

July 28, 1964

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3,142,741

SNAP ACTING TRIGGER SWITCH

Filed July 11, 1962

2 Sheets-Sheet 1

Fig.1

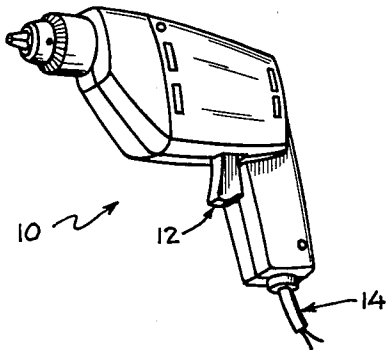


Fig.3

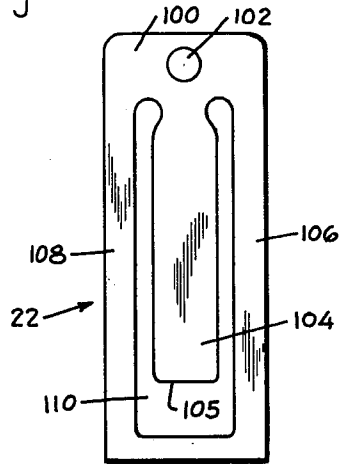


Fig.2

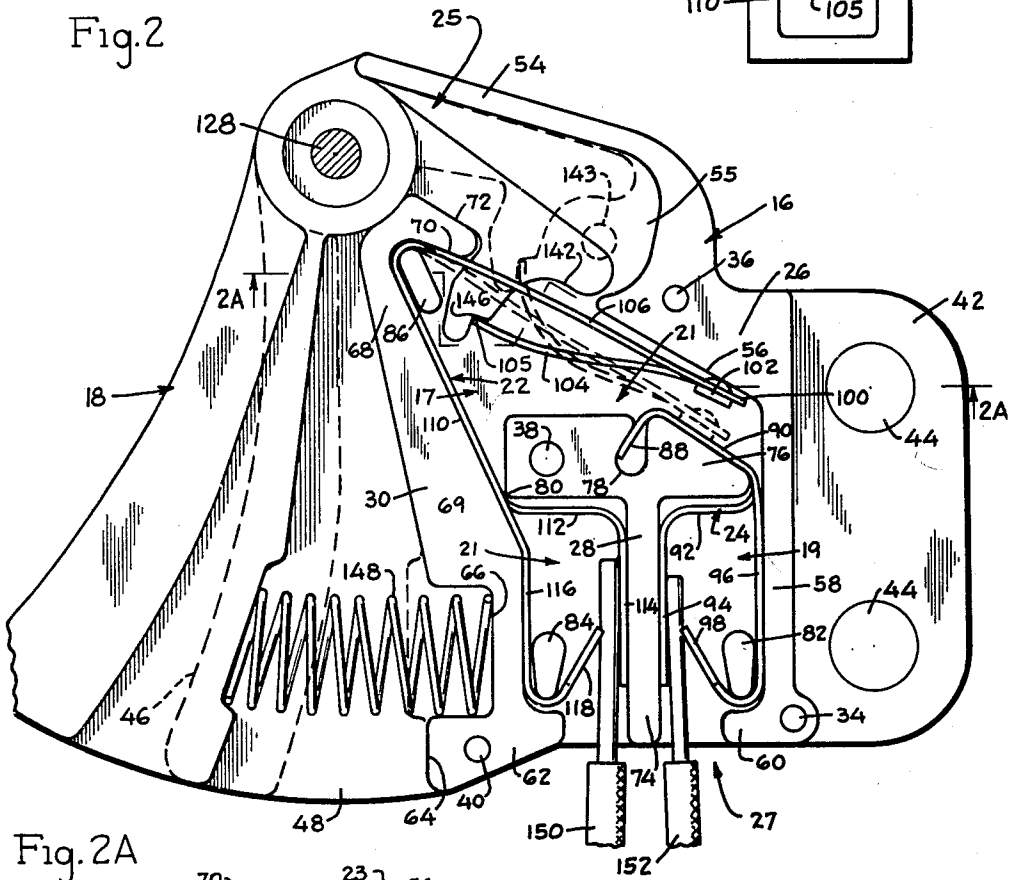
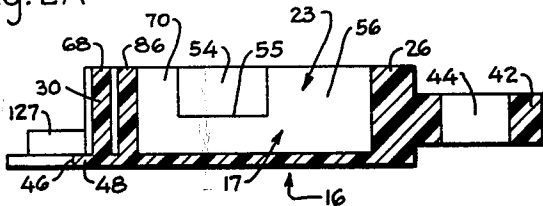


Fig.2A



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2 Sheets-Sheet 2

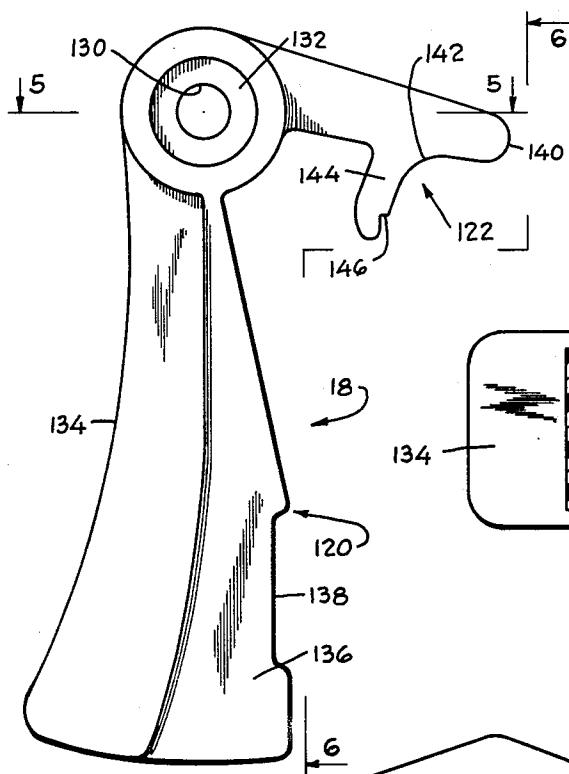


Fig. 4

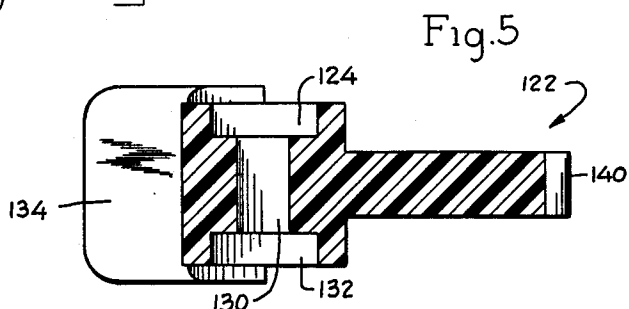


Fig. 5

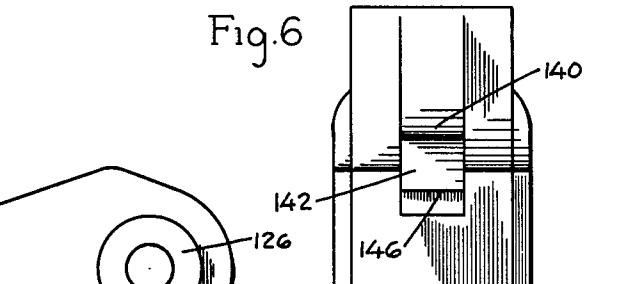
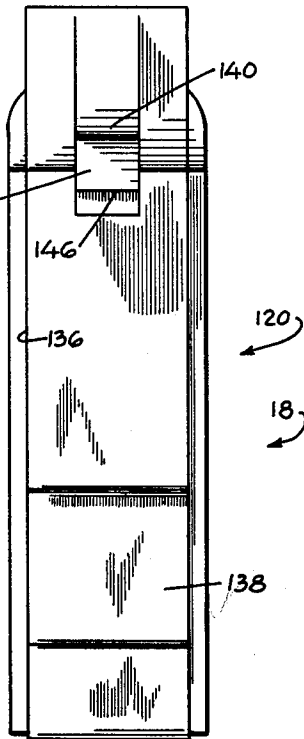
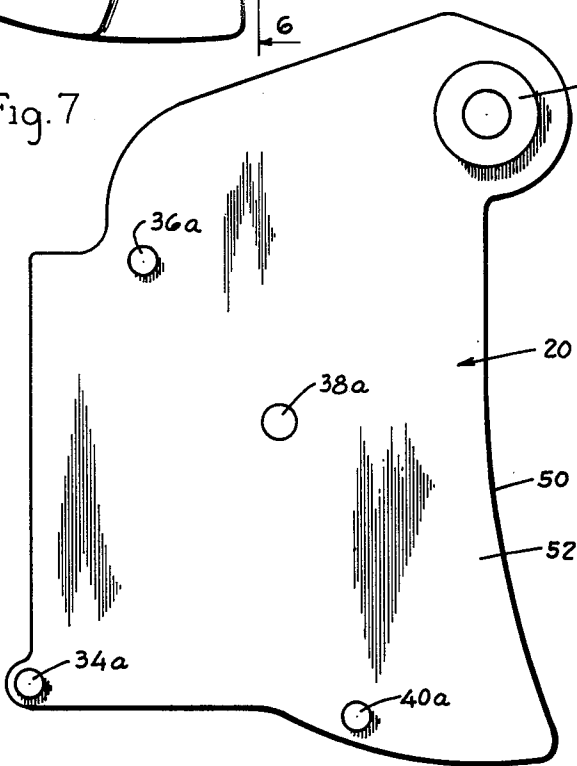


Fig. 6

Fig. 7



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3,142,741

SNAP ACTING TRIGGER SWITCH

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11 Claims. (Cl. 200—157)

This invention relates in general to a switch construction, and more particularly, relates to a manually actuated switch construction of the snap acting variety.

It has long been desired to have a simple, safe-economical snap acting switch for association with power tools and the like. Switches associated with electrically powered tools, which have a pistol like grip, often are called "trigger switches" due to their actuation by a squeezing action on the part of the operator.

It is a general object of this invention to provide an economical unitary compact snap acting trigger switch for association with electrically powered tools and the like.

It is a further object of this invention to provide a trigger switch which eliminates complicated linkage mechanisms, is easy to assembly per se, and in turn is easy to assemble on the equipment it is designed to actuate.

It is a further object of this invention to provide a trigger switch as above set forth which has a manually engageable portion made of insulating material, which prevents any possibility of electrical contact by the operator through the trigger.

It is still another object of this invention to provide quick connect terminal means integral with the contact means of the switch which aids in assembly of the electrical connection to the switch.

While the particular structural features of the specific embodiment shown in the drawings are important, it is to be understood that the precise feature shown and described may be varied with the broader aspects of the invention. To acquaint those skilled in the art with the form of construction of the invention, the invention will now be described in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of one type of portable electrically powered tool utilizing a switch which is the subject of the invention;

FIG. 2 is a plan view of the chambered base portion of the switch with the trigger assembled thereto and the cover being removed;

FIG. 2A is a sectional view of the chambered base portion only along lines 2a—2a of FIG. 2;

FIG. 3 is a view in detached relationship of the movable contact means of the instant assembly;

FIG. 4 is a view of the trigger mechanism in detached relationship from the base and the cover;

FIG. 5 is a sectional view along lines 5—5 of FIG. 4;

FIG. 6 is an elevational view along lines 6—6 of FIG. 5; and

FIG. 7 is a plan view of the inside surfaces of the cover for the switch in detached relation.

Many types of electrical devices such as portable tools and the like utilize a trigger mechanism to actuate the tool. A portable tool 10 in the form of a drill having a trigger switch mechanism 12 associated therewith is electrically actuated by conventional electrical motor power means (not shown) through electrical wires 14. The switch 12 is associated with the handle or butt mechanism of the powered tool with only the trigger portion of the switch extending exteriorly of the casing.

While the instant switch 12 is shown associated with a portable electrically powered tool such as a drill, this showing is to be considered illustrative rather than limit-

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ing. It is, of course, contemplated that the instant switch may be associated with many other devices requiring a trigger electrical actuation.

The switch 12 per se comprises a chambered base portion 16, preferably molded out of an insulating plastic material such as sold under the trade name of "Lexan," nylon, or materials having similar moldable chemical compositions, electrical insulation properties, and strength characteristics. The switch further comprises a minimum number of parts such as a trigger 18 molded out of similar plastic material, a molded cover 20, movable electrically conductive contact means 22, and fixed electrically conductive snap acting contact means 24. Two additional parts, namely, a pivot pin 128 and a spring 148 may be used in the construction depending on requirements of the environment and the exact configuration of the snap acting movable contact means 24 as shall become apparent through later discussion.

The chambered base portion 16 is formed with three major bosses 26, 28 and 30 having coplanar top surfaces, the bosses 26 and 30 in effect providing the side walls of the switch chamber 17, the center T-shaped boss 28 aiding in providing contact location and mounting functions as shall become apparent. Upstanding bosses 26, 28 and 30 are provided with four spaced shallow bores 34, 36, 38 and 40, which are adapted to receive lugs 34a, 36a, 38a and 40a respectively projecting from the cover means 20 upon assembly of the corresponding lugs into the respective bores of the chambered base means. The switch chamber 17 is formed having a first opening 25 adjacent the top as shown in FIG. 2 and a second opening 27 adjacent the bottom for receipt of the terminal end of the wires which are connected through the switch. The chamber 17 has three separated subchambers 19, 21, and 23 formed by T-shaped boss 28, the chambers 19 and 21 being substantially isolated from each other and from chamber 23. A web of material 42 is associated with the right hand side of the base 16 as shown in FIGS. 2 and 2A, which is provided with a pair of spaced bores 44 which are adapted to mount the switch 12 with suitable fastening means interiorly of the handle for the portable tool. Other and different mounting means can, of course, be provided for the switch 12 as suitable and desired.

Outboard of boss 30 (to the left as viewed in FIG. 2) is a curvilinear edge surface 46 spaced from boss 30 by a varying width thin web section 48. Curvilinear edge surface 46 may be varied to suit and is generally aligned with the edge surface of the handle of the tool to which the switch is assembled. Cover 20 has an edge surface 50 which is complementary to edge surface 46. Upon assembly of the cover 20 to the base with glue, heat sealing, etc., a web portion 52 of the cover corresponding to portion 48 and together with portion 48 and boss 30, form a U-shaped channel for receipt of one arm of the movable trigger 18 as shall become apparent.

At the upper portion of base 16, as shown in FIG. 2, is a subportion 54 of boss 26 which defines one of the outboard edges to the opening 25, the opening being smaller than the interior of the chamber 21 as shown by the offset base surface 55. The opening 25 is defined by surface 55, the subportion 54 of the boss 26 and the upper end of the side wall boss 30 having the hook-like surface as shown in plan view in FIG. 2. This opening 25 is filled by the hub of the bell crank lever means forming the trigger 18 of the switch so that subchamber 21 is substantially isolated from the exterior.

As viewed in FIG. 2, the right hand side wall boss 26 has a portion 56 which is disposed substantially parallel to subportion 54 and serves as a stop portion for the limiting movement of the movable contact means 22.

Extending downwardly as viewed in FIG. 2 is portion 58 of the boss 26 which terminates in a hook portion 60, which together with hook portion 62 of sidewall boss 30 form the second opening 27 or entrance to the switch chamber 17. Side wall boss 30 has a laterally extending abutment portion 64 which serves as a limiting stop for engagement of one arm of the trigger member 18. Immediately above portion 64 is an offset portion 66 for receipt of one end of a coil return spring means 148. Boss 30 also has an upper portion 68, which together with portion 70 helps confine and mount the movable contact means along with the small island bosses 84 and 86. End surface 72 of boss 30 adjacent opening 25 serves as a stop for the second arm portion of the trigger means 18 in limiting movement of the trigger 18 in an outward direction.

The T-shaped interior boss portion 28 has a stem portion 74 as shown in FIG. 2, which effectively separates the incoming and outgoing leads 150 and 152 for actuating the electric motor (not shown). The cross portion of the T-shaped boss 28 has an angular side wall portion 76 and a cut-out portion 78 for mounting retention of the end 88 of fixed contact means 24. Corner 80 on the boss means 28 helps confine and mount the movable contact means 22. Thus, three island bosses 82, 84 and 86 together with the side walls of the bosses 26, 28 and 30 confine and mount the movable contact means 22 and fixed contact means 24 as shown in FIG. 2 interiorly of the switch and without separate fastening means.

The fixed contact means 24 essentially comprises a flat resilient spring member made of conductive material such as beryllium copper or the like having a bent end portion 88 which is angularly disposed to straight portion 90. Portion 88 is disposed in the cut-out 78 of boss 28 and portion 90 is disposed adjacent to angularly disposed portion 76 of the T-shaped boss 28. A tongue 92 is struck out of the center of the fixed contact means 24 and is configured so that the free end portion 94 is disposed adjacent to one wall of boss portion 74, the side edges remaining after blanking out of the tongue 92 being disposed intermediate the island boss 82 and portion 60 of boss 26 for retention purposes. The end 98 of the fixed contact means 24 is disposed in opposed relation to portion 94, said end 98 being resiliently biased around island boss 82 and towards portion 94 so that mere insertion of the stripped portion of an insulated wire 152 will quickly and conveniently make an electrical connection to the fixed contact means 24. Portion 90 forms the fixed contact of the electrical assembly and may be used "as is" or may have a special contact surface disposed thereon as suitable and desired. It will be appreciated that the fixed contact means 24 is merely slipped into place and is fixedly held confined between the various bosses, no other mounting means being required to hold it in place interiorly of the switch.

The movable contact means 22 is also preferably formed of flat thin spring stock also of a material similar to beryllium copper or the like. Movable contact means 22 has a free end portion 100 mounting a contact 102 near the center thereof. A tongue 104 is blanked out of the contact means 22 to provide a free end 105 and a pair of spaced arm portions 106 and 108. Contact means 22 further has a portion 110 which is angularly disposed to portions 104, 106, and 108, and is suitably confined between island boss 86 and boss portion 68 of boss 30, said portion 110 being further confined between corner 80 of boss 28 and boss portion 69 of boss 30. A tongue 112 is struck out of movable contact means similarly to tongue 92 and extends towards tongue 92 having a mirror image relationship thereto. End portion 114 of the tongue portion 112 is disposed on the opposite side of portion 74 of boss 28 to portion 94 of the fixed contact means. Portions 116 and 118 of the terminal end of the movable contact means correspond to portions 96 and 98 of the fixed contact means to provide a suitable

quick connect attachment means for an insulated conductor which has been stripped at the end portion such as is shown at 150 in FIG. 2.

Manually engageable trigger 18 is in the form of a bell crank lever having an elongated first arm portion 120 and a shorter arm portion 122. The apex or hub of the arms 118 and 122 is formed with a bore 130 having counterbores 124 and 132 for receipt of lugs 126 and 127 which are respectively molded on the cover 20 and the chambered base portion 16. A pivot pin 128 is mounted through the annular bosses 126, 127, and is disposed in bore 130 to pivotally mount the trigger 18 so that the arm 122 extends into opening 25 for coaction with the movable contact means. Under some circumstances, the pin 128 may be molded integrally into the base 16 or cover 20. Surface 134 of arm 120 is curvilinear and is adapted to be engaged by the finger. Portion 120 of the trigger means 18 is formed with a pair of slightly offset surfaces 136 and is further formed with a cut-out 138 for receipt of the other end of the spring means 148. It will be appreciated that spring 148 is adapted to be inserted between cut-out 136 of the trigger and cut-out 66 of boss means 30 of the base portion 16. It will also be realized that depending upon the snapping type of mechanism used in the movable contact means, the spring 148 may or may not be necessary since the force of the tongue 104 may provide sufficient return force for the trigger.

Arm portion 122 of the trigger 18 has an end portion 140 and a depending hook-like portion 144 which describes a curvilinear fillet 142 therebetween. A shoulder surface 146 is disposed on the end of portion 144 for receipt of the end 105 of the tongue 104 of the movable contact means. The fillet 142 is adapted to be engaged by a pin disposed as indicated in dotted lines at 143 to lock the trigger in its dotted position.

After the parts are assembled as shown in FIG. 2, it will be seen that the movable contact 102 is normally biased against surface 56 of boss 26 by the coaction of end 105 of tongue 104 of the movable contact means with shoulder 146 of the trigger 18. Further, spring 148 also biases the trigger 18 to the full line position shown in FIG. 2. Movement of arm portion 118 to the right as viewed in FIG. 2, as by the manual squeezing pressure of a finger on a trigger, causes the trigger 18 to pivot about pin 128 to in turn cause the end 105 to move to the position shown in dotted lines in FIG. 2. This movement causes the contact 102 to snap over center and move into engagement with fixed contact means 24 at portion 90. This will make the electrical connection between incoming and outgoing wires 150 and 152. It will be realized that all parts are plastic in this device except for the pin 128, the spring 148, and the contact means 22 and 24. Thus, it is apparent that the operator of the device cannot receive an electrical shock through the trigger 18. It will be further realized that the depiction of the switch in the drawings are considerably exaggerated in size and that in point of fact the switch 12 is of a very compact nature. It will be further seen that the device has a minimum number of parts which are carefully arranged for ease of assembly. The absence of complicated lever mechanisms and small number of parts provide a long and trouble-free field life which is admirably suited for association with power tools and the like.

While a specific embodiment of the invention has been shown and described, it is with full awareness that many modifications are possible. The invention, therefore, is not to be restricted except in so far as is necessitated by the prior art and by the spirit of the appended claims.

I claim:

1. A switch for association with an electrically powered portable tool or the like comprising molded insulated housing means comprising chambered base means and cover means assembled together to define first and second spaced openings, pivot means located adjacent said

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first opening and associated with said base means and cover means, manually engageable pivotal bell crank lever means having first and second angularly disposed arms mounted on said pivot means with said second arm extending into said first opening, fixed contact means mounted in said chambered base means having a terminal portion extending adjacent said second opening, movable contact means comprising an angularly bent flat spring member having a first portion carrying a movable contact adjacent the free end thereof and a second portion disposed adjacent to and spaced from the fixed contact means portion and adjacent to said second opening, said spring member having a third portion intermediate said first and second portions engageable with said second arm of said bell lever and adapted to impart snap action movement to said contact on said first portion, and spring means interposed between said first arm portion of said bell crank lever means and said chambered base portion biasing said bell crank lever means to a first position, whereby movement of said first arm of said bell crank lever means against said spring means causes said second arm to move said movable contact means relative to said fixed contact means with a snap like action.

2. A trigger switch for association with an electrically powered portable tool or the like comprising molded plastic housing means having a chambered base means and cover means assembled together to define an irregularly shaped chamber having greater width and length than thickness and having first and second spaced openings in the side walls defining the thickness of the housing, pivot means located adjacent said first opening and mounted between said base means and cover means, manually engageable pivotal bell crank lever means having a first finger engageable arm and a second angularly disposed arm mounted on said pivot means with said second arm extending into said first opening, said lever means being movable in a plane parallel to said cover means, fixed contact means comprising an elongated thin flat spring member fixedly mounted in said switch chamber having a terminal portion extending adjacent said second opening, said terminal portion having a quick connection means for association with electrical conductors, movable contact means comprising a second angularly bent flat spring member having a first movable portion carrying a contact adjacent the free end thereof and a second portion disposed adjacent to and spaced from the terminal portion of said fixed contact means adjacent to said second opening, said second portion also having quick connection means for association with electrical connectors, said second spring member having a third portion blanked out of a fourth portion located intermediate said first and second portions to provide a stressed tongue engageable with said second arm of said bell lever adapted to impart snap action movement to said contact on said first portion, and compression spring means interposed between said first arm portion of said bell crank lever means and said side walls of said chambered base portion biasing said first arm of said bell crank lever means outwardly therefrom, whereby manual squeezing movement of said first arm of said bell crank lever means against said spring means causes said second arm to move said movable contact means relative to said fixed contact means with a snap like action.

3. A trigger switch comprising chambered base means and cover means assembled together to define a switch enclosure having first and second spaced openings, pivot means located adjacent said first opening and mounted between said base means and cover means, manually engageable pivotal bell crank lever means having first and second angularly disposed arms mounted on said pivot means with said second arm extending into said first opening, fixed contact means mounted in said switch enclosure having a terminal portion extending adjacent said second

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opening, movable contact means comprising a member having a first portion carrying a contact engageable with said fixed contact means and a second portion disposed adjacent to and spaced from the terminal portion of said fixed contact means adjacent to said second opening, said member having a third portion intermediate said first and second portions engageable with said second arm of said bell lever to impart snap action movement to said contact on said first portion, whereby movement of said first arm of said bell crank lever means causes said second arm to move said movable contact means relative to said fixed contact means with a snap like action.

4. The trigger switch set forth in claim 3 wherein the terminal portion of the fixed contact means has a tongue portion blanked out of a relatively straight portion and angularly bent in opposition thereto to provide quick connection means for a wire conductor, and said second portion of said movable contact means is formed similarly to said terminal portion of said fixed contact means to form a quick connection means for a second wire conductor or the like.

5. The trigger switch set forth in claim 3 wherein said chambered base means has an internal T-shaped boss means having an opening therein for engaging and mounting one end of said fixed contact means, the long portion of said T-shaped boss means providing an insulating separator to said terminal portion of said fixed contact means and said second portion of said movable contact means adjacent said second opening.

6. The switch set forth in claim 3 wherein said second arm of said bell crank lever means has a depending portion disposed substantially parallel with said first arm of said bell crank lever means, said depending portion being formed with a shoulder engageable with said third portion of said movable contact means to impart snap action movement to said contact on said first portion of said movable contact means.

7. The trigger switch set forth in claim 6 wherein said depending portion of said second arm portion is located intermediate the ends of said second arm, the end of said second arm away from said pivot point providing an abutment engageable with a locking means to hold said bell crank lever in a fixed position.

8. The trigger switch set forth in claim 3 wherein said chambered base means has a plurality of boss means providing side walls to said switch enclosure, said chambered base means further having a plurality of island boss means located closely adjacent to said side wall boss means to confine and mount the fixed and movable contact means therebetween for retention of the fixed and movable contact means in operative position without the use of fastening means.

9. The switch set forth in claim 3 wherein said chambered base means has a first boss means defining a side wall to said switch enclosure, said base means having a web portion extending exterior of said first boss means, and when assembled with said cover means defines a U-shaped chamber for receipt of said first lever arm upon actuation of said first lever arm in a plane substantially transverse to said first boss means and parallel to said cover means and said web portion of said chambered base means.

10. The switch set forth in claim 9 wherein said chambered base means has a second web portion extending outwardly from the side opposite to said first boss means, said second web portion being provided with mounting holes for mounting said switch.

11. The trigger switch set forth in claim 3 wherein said chambered base means, said cover means, and said manually engageable bell crank lever means are formed of plastic material having insulating characteristics.

No references cited.