing clamp unit adapted to be applied to a switch having a biased externally projecting actuating plunger, an opening in said plate through which said plunger is adapted to pass, a longitudinal frame extending from said plate, a wing dependent from an edge of said frame to provide mounting means for the assembly of the unit and switch, a fulcrum supported above the end of said frame, a trigger element of U-shaped cross-section straddling said fulcrum, a pivot extending between the side walls of said trigger near one end thereof and engaged in said fulcrum, a switch operating lever extending from the trigger to said plunger, means fulcruming said lever intermediate its ends near the free end of the trigger with one end of the lever housed in the trigger, an expansion spring compressed between said last mentioned trigger end and said frame and acting to return the trigger to its "off" position and bias the lever free end toward said plunger.

2. The device as described in claim 1 in which means is provided within the trigger and independent of said lever to limit movement of the trigger under action of said spring.

3. The device as claimed in claim 2 in which a portion of the lever within the trigger engages a portion of the latter to limit said bias movement.

4. In a switch support and operator in combination, a frame adapted for attachment to supporting means, an extension on said frame, means to support a plunger actuated switch from said extension with its plunger extending therethrough, a fulcrum supported above the free end of the frame, a hollow trigger straddling said fulcrum, a pivot attaching the end of the trigger remote from said extension to said fulcrum, a lever having an end overlying said plunger, the opposite end being within said trigger, means at the free end of said trigger fulcruming said lever thereto intermediate the lever ends, a spring expanded between the opposite end of the lever and said frame, means to limit movement of said trigger about said fulcrum under the action of said spring and means to limit the movement of said opposite end and relative to said trigger under the action of said spring.

5. The device as claimed in claim 4 in which locking means is provided between said trigger and frame, said means being arranged for engagement only when the lever is deflected in respect to said trigger.

6. The construction defined in claim 4 in which the fulcrum for the lever is the wall of a slot in the end wall of the trigger, said lever being wider than the slot just outside of it and being bent substantially 90° just inside the closure to maintain the lever against longitudinal movement in the trigger wall.

7. The construction as defined in claim 5 in which the trigger has an end wall providing the fulcrum for said lever and so positioned in respect to the frame as to engage it and provide a limiting stop for trigger movement in the switch actuation direction beyond the lock engaging position.

8. The construction as defined in claim 7 in which means is provided at said switch to stop movement of the lever before said trigger edge abuts said frame, whereby the lever is rocked on its fulcrum as the trigger is pulled farther.

9. In a device of the type described, in combination, a frame, means on said frame for attachment to a plunger actuated switch, an elongated trigger pivoted near one end to said frame for motion between an "off" and an "on" position, a lever pivoted intermediate its ends to the other end of said trigger and having an end extending into operative relation to said plunger, spring means compressed between the frame and the opposite end of the lever and resisting movement of the trigger toward one

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of said positions, said last mentioned means engaging the opposite end of said lever to urge it against said trigger remote from its pivot point thereon, whereby overtravel of the trigger may be effected after the movement of the free end of the lever is terminated.

10. The device as described in claim 9 in which the trigger is of saddle form, pivoted near one end and having closure means for the opposite end, said lever being fulcrumed in a slot in said closure means above its bottom.

11. The mechanism as defined in claim 10 in which the lever is of sheet metal shouldered to limit its movement into the trigger and bent to substantially parallel the closure means inside the trigger to prevent withdrawal.

12. The device as defined in claim 10 in which said closure means beneath said slot engages said frame to limit trigger movement in one direction.

13. A switch operating trigger mechanism comprising, in combination, a frame having a fulcrum thereon, an extension on said frame for supporting a switch having a spring extended operating plunger, a hollow trigger pivoted near one end to said fulcrum, a lever extending from the opposite end of said trigger to engage said plunger, a stop element on said frame projecting into the lever end of said trigger and having "stop" and "lock" overhangs, means on said trigger adapted to normally engage said "stop" overhang to limit the "off" position of the trigger, said means moving to a position adjacent the "lock" overhang when the trigger is pressed to the "on" position.

14. The switch mechanism as defined in claim 13 in which said trigger is slidable on said fulcrum in the direction of the length of said lever whereby said means may be engaged beneath the "lock" overhang to hold the switch plunger depressed.

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15. The switch mechanism as defined in claim 14 in which oppositely directed finger engaging surfaces are provided on the trigger oriented toward and away from the lever to determine the positioning of the trigger in respect to the fulcrum when in "on" position.

16. The switch mechanism as defined in claim 14 in which said stop element is provided with a surface between said overhangs for engagement by said means on the trigger to prevent its sliding movement on said fulcrum except at the "on" position.

17. The switch mechanism as defined in claim 14 in which a spring between the frame and trigger biases the latter toward "off" position, said spring being canted to urge the trigger toward non-locking position.

18. The switch mechanism as defined in claim 17 in which said lever is fulcrumed on said trigger and said spring engages one end of the lever to bias it against the trigger and toward switch "on" position.

19. A trigger assembly for actuating a spring biased switch comprising a frame, a trigger, means fulcruming the trigger to said frame for oscillation and limited sliding over the frame, a spring urging the trigger toward "off" position, interlocking means on the frame and trigger to limit trigger movement to the "off" position and to prevent sliding, said interlocking means being constructed to be ineffective to prevent sliding when the trigger is moved to the "on" position and having means to lock the trigger in the "on" position when sliding is there effected.

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