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G. J. BURY

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SNAP ACTING TRIGGER SWITCH

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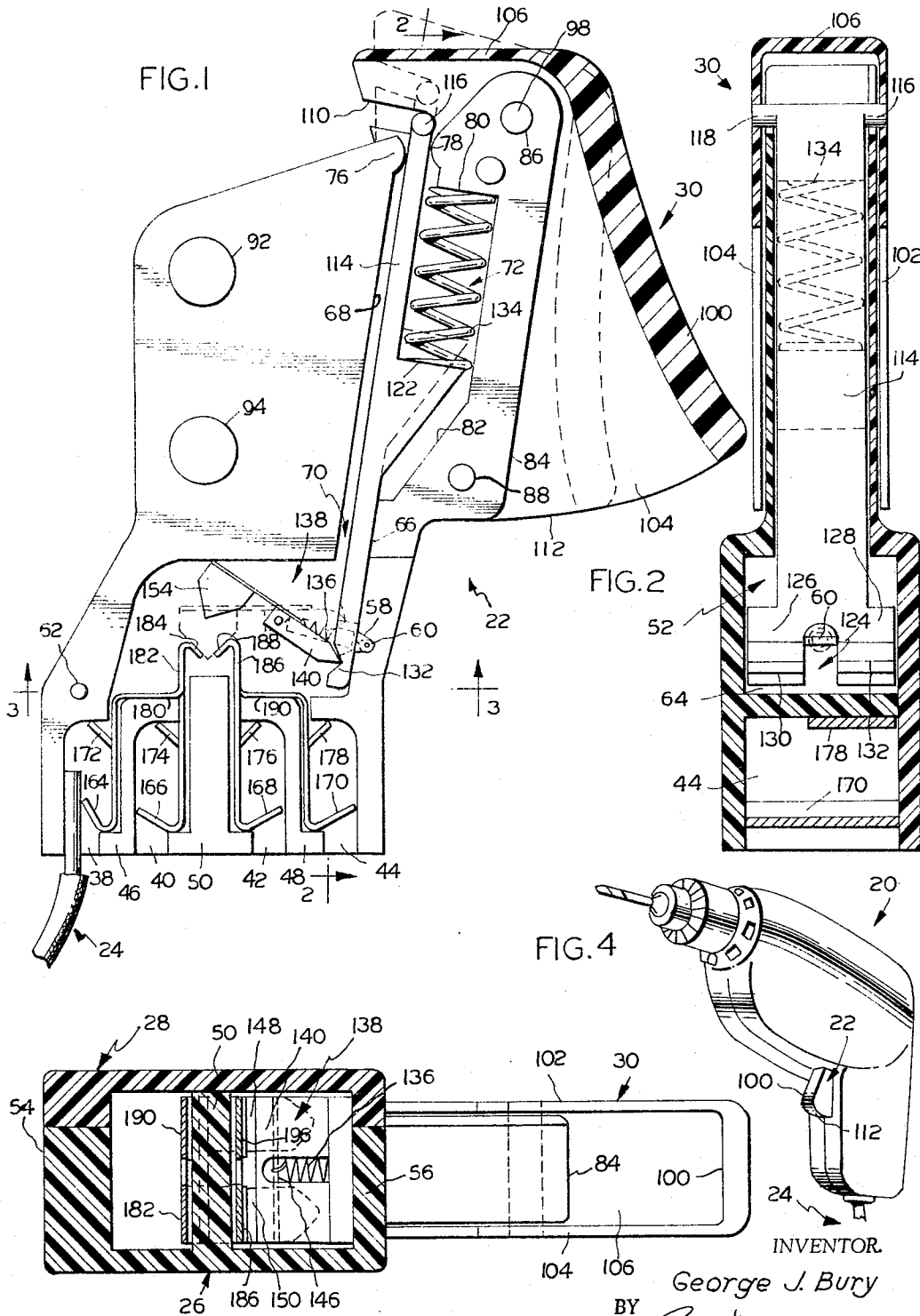


FIG. 4

FIG. 3

INVENTOR

George J. Bury

BY

Robert H. Silver
His Att'y

Aug. 23, 1966

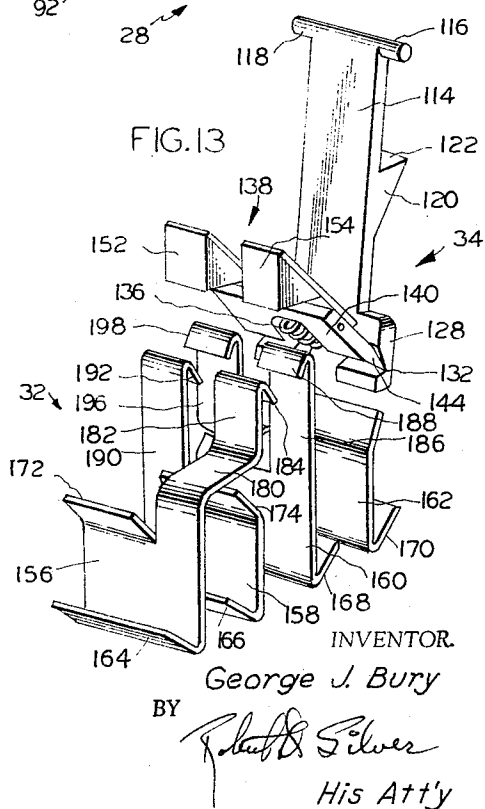
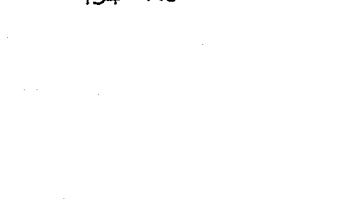
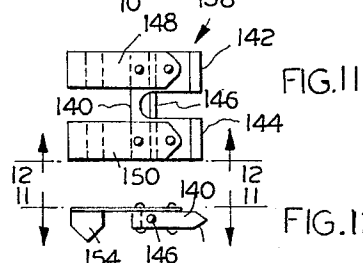
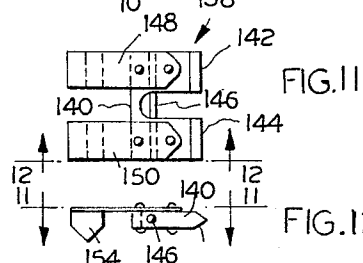
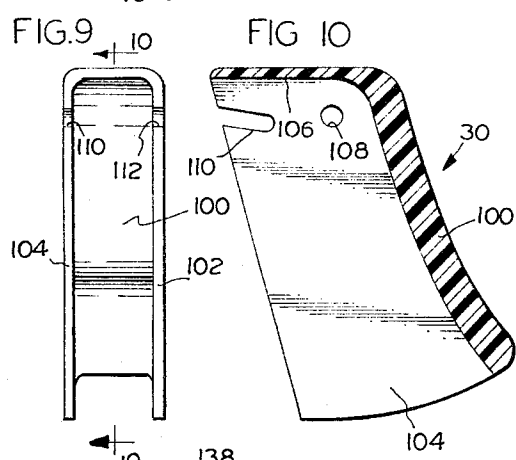
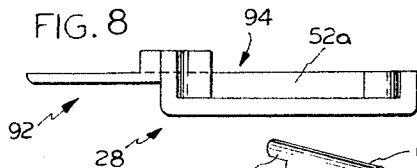
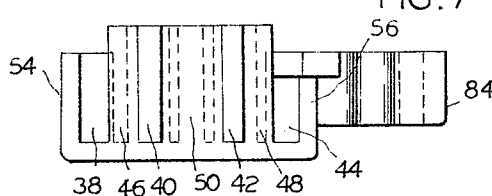
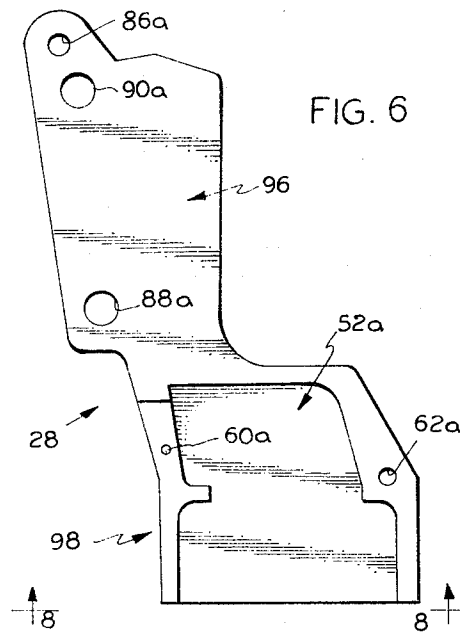
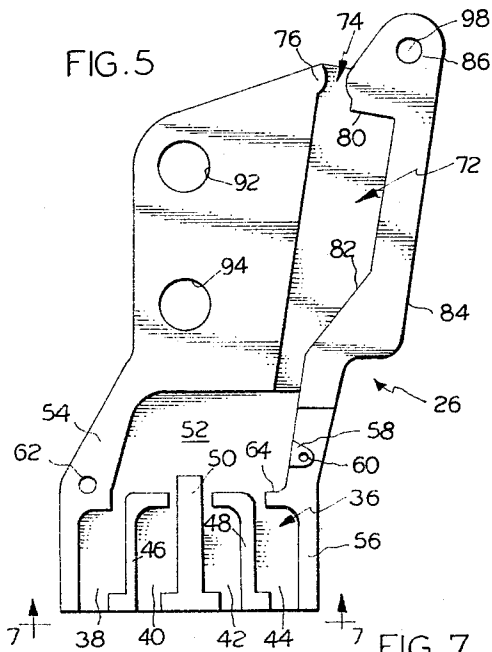
G. J. BURY

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SNAP ACTING TRIGGER SWITCH

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2 Sheets-Sheet 2



INVENTOR.
George J. Bury
BY
Robert D. Silver
His Att'y

1

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SNAP ACTING TRIGGER SWITCH

George J. Bury, Antioch, Ill., assignor to Illinois Tool Works Inc., Chicago, Ill., a corporation of Delaware
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7 Claims. (Cl. 200—157)

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

This invention is an improvement upon the switch construction shown, described and claimed in my copending application filed July 11, 1962 having a Serial No. 209,197 and entitled Snap Acting Trigger Switch now Patent No. 3,142,741.

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. In my aforementioned copending application, I have shown and disclosed a single pole single throw trigger switch which is efficacious for its intended purpose. However, the instant device provides a double pole single throw mechanism which is operable with higher current capacities in the same sized envelope.

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

It is a further object of this invention to provide a trigger switch of the double pole variety which eliminates complicated mechanisms, is easy to assemble 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 single throw double pole trigger switch as above set forth which has a manually engageable portion made of insulating material and which is electrically isolated from the portions of the switch mechanism which carry electrical current in a manner to prevent any possible contact by the operator of 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 features 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 side elevational view of the switch construction with the cover removed and a portion of the trigger mechanism shown in section;

FIG. 2 is a sectional view along lines 2—2 of FIG. 1;

FIG. 3 is a sectional view along lines 3—3 of FIG. 1;

FIG. 4 is a perspective view of a power tool of the portable variety which may utilize a switch which is the subject of the instant invention;

FIG. 5 is a view of the switch body shown in FIG. 1 without the trigger and the actuating mechanism therein;

FIG. 6 is a view of the cover for the body shown in FIG. 5;

FIG. 7 is a view along lines 7—7 of FIG. 5;

FIG. 8 is a view along lines 8—8 of FIG. 6;

FIG. 9 is a vertical elevational view of the trigger mechanism in detached relation;

FIG. 10 is a sectional view of the trigger along lines 10—10 of FIG. 9;

2

FIG. 11 is a plan view of the trigger mechanism along lines 11—11 of FIG. 12;

FIG. 12 is a side elevational view of the contact mechanism along lines 12—12 of FIG. 11; and

FIG. 13 is a perspective view of the terminal means and movable contact means 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 20 in the form of a drill having a trigger mechanism 22 associated therewith is electrically actuated by conventional electrical motor power means (not shown) through electrical wire 24 associated with the usual source of electrical power. The switch mechanism 22 is generally associated with the handle or button mechanism of the powered tool with only the trigger portion of the switch extending exteriorly of the casing of the tool.

While the instant switch 22 is shown associated with a portable electrically powered tool, such as a drill, this showing is to be considered illustrative rather than limiting. It is, of course, contemplated that the instant switch may be associated with any other devices requiring a trigger electrical actuation.

The switch 22 per se comprises a chambered base portion means 26, a cover means 28, a trigger means 30, fixed terminal means 32, and movable contact means 34. The base means 26, cover means 28, trigger means 30, and portions of the movable contact means 34 are preferably molded out of an insulating plastic material such as sold under the trade name of "Lexan," nylon, or other materials having similar moldable chemical compositions, electrical insulating properties, and strength characteristics.

The chambered base means 26 has a terminal receiving means portion 36 comprising chambers 38, 40, 42, and 44 for receipt of combination fixed contact means and quick wire attaching means. While the present invention is designed to provide a "double insulation effect" by accommodating two input and output wire connections through adjacent chambers (38, 40 or 42, 44), it will be apparent that single input and output wire connections, as is conventional, are also contemplated. The chambers are separated by somewhat Z-shaped bosses 46 and 48 on opposite sides of a central inverted T-shaped boss 50 which projects a slightly higher distance. A central chamber means 52 is located above the terminal area 36 for receipt of the movable contact means. Side walls 54 and 56 of the base along with the cover means 28 complete the terminal chambers 38 and 44 and the contact chamber 52.

A hollowed-out portion, or notch 58 is formed in the right hand portion of chamber 52 as shown in FIGS. 1 and 5 for receipt of a cross pin 60 which may be molded integral therewith or may be applied at a latter stage. The pin 60 serves as an anchor for spring 136 as shall become apparent.

A molded pin 62 (or an aperture for receipt of a post-assembled pin) is formed in the side wall 54 for cooperation with the similar pin 62a or aperture in the cover 28.

An internal boss 64 is located at the bottom end of side surface 66 of the wall 56 which forms the track for the movable slide member 114 of the contact actuation means as shall be explained. A narrow neck portion 70 separates chamber 72 from chamber 52, chamber 72 receiving the slide member and the compression spring as shall be discussed. The chamber 72 has a straight side wall 68, a lower neck portion 70, and an upper narrowed-down neck portion 74 defined by two bosses 76 and 78. An internal shoulder 80 of chamber 72 receives one end of the compression spring 134. Angularly disposed surface 82 has substantially the same angularity as lug 120 of member 114 which is movable in chamber 72.

Outer surface 84 of the base serves as a stop for inward movement of the trigger as shall become apparent. Locating holes 86 and 88 receive integrally molded pins for cooperation with similarly formed apertures 86a and 88a of the cover means 28. Holes 92 and 94 serve to mount the entire switch construction to the mounting lugs of the interior of the portable tool (not shown).

As best shown in FIG. 6 the cover 28 has a complementary chamber portion 52a at the lower end 98 and an upper portion 96 which serves as a cover means to chamber 72. The cover means is mounted by the aforementioned pins. Glue or suitable resins may be used to hold the cover to the base portion if desired. Aperture 86 mounts a pivot pin 98 for the trigger mechanism 30. The trigger mechanism comprises a U-shaped member having a web portion 100 which is somewhat thickened and extending arms 102 and 104. The top portion 106 is co-extensive with the arms and each arm has a bore 108 to receive the pin 98. A pair of oppositely disposed slots 110 and 112 are slightly angularly disposed in the upper portion of arm members 104 and 102 for receipt of extending bosses 116 and 118 of movable member 114.

Movable member 114 has an outwardly extending boss 120 which has a surface 122 in opposition to surface 80 of the base to trap a loading compression spring 134 which loads the trigger to the right as viewed in FIG. 1 and the member 114 in a downwardly direction. Member 114 is formed with an enlarged end portion which is bifurcated at 124 to form two arms 126 and 128 having V-shaped notches 130 and 132 adjacent the terminal edges thereof. The aperture formed at 124 is adapted to receive the spring 136 which is mounted to fixed pin 60 on the base and to the movable contact means 138.

The movable contact means 138 comprises a plastic member 140 which is generally U-shaped, including a pair of arms and an interconnecting bail portion, wherein the ends of the arms have knife edges 142 and 144 which cooperate respectively with the notches 130 and 132 of member 114. Spring 136 is connected to member 140 by an anchor means in the form of a cross pin 146 which extends across the aperture formed by the two arms as shown in FIGS. 11 and 12. Flexible contact carrying members 148 and 150 are mounted in spaced relationship to member 140 and carry the wedge-shaped contacts 152 and 154 on the bottom sides thereof for cooperation with the fixed terminal means upon actuation of member 114. The contacts 152 and 154 may be made of silver or other appropriate material. The movable contact means 138 may take any of a variety of forms, although it is preferable to have the movable contacts 152 and 154 not only electrically isolated relative to each other, but in addition, to have some relative flexibility so that minute tolerances relative to the height of the various fixed contacts will not cause arcing or degradation of the other contact connection due to insufficient contact pressure. The flexibility allows both contacts 152 and 154 to seat firmly on the fixed contact means.

The fixed contact means and quick wire connectors comprise four separate stampings 156, 158, 160, and 162. These are perhaps best shown in the perspective view FIG. 13. Each of the members 156-162 has a lower end portion which is angularly disposed, identified by the reference numerals 164, 166, 168, and 170, for cooperation with the bare end of a wire as shown in FIG. 1. Simple stripping of a wire and jamming it in the respective apertures 38, 40, 42, and 44 will cause the flexible end portions 164, 166, 168, and 170 to deflect upwardly and bite into the wire for a firm electrical connection thereto while preventing accidental disengagement thereof.

Struck out tongues 172, 174, 176 and 178 of the respective members engage the various other sides of the bosses for locating and holding members 156, 158, 160, and 162 in place in their chambers. Reversely bent portion 180 and upstanding portion 182 terminates in a downturned portion 184 on member 156 and serves as one of the four

fixed contacts. The cooperating oppositely disposed contact to contact 184 is the free end of member 160 which has a vertically extending portion 186 which terminates in reversely extending contact portion 188. The contact portions 184 and 188 cooperate with the wedge-shaped contact 154 of the movable contact means 138.

Member 158 has a vertically extending portion 190 terminating in a reversely extending contact portion 192 for cooperation with contact 152 and member 162 forms the opposite contact having horizontally extending portion 194 that cooperates with the top of boss 48 with upwardly extending portion 196 terminating in reversely extending contact portion 198 for cooperation with the other side of contact 152. Due to the springy nature of the members 156, 158, 160, and 162, and the wedge-shaped nature of the contacts 152 and 154, good contact will be made for good electrical connection therebetween.

The operation of the device is as follows: With no pressure applied to the trigger means 30, the actuation bar 114 is maintained in its lowermost position (shown in FIG. 1) by the compression spring 134. Pivoting lever contact carrying means 138 is maintained in its upper raised position by the relative location of the pin 60 and compression spring 136 whereby the contacts 152 and 154 are making no contact with the fixed contact portions 184, 188, 192, and 198. This causes an open circuit condition to both circuits as will be apparent.

As pressure is applied to the trigger 30 (to the left as viewed in FIG. 1), the trigger pivots about pin 98 causing the slots 110 and 112 therein to move wings 116 and 118 upwardly between the bosses 76 and 78 to the dotted line position shown in FIG. 1. As the actuating bar member 114 travels upward, pivot point notches 130 and 132 on the lower end thereof passes over the line of action of the spring 136 causing member 140 to snap downwardly and the contacts 152 and 154 to engage the fixed contacts 188, 184, 192, and 198.

It will be apparent that when the member 140 goes over center the contacts move into engagement to make both circuits with a snap action. This closed circuit condition is maintained so long as pressure is applied to the trigger. As pressure on the trigger is released, the compression spring 134 forces member 114 downwardly again passing the point of the center of spring 136 causing the member 140 to return to the position shown in FIG. 1. Any contact weld tendency caused by arcing, etc., is sheared by the twisting motion of the contacts 152 and 154 as the member 144 starts its downward motion. If desired a standard trigger lock arrangement may be employed as shown in the aforementioned application.

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

What is claimed as the invention is:

1. A trigger switch comprising chambered base means and cover means assembled together to define a switch enclosure having first and second openings at different portions thereof, pivot means located adjacent said first opening, manually engageable pivotal trigger means mounted on said pivot means, a plurality of fixed contact means mounted in said switch enclosure having terminal portions adjacent said second opening, at least one of said fixed contact means being electrically isolated from another fixed contact means, movable contact means comprising first and second lever means, said first lever means being connected to said trigger means for reciprocatory movement responsive to pivotal movement of said trigger means, said second lever means carrying spaced contact means on the end thereof and being pivotally mounted on said first lever means, spring means engaged with said second lever means and said base means to provide overcenter snap action movement of said

5

second lever means upon reciprocatory movement of said first lever means, whereby movement of said trigger means causes movement of said first and second lever means and movement of said movable contact means into engagement with said fixed contact means with a snap-like action.

2. A trigger switch comprising means defining a switch enclosure means, pivot means located on said enclosure means, manually engageable pivotal trigger means mounted on said pivot means, a plurality of spaced fixed contact and terminal means mounted in said switch enclosure means having terminal portion means for quick circuit connection to electrical wires, at least one of said fixed contact means portions being electrically isolated from another fixed contact means portion, movable contact means comprising first and second contacts respectively engageable with said spaced fixed contact means and operatively connected to said trigger means for movement responsive to pivotal movement of said trigger means, spring means engaged with said movable contact means and said enclosure means to provide overcenter snap action movement of said movable contact means on movement of said trigger means, whereby movement of said trigger means causes movement of said first and second contacts into engagement with 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 openings at opposite ends thereof, pivot means located adjacent said first opening, manually engageable pivotal trigger means mounted on said pivot means, first, second, third, and fourth fixed contact means mounted in said switch enclosure each having terminal portions adjacent said second opening, each of said fixed contact means being electrically isolated from the other fixed contact means, movable contact means comprising fifth and sixth spaced contacts and first and second lever means, said first lever means being connected to said trigger means for reciprocatory movement responsive to pivotal movement of said trigger means, said second lever means carrying said fifth and sixth spaced contact means in electrically isolated relationship on the end thereof and being pivotally mounted on said first lever means, spring means engaged with said second lever means and said base means to provide overcenter snap action movement of said second lever means upon reciprocatory movement of said first lever means, whereby movement of said trigger means causes movement of said first and second lever means and movement of said fifth and sixth movable contact means into engagement with said first and third and second and fourth fixed contact means respectively with a snap-like action.

4. The switch set forth in claim 3 wherein said first and third contacts are spaced from each other for simultaneous engagement by said fifth contact and said second and fourth contacts are spaced for simultaneous engagement by said sixth contact.

5. A trigger switch comprising means defining a switch enclosure means, pivot means located on said switch enclosure means, manually engageable pivotal trigger means mounted on said pivot means, a plurality of fixed contact means mounted in said switch enclosure means with at

6

least one of said fixed contact means being electrically isolated from another fixed contact means, snap action movable contact means operably connected to said trigger means for movement responsive to pivotal movement of said trigger means and including first lever means engaged to said trigger means for reciprocal movement and second lever means pivotally mounted on said first lever means, said second lever means carrying spaced contact means for engaging each of said electrically isolated fixed contact means, an overcenter snap action spring means connected to said second lever means and switch enclosure means to provide snap action movement of said second lever contact means with respect to said electrically isolated fixed contact means.

6. The switch set forth in claim 5 wherein said plurality of fixed contact means comprises first, second, third, and fourth contact means each having terminal means and each being individually mounted in spaced relationship to each other for attachment to different electrical wire means, said first and third fixed contact means being characterized as being in spaced parallel relationship having end surfaces in angular opposed relationship to each other, said second and fourth fixed contact means being spaced relative to said first and third fixed contact means and having end surfaces angularly disposed in opposed relationship relative to each other, and said second lever contact means comprising first and second spaced wedge-shaped contact members each having diverging surfaces, said first and second wedge-shaped contact members being cooperable respectively with said first and third and second and fourth fixed contact means.

7. The switch set forth in claim 5 wherein said overcenter snap action spring means as one end thereof anchored to said switch enclosure means, said second lever means having a generally U-shaped configuration terminating in a pair of V-shaped free arm end portions and a bail portion, a pair of flexible members extending from said bail portion of the second lever means each mounting a contact in spaced parallel electrically isolated relationship to one another, means intermediate said U-shaped arms providing an anchor for said overcenter snap action spring means, and said first lever means having a pair of U-shaped arms adjacent one end thereof each formed with a notch cooperable with a free arm end portion of said second lever means, the space intermediate the arms of said first lever means receiving the spring means anchored to said second lever means, whereby movement of said first lever means initiates movement of said second lever means to cause movement of the contacts on the bail portion of said second lever means with a snap-like action.

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ROBERT K. SCHAEFER, *Primary Examiner.*

ROBERT S. MACON, *Examiner*

H. HOHAUSER, *Assistant Examiner.*