Aug. 3, 1937. G. J. MEUER 2,089,032

ELECTRIC SWITCH

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Fig. 1

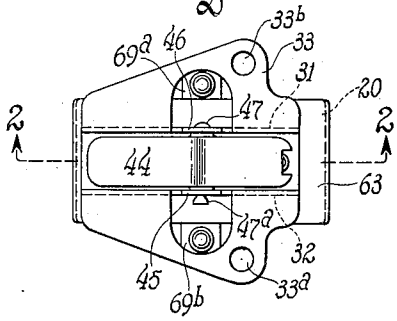


Fig. 2

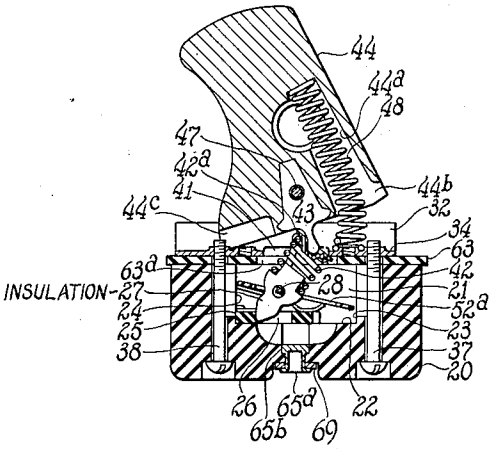


Fig. 3

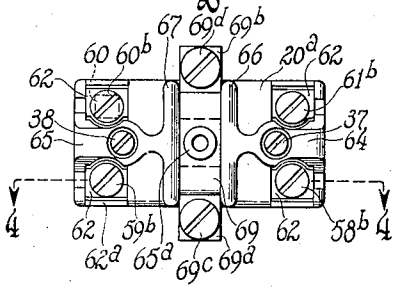


Fig. 4

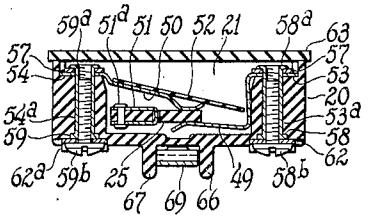


Fig. 5

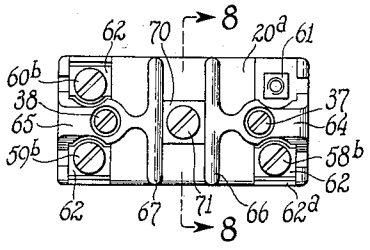


Fig. 6

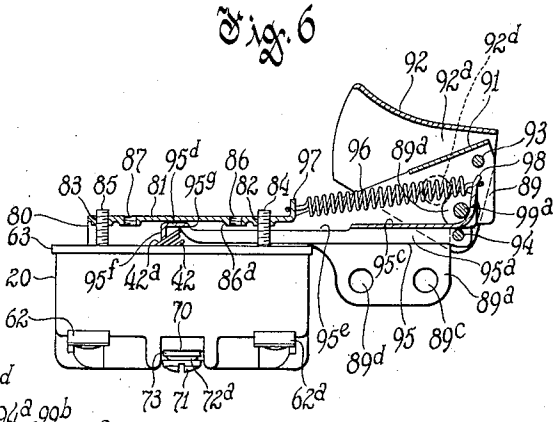
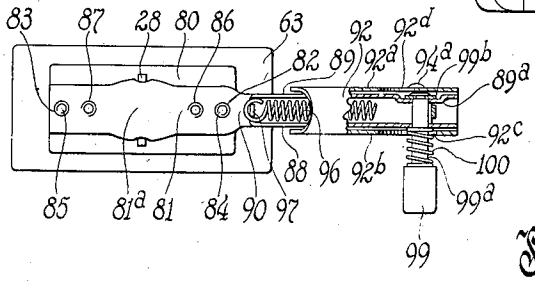


Fig. 7



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Fig. 8

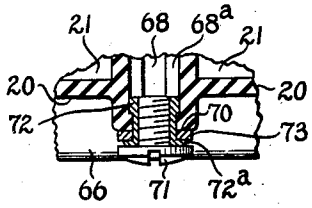


Fig. 11

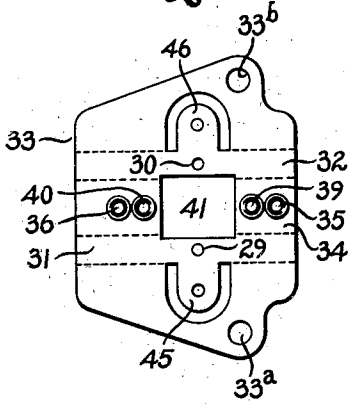


Fig. 9

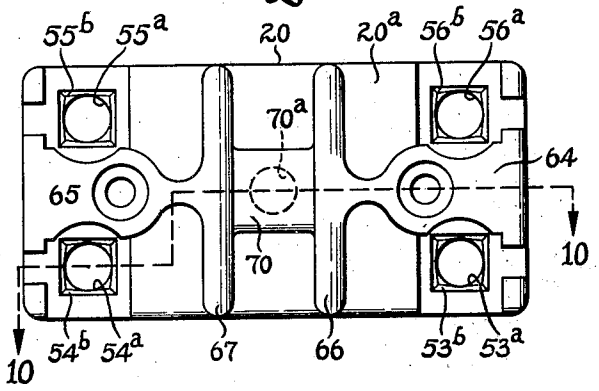


Fig. 12

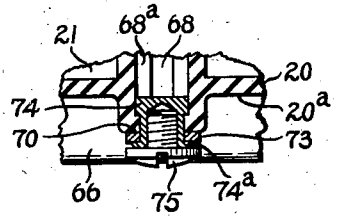


Fig. 10

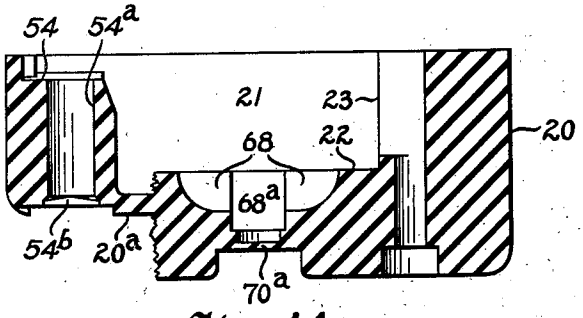


Fig. 13

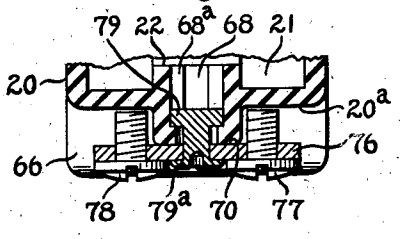


Fig. 14

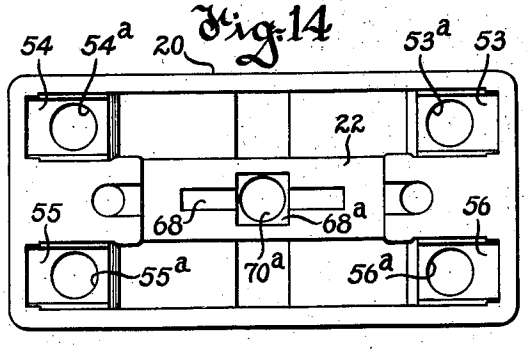
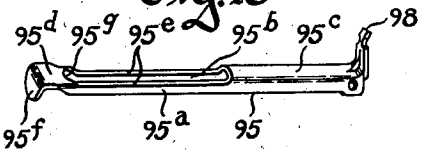


Fig. 15



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Patented Aug. 3, 1937 2,089,032

UNITED STATES PATENT OFFICE

2,089,032

ELECTRIC SWITCH

George J. Meuer, Milwaukee, Wis., assignor to Cutler-Hammer, Inc., Milwaukee, Wis., a corporation of Delaware

Application April 6, 1936, Serial No. 72,881

20 Claims. (Cl. 200—67)

This invention relates to improvements in electric switches, and more particularly to electric snap switches of the so-called tool-handle type.

A primary object of the invention is to provide a novel form and arrangement of the wiring terminal elements of switches of the aforementioned character.

Another object is to provide an improved arrangement affording better spacing between or insulation of all parts of the contact and terminal members of opposite polarity, to thereby better insure against surface creepage incident to the presence of metal dust and the like in the atmosphere in which the switch may be employed.

A more specific object is to provide a snap switch having a novel form of rear- or bottom-wiring terminal elements.

Another object is to provide a rear-wired snap switch having novel means for attaching or supporting the neutral wire of a three-wire source of current supply.

Another object is to provide an arrangement of wiring terminals to enable selective employment of a greater variety of switch supporting and actuating elements.

Another object is to provide an insulating base normally adapted to provide a switch for use with a two-wire source of current supply, and readily adaptable for attachment of the neutral wire terminal member to provide a switch for use with a three-wire source of current supply.

Another object is to provide a snap switch of the aforementioned character affording more complete closure of the switch chamber or recess with respect to the surrounding atmosphere.

Another object is to provide alternative forms of neutral wire terminal elements, which may be selected for use on the switch according to the wiring space afforded in the casing of the tool with which the switch is to be employed.

Another object is to generally improve the details of construction of the switch parts whereby the operating life of the switch is substantially increased.

Another object is to provide novel forms of switch supporting members and novel forms of switch actuating elements to be associated therewith.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate certain embodiments of the invention which will now be described, it being understood that the illustrated embodiments are susceptible of modification in respect of certain details of construction thereof without departing from the scope of the appended claims.

In the drawings, Figure 1 is a top plan view of one form of electric snap switch constructed in accordance with my invention.

Fig. 2 is a vertical sectional view, on the line 2—2 of Fig. 1.

Fig. 3 is a bottom plan view of the switch shown in Figs. 1 and 2,—the supporting top plate and the insulating cover plate being omitted.

Fig. 4 is a vertical sectional view, substantially on the line 4—4 of Fig. 3, with the insulating cover plate shown in position thereon.

Fig. 5 is a view similar to Fig. 3, but showing a modified form of means for attachment and support of the neutral wire of a three-wire source of current supply.

Fig. 6 is a side elevational view, with parts in vertical section, showing switch parts like those illustrated in Fig. 5 employed in conjunction with switch supporting and actuating elements of modified form.

Fig. 7 is a top plan view of the switch shown in Fig. 6.

Fig. 8 is a fragmentary vertical sectional view, on the line 8—8 of Fig. 5.

Fig. 9 is a bottom plan view (double size) of a molded insulating base which may be utilized in producing the switches shown in Figs. 1 to 8,—the bottom wall of the switch chamber, however, being shown closed to provide for omission of the neutral wire terminal member.

Fig. 10 is a vertical sectional view, on the broken line 10—10 of Fig. 9.

Fig. 11 is a plan view of the sheet metal blank from which the switch supporting plate of Figs. 1 and 2 may be formed.

Fig. 12 is a fragmentary sectional view similar to Fig. 8,—but showing means for insuring complete closure of the bottom wall of the switch chamber in the absence of the neutral wire terminal screw,—and to further insure against use of a terminal screw having a shank of excessive length.

Fig. 13 is a fragmentary sectional view similar to Fig. 12,—but showing a two-screw auxiliary terminal plate of a length to lie within the width of the switch base,—as distinguished from that shown in Figs. 1 to 4.

Fig. 14 is a top plan view of the switch base, and

Fig. 15 is an enlarged perspective view of the switch-actuating guide link shown in Figs. 6 and 7.

The switches herein disclosed embody certain

features of the switches described and claimed in my prior patents, No. 1,889,259, dated November 29, 1932, and No. 1,977,078, dated October 16, 1934.

Referring first to the form of switch shown in Figs. 1 to 4 and 11, the numeral **20** designates a base molded from a suitable insulating material, such as the phenol-formaldehyde condensation product sold commercially under the trade-name of "bakelite." The form of the insulating base is shown in greater detail (double-size) in Figs. 9, 10 and 14.

Base **20** is provided with a substantially rectangular switch chamber or recess **21** opening to the upper surface thereof. Recess **21** is preferably provided in its bottom and end walls with alined ribs **22**, **23** and **24** (Figs. 2, 10 and 14), the rib **22** having a flat upper surface upon which the flat punched plate **25** of fiber or other suitable insulating material is adapted to slide. Plate **25** is of substantially rectangular form and of a width to fit between and be guided by the side walls of recess **21**. The length of plate **25** is substantially less than the length of recess **21**, and the end walls of the latter are adapted to limit movements of the former to opposite extreme positions,—said plate **25** being cut away at opposite ends thereof (Fig. 2) to accommodate the respective end ribs **23** and **24** aforementioned.

Plate **25** is provided with a symmetrically arranged longitudinally extending slot or opening **26** (Fig. 2) which is adapted to accommodate, with a lost motion, the lower end of an oscillatable member **27** which is preferably formed of insulating material. Member **27** is pivotally supported by a U-shaped wire yoke member **28**, which is in turn pivotally supported in a pair of alined openings **29** and **30** formed in the upstanding parallel arms **31** and **32** of a supporting top plate **33**, the blank for which is shown in Fig. 11. Plate **33** is bent along the four parallel dotted lines shown in Fig. 11 to the form shown in Figs. 1 and 2,—the base portion **34** of said plate being provided with a pair of tapped openings **35**, **36** to accommodate the shanks of a pair of securing screws **37** and **38**. A second pair of tapped openings **39** and **40** is preferably provided to enable alternative use of a switch base (not shown) of relatively smaller dimensions.

Plate **33** is provided with an opening **41** which preferably extends to a slight degree into the area of each of the arms **31**, **32** (Fig. 11) to facilitate upward bending of the latter,—said opening **41** providing clearance for the upper end of a coiled compression spring **42** (Fig. 2) and for the abutment end of a lever **43**, which engages a metal cup **42a** positioned within said end of the spring. The lower end of spring **42** is adapted to telescope onto the upper end of member **27** (Fig. 2) and to abut a pair of shoulders formed on the latter. The oppositely extending horizontal arms of top plate **33** are respectively provided with openings **33a**, **33b** through which suitable screws or bolts (not shown) may pass for clamping the complete switch unit to a suitable support.

Lever **43** is preferably embedded or molded within a die cast metal handle or lever of the form shown at **44** in Figs. 1 and 2. Plate **33** is provided with lugs **45** and **46** which extend upwardly in the respective planes of the arms **31** and **32**,—said lugs being provided with alined openings to receive the headed pin **47**, the shank of which penetrates handle **44** and lever **43** and is spread or upset, as shown at **47a**, Fig. 1, to hold the lever in assembled relation to the top plate.

Handle **44** is preferably provided with a recess or cavity **44a**, Fig. 2, to accommodate a coiled compression spring **48**. In practice the extrusion surrounding the aforementioned tapped opening **39** is utilized as an abutment for the lower end of said spring. The arrangement is such that handle **44** is normally biased in a counter-clockwise direction (Fig. 2) to effect (through spring **42**, yoke **28** and member **27**) snap movement of plate **25** from its right-hand position to its left-hand position,—manual operation of lever **44** in a clockwise direction obviously providing for snap movement of plate **25** from left to right.

The stationary and movable contact elements of the switch are in general quite similar to those illustrated in my Patents Nos. 1,889,259 and 1,977,078 aforementioned. In Fig. 4 I have shown one pair of lower and upper stationary contacts **49** and **50** between the resilient tips of which the plate **25** is interposed in all positions of the latter,—it being understood that in each of the switches herein disclosed the use of two pairs of upper and lower stationary contacts is contemplated. The plate **25** is notched at the midpoint of each side edge thereof to receive the connecting portions of a pair of similarly arranged movable bridging contactors, one of which is shown at **51** in Fig. 4.

The arms of said contactors preferably extend to a line substantially flush with one end of plate **25**, and said arms and the plate are provided with alined openings to receive the shanks of headed rivets, one of which is shown at **51a**, the shank ends of said rivets being upset as shown to rigidly and permanently secure the contactors to plate **25**. A relatively thin plate **52** of fiber or other insulating material is loosely positioned above the tips of the aforementioned pairs of stationary contacts, but below the yoke member **28** and spring **42**, to afford a substantially closed and relatively restricted arcing chamber,—said plate **52** having a slot **52a** (Fig. 2) formed therein to provide clearance for member **27** during oscillating and bodily movement of the latter.

As illustrated in Figs. 4, 10 and 14, base **20** is provided at the four corners thereof with substantially rectangular recesses **53**, **54**, **55** and **56** which are respectively adapted to receive with a fairly snug fit the rectangular ends of the strip-metal stationary contacts. Superimposed upon said ends of the contacts (see Fig. 4) are metal plates or washers **57** (preferably square). Base **20** is provided with passages **53a**, **54a**, **55a** and **56a** of circular cross section which extend from the lower surface **20a** of said base and open to the respective recesses.

As best illustrated in Figs. 9 and 10 each of said passages is provided at its lower end with an enlargement or countersink **53b**, **54b**, **55b**, **56b** of square or other polygonal contour, to accommodate the correspondingly shaped heads of internally threaded hollow metal members or eyelets, two of which are shown at **58** and **59** in Fig. 4, another of which is shown in dotted lines at **60** in Fig. 3, and the other of which is shown at **61** in Fig. 5. The shanks of said eyelets penetrate openings in the aforementioned ends of the contacts and the plates **57** and are upset over the latter, as shown at **58a** and **59a** in Fig. 4. Although I prefer to attach said eyelets to the base in the manner illustrated and described, it is of course to be understood that the same might be arranged in the reverse manner, with the shank ends thereof upset over the lower surface of said base.

In practice, after attachment of the two lower contacts (such as 49) of the switch, the plate 25 with the contactors attached thereto is inserted in the relationship illustrated, and thereafter the two upper contacts (such as 50) are secured to base 20 (see Fig. 4). The aforementioned eyelets are threaded internally throughout the major portion of the length thereof, and I prefer to employ binding screws 58b, 59b, 60b and 61b the shanks of which are relatively long,—as shown in Fig. 4. The circuit wires (not shown) may be clamped directly against the eyelet heads (see 61 in Fig. 5) by the heads of the respective binding screws. I prefer, however, to associate with each of said binding screws a flat plate 62 of the form best illustrated in Figs. 3 and 4,—the lower surface 20a of base 20 having correspondingly shaped shallow recesses to accommodate said plates in a substantially flush relationship to said surface. Moreover, each plate 62 is preferably provided at its outermost end with a lug or flange 62a which is angled away from the bottom surface 20a of the base to provide a guard for facilitating and insuring proper attachment of a circuit wire.

As best illustrated in Fig. 2 I prefer to interpose between the upper surface of base 20 and the supporting top plate 33 a flat punched plate 63 of laminated fiber or similar insulating material,—said plate having a substantially circular opening 63a formed therein to provide clearance for the yoke 28 and spring 42. Plate 63 is also provided with openings to afford clearance for the shanks of screws 37, 38 which engage with the aforementioned tapped openings 35 and 36 in top plate 33. The spring 48 is preferably assembled with respect to handle 44 and top plate 33 prior to insertion of the aforementioned pivot pin 47. It is to be understood, however, that spring 48 may be inserted or removed after said handle is pivotally attached to the top plate. Handle 44 is preferably formed as indicated at 44b and 44c to provide ample clearance between the same and the securing screws 37 and 38.

As shown in the several figures of the drawings (particularly Figs. 2, 4, 6, 10 and 14) the upper surface of base 20 is unbroken throughout the periphery thereof wherefore the insulating plate 63 which overlies the same (Fig. 7) provides an effectual seal to prevent ingress of dust particles into the switch chamber,—the aforementioned opening 63a in said plate being substantially covered or protected by the cover plate 33 and the switch operating elements carried thereby.

The bottom surface 20a of base 20 has formed integrally therewith a pair of longitudinally extending barriers 64 and 65, and a pair of spaced transversely extending barriers 66 and 67,—the barriers 64 and 66 being merged and the barriers 65 and 67 being merged,—thus providing five areas upon said bottom surface which are insulated from each other. When the motor to be controlled by the switch is fed from an ordinary two-wire source of supply, the severed ends of one of the supply wires are respectively attached to the switch by means of screws 58b and 59b, and the severed ends of the other supply wire are respectively attached to the switch by means of screws 61b and 60b. When the switch is to be used for control of a two-wire source of supply, the bottom wall of recess 21 in base 20, which is preferably initially molded in the manner best illustrated in Figs. 9, 10 and 14, is left imperforate to insure against entrance of dust or other foreign matter into the switch chamber.

When the switch is to be used for control of current from a three-wire source of supply it is necessary or desirable to bring the three wires (including the neutral wire) to the switch base. I therefore provide neutral wire terminal means upon the switch base. For this purpose the relatively thin circular area 70a (Figs. 10 and 14, and shown in dotted lines in Fig. 9) is broached out to accommodate the hollow cylindrical shank of a rivet 65a (Fig. 2), the square closed head 65b of which is accommodated within a correspondingly shaped recess 68a in the bottom wall of recess 21. The depth of the head 65b of said rivet (Fig. 2) is preferably such that the upper surface thereof is substantially flush with or below the bottom wall of the auxiliary recess 68 which provides clearance for the aforementioned member 27.

In Figs. 1 to 4 I have shown a terminal plate 69 which is adapted to seat against the flat surface 70 (Fig. 9) offset downwardly from the aforementioned bottom surface 20a of the base,—said plate being located between the aforementioned transverse barriers 66 and 67, and the same having upwardly offset end portions 69a and 69b which project beyond opposite sides of base 20. Said end portions 69a and 69b are provided with tapped openings to receive the shanks of binding screws 69c and 69d in a relation to clear the opposite sides of base 20 (see Fig. 1). Plate 69 is provided with an intermediate opening to receive the shank of rivet 65a,—which is upset as shown in Figs. 2 and 3 to secure the plate to base 20. The shoulders formed by offsetting portions 69a and 69b of plate 69 and the adjacent ends of the barriers 66 and 67 act as wire-beard guards to facilitate attachment of the circuit wires to said plate.

In Figs. 5 and 8 I have shown a modified form of switch adapted to provide for attachment of the neutral wire of a three-wire source of current supply, as by means of a single binding screw 71. For this purpose I may employ an internally threaded hollow member or eyelet 72 (Fig. 8) over the projecting end of which a washer 73 (preferably circular) is adapted to fit,—said projecting end being then upset as shown at 72a to retain the eyelet in position. A portion of the neutral wire (not shown) may be bared and formed into a loop of suitable size to be clamped against the upset end 72a of the eyelet by the head of screw 71. As an alternative, the neutral wire may be cut and the respective cut ends thereof bared for clamping by the head of screw 71. As will be noted the shank of screw 71 is made sufficiently short to avoid any possible interference between the same and the member 27 which moves within the auxiliary recess 68.

In Fig. 12 I have shown an arrangement quite similar to that of Fig. 8. In this instance, however, I employ an internally threaded hollow member or rivet 74 having a closed upper end,—the shank 74a of which is upset over washer 73. By employing a closed-end member I positively insure that a binding screw, such as 75, having a sufficiently short shank will be employed. By the arrangement shown in Fig. 12 the screw 75 may be entirely omitted (in the event that the switch is employed for control of a two-wire source of current supply) while at the same time insuring complete closure of the bottom wall of the switch chamber.

While in some cases it is preferred to employ a pair of binding screws such as shown in Figs. 1 to 4 for attachment of the neutral wire, the available space in a particular installation may

necessitate positioning of the neutral wire binding screws within the width of base 20. Accordingly in Fig. 13 I have provided for use of a flat plate or bus member 76, the length of which is less than (or at least not greater than) the width of base 20. Plate 76 is provided adjacent to opposite ends thereof with tapped openings to receive the shanks of binding screws 77 and 78 of suitable length. Plate 76 is provided with an intermediate opening through which the hollow end of a solid-headed rivet 79 is adapted to pass,—said hollow end being upset as shown at 79a to rigidly secure plate 76 to base 20. In practice the plate 76 is of a width substantially equal to the width of plate 69 (Fig. 3) whereby the same fits rather snugly between the aforementioned barriers 66 and 67 on the bottom surface 20a of the base.

In Figs. 6, 7 and 15 I have illustrated a switch having supporting and actuating means of modified form. The insulating base 20 is like that aforedescribed, and it is to be understood that the stationary and movable switch contacts and the terminal members may be identical with the parts aforedescribed. It is to be noted, however, that base 20 with its stationary and movable switch contacts is reversed in position, with respect to the arrangement of Figs. 1 to 5. In Fig. 6 I have shown neutral wire terminal connecting means of the character illustrated in Figs. 5 and 8, but it is obvious that any of the other neutral wire terminal means may be employed alternatively, or the same may be omitted entirely (see Fig. 9) where the switch is to be used for control of a two-wire source of current supply.

The switch supporting means comprises essentially a metal top plate or member 80 having a portion 81 of inverted channel shape in cross section,—said portion having an intermediate relatively wide or laterally bulged part 81a the opposite vertical walls of which are provided with openings to pivotally support the opposite ends of yoke member 28. Portion 81 is provided with a pair of tapped openings 82 and 83 to receive the shanks of screws 84 and 85, which secure said top plate to base 20. Portions 81 is likewise provided with a pair of less widely spaced tapped openings 86 and 87, to provide for use of the top plate 80 with a relatively smaller insulating base (not shown), or alternatively, to accommodate securing screws for attaching the switch unit to a suitable support.

Top plate 80 is provided at the forward end thereof with integral extensions 88 and 89 located in parallel vertical planes, the upper edges of said extensions being inclined upwardly, and said edges being connected by the portions 90 and 91 to form a substantially rigid frame. A manually operable lever 92 of substantially saddle form is adapted to straddle extensions 88 and 89 and is permanently pivotally secured thereto as by means of a headed pin 93, the shank end of which is upset over the side 92a of lever 92 to retain said pin in position. The parallel side portions 92a and 92b of lever 92 are provided with alined openings to receive the headed pin or rivet 94, the shank end of which is upset as shown at 94a (Fig. 7). Pin 94 likewise penetrates alined openings in the forward ends of the parallel arms 95a, 95b (Figs. 6 and 15) of a switch-actuating guide link 95. The top edges of said arms 95a, 95b are connected by integral flat portions 95c, 95d,—said link having a cut-away portion or opening 95e to provide clearance between the same and the shank of screw 84 (Fig. 6).

Upon counter-clockwise movement of lever 92 (Fig. 6) the pivot pin 94 moves toward the right, carrying with it the aforementioned link 95. The rear end of link 95 is provided with a downwardly projecting abutment 95f which fits within the cup 42a in the upper end of spring 42, whereby upon such movement of link 95 the spring 42 is compressed to effect storage of sufficient energy to effect snap movement of the movable contactors to circuit completing position, as an incident to movement of the upper end of spring 42 to the right beyond the point of pivotal support of yoke 28. The switch mechanism is biased to circuit breaking position as by means of a coiled tension spring 96, one looped end of which is hooked onto the upstanding lug 97 formed integrally with portion 90 of the top plate, and the other looped end of which is hooked onto the upstanding lug 98 formed integrally with link 95. Thus upon manual release of lever 92 spring 96 will act in an obvious manner to effect return of the switch parts to the respective positions thereof shown in Figs. 6 and 7.

I have shown means for latching the switch mechanism in circuit completing condition. Said means comprises a pin 99 having a shank 99a which is slidable within openings formed in the parallel arms 88 and 89 of the top plate extension. The outer surface of arm 89 (Fig. 6) is provided with an inward depression 89a surrounding the opening therein,—said depression being adapted to accommodate a relatively thin washer 99b, over which the end of shank 99a is upset, to normally avoid interference between the shank 99a of said pin, with its attached washer, and the arm 92a of lever 92. The other arm 92b of lever 92 is provided with a relatively large opening 92c to provide clearance between the same and shank 99a in all positions of said lever. However, the arm 92a of lever 92 is provided with an opening 92d, Figs. 6 and 7, which is adapted to register with shank 99a of the pin in the closed position of the switch. Under such conditions if pin 99 is pressed inwardly the aforementioned shank 99a and its associated washer will penetrate said opening 92d, and thus restrain lever 92 from clockwise movement under the bias of spring 96.

A coiled compression spring 100 surrounds the shank 99a of said pin and is interposed under a predetermined degree of compression between the cylindrical head of pin 99 and the outer surface of arm 88 (Fig. 7). When the switch is thus latched in closed position, the same may be released by simply moving the lever 92 manually to its extreme counter-clockwise position, with reference to Fig. 6, so that the aforementioned washer may be withdrawn through the opening 92d by the action of the retracting spring 100. Thereafter, upon manual release of lever 92 the spring 96 will be free to act in the aforedescribed manner to return the switch parts to circuit interrupting position.

Outward movement of the guide link 95 is preferably limited by engagement of the end wall 95g of the opening 95e therein with the annular flange 86a (Fig. 6) surrounding the opening 86. Movement of link 95 in the reverse direction under the action of spring 96 is preferably limited by engagement of the lower portion of lug 98 of said link with the aforementioned shank 99a of pin 99.

As shown in Fig. 6, the arm 89 is provided with an integral portion projecting downwardly below the top surface of insulating base 20 at one end of the latter,—said portion 89a having openings

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89c and 89d to accommodate suitable bolts or other securing means whereby the unit as a whole may be attached to the casing of a power-operated tool, or to any other suitable support.

What I claim as new and desire to secure by Letters Patent is:

1. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, a plurality of pairs of resilient stationary contacts, the tips of each pair of stationary contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat plate of insulating material interposed between and adapted to slidably engage the tips of the respective pairs of contacts in all positions of said plate, contactors carried by said plate and movable thereby into and out of bridging relation to said pairs of contacts, a yoke member pivotally supported for oscillatory movement of the lower end thereof within said recess, manually operable means including a coiled compression spring for effecting snap movement of said yoke member from each extreme position thereof to the other, means providing a lost motion driving connection between said yoke member and said insulating plate, a flat punched plate of insulating material superimposed upon the upper surface of said base and adapted to seal the peripheral upper edge of said recess, a plurality of wiring terminal elements comprising internally threaded hollow metal members having shoulders engaging the bottom surface of said base and having shoulders engaging the respective contacts to secure the latter in position, and a corresponding number of binding screws having threaded engagement with said terminal elements, said screws having the heads thereof exposed upon said bottom surface of the base.

2. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, a plurality of pairs of resilient stationary contacts, the tips of each pair of stationary contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat plate of insulating material interposed between and adapted to slidably engage the tips of the respective pairs of contacts in all positions of said plate, contactors carried by said plate and movable thereby into and out of bridging relation to said pairs of contacts, a yoke member pivotally supported for oscillatory movement of the lower end thereof within said recess, manually operable means including a coiled compression spring for effecting snap movement of said yoke member from each extreme position thereof to the other, means providing a lost motion driving connection between said yoke member and said insulating plate, a flat punched plate of insulating material superimposed upon the upper surface of said base and adapted to seal the peripheral upper edge of said recess, a plurality of wiring terminal elements comprising internally threaded hollow metal members extending upwardly from the bottom surface of said base and having the upper ends thereof upset over the respective contacts to secure the latter in position, a corresponding number of binding screws having threaded engagement with said terminal elements, said screws having the heads thereof exposed upon said bottom surface of the base, and said bottom wall of said base having a plurality of barriers formed integrally therewith and interposed between said binding screws to insulate the latter from each other.

3. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, stationary and movable contact elements located within said recess, said base having a plurality of ledges offset downwardly from the upper surface thereof, said stationary contacts having flat portions adapted to seat upon said ledges respectively, a flat punched insulating plate seated upon the upper surface of said base and adapted to overlie said stationary and movable contact elements, a stamped sheet metal supporting member positioned above said plate and rigidly attached to said base, the outer surfaces of the side and end walls of said base being uninterrupted and the same being free from conducting elements, a plurality of internally threaded hollow metal members penetrating said base and positively restrained against rotation with respect thereto, said members having heads formed at each end thereof to respectively engage the bottom surface of said base and the flat portions of the contactors to secure the latter in position, and a corresponding number of binding screws having threaded engagement with said hollow metal members and being accessible from said bottom surface.

4. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, stationary and movable contact elements located within said recess, said base having a plurality of ledges offset downwardly from the upper surface thereof and inwardly with respect to the peripheral side and end walls thereof, said stationary contacts having flat portions adapted to seat upon said ledges respectively, a flat punched insulating plate seated against the peripheral upper edge of said base and adapted to overlie said stationary and movable contact elements, a stamped sheet metal supporting member positioned above said plate and rigidly attached to said base, the outer surfaces of the side and end walls of said base being free from conducting elements, a plurality of internally threaded hollow metal members penetrating said base and positively restrained against rotation with respect thereto, said members having shoulders formed at each end thereof to respectively engage the bottom surface of said base and the flat portions of the contacts to secure the latter in position, a corresponding number of binding screws having threaded engagement with said hollow metal members and being accessible from said bottom surface, and said bottom surface having a plurality of relatively high longitudinally extending and transversely extending ribs formed integrally therewith and adapted to properly insulate said binding screws from each other.

5. In an electric snap switch, in combination, a molded insulating base having a substantially rectangular recess formed therein and opening to the upper surface thereof, said base having ledges offset downwardly from the upper surface thereof and positioned within the continuous peripheral edge of the latter, said ledges communicating with said recess at the four corners respectively of the latter, two pairs of upper and lower resilient stationary contacts having flat portions thereof respectively positioned upon said ledges, the tips of said pairs of contacts being located within said recess and biased toward each other, a movable insulating plate continuously interposed between the respective pairs of contact tips, a pair of contactors carried by said plate and movable

thereby into and out of bridging engagement with said pairs of contact tips, flat metal members superimposed upon the flat portions of said stationary contacts respectively, said flat metal members, said flat portions of said contacts and said base having alined openings formed therein, wiring terminal members comprising a plurality of metal eyelets having head portions of angular contour adapted to seat within correspondingly shaped recesses in the lower surface of said base and shank portions adapted to penetrate each of said groups of alined openings, said shank portions having their ends upset over the respective flat members to rigidly secure said contact and terminal members to said base and to each other, said eyelets having internal threads formed therein, and a corresponding number of binding screws adapted to thread into said eyelets from the lower surface of said base.

6. In an electric snap switch, in combination, a molded insulating base having a substantially rectangular recess formed therein and opening to the upper surface thereof, said base having ledges offset downwardly from the upper surface thereof and positioned within the continuous peripheral edge of the latter, said ledges communicating with said recess at the four corners respectively of the latter, two pairs of upper and lower resilient stationary contacts having flat portions thereof respectively positioned upon said ledges, the tips of said pairs of contacts being located within said recess and biased toward each other, a movable insulating plate continuously interposed between the respective pairs of contact tips, a pair of contactors carried by said plate and movable thereby into and out of bridging engagement with said pairs of contact tips, flat metal members superimposed upon the flat portions of said stationary contacts respectively, said flat metal members, said flat portions of said contacts and said base having alined openings formed therein, wiring terminal members comprising a plurality of metal eyelets having head portions of polygonal contour adapted to seat within correspondingly shaped recesses in the lower surface of said base and shank portions adapted to penetrate each of said groups of alined openings, said shank portions having their ends upset over the respective flat metal members to rigidly secure said contact and terminal members to said base and to each other, said eyelets having internal threads formed therein, a corresponding number of binding screws adapted to thread into said eyelets from the lower surface of said base, and said insulating base having a plurality of relatively high longitudinally extending and transversely extending barriers formed integrally with the bottom surface thereof, to thereby minimize surface creepage of electric current from each of said wiring terminal members to other of the same.

7. In an electric snap switch, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, two pairs of upper and lower resilient stationary contacts, the tips of each pair of stationary contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat plate of insulating material interposed between and adapted to slidably engage the tips of the respective pairs of contacts in all positions of said plate, contactors carried by said plate and movable thereby into and out of bridging relation to said pairs of contacts, manually operable means including a coiled compression spring for effecting snap movement of said contactors from each extreme position thereof to the other, a plurality of wiring terminal elements comprising internally threaded hollow metal members the shanks of which extend upwardly from the bottom surface of said base and are upset over the respective contacts to secure the latter in position, a corresponding number of binding screws having threaded engagement with said members and being accessible from said bottom surface of the base, and an auxiliary wiring terminal element, secured to the bottom surface of said base, said last mentioned element having at least one binding screw associated therewith to provide for attachment of the neutral wire of a three-wire source of current supply.

8. In an electric snap switch, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, two pairs of upper and lower resilient stationary contacts, the tips of each pair of stationary contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat plate of insulating material interposed between and adapted to slidably engage the tips of the respective pairs of contacts in all positions of said plate, contactors carried by said plate and movable thereby into and out of bridging relation to said pairs of contacts, manually operable means including a coiled compression spring for effecting snap movement of said contactors from each extreme position thereof to the other, a plurality of wiring terminal elements comprising internally threaded hollow metal members the shanks of which extend upwardly from the bottom surface of said base and are upset over the respective contacts to secure the latter in position, a corresponding number of binding screws having threaded engagement with said members and being accessible from said bottom surface of the base, an auxiliary wiring terminal element secured to the bottom surface of said base, said last mentioned element having at least one binding screw associated therewith to provide for attachment of the neutral wire of a three-wire source of current supply, and said bottom surface of the base having a plurality of longitudinally extending and transversely extending barriers formed integrally therewith, said barriers being adapted to insulate said first mentioned terminal elements from each other and from said auxiliary terminal element.

9. In an electric snap switch, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, a one-piece metal cover member of inverted channel-shape secured to the upper surface of said base, a flat plate of insulating material interposed between said cover member and said base, said cover member having integral parallel portions thereof extending beyond one end of said base and respectively located above the plane of the upper surface of said base, a manually operable lever pivotally supported by said parallel extending portions of the cover member, a guide link of inverted channel-shape slidable between said cover member and said insulating plate and having an operative connection with said lever, said link having an abutment formed at one end thereof, a coiled compression spring having an operative connection with said abutment to provide for snap movement of the switch contacts relatively to each other, a single coiled tension spring attached at one end to said cover member and at the other end to said guide link to bias the latter and said lever to given extreme

positions, one of said parallel portions having an integral downward extension and said downward extension having a plurality of openings formed therein to provide for attachment of the switch as a unit to a suitable support.

10. In an electric snap switch of the character described, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, two pairs of upper and lower resilient stationary contacts, the tips of each pair of contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat plate of insulating material continuously interposed between the tips of the respective pairs of contacts, contactors carried by said plate and movable thereby into and out of bridging engagement with said pairs of contact tips, means for securing said contacts to said base, said means comprising a corresponding number of internally threaded tubular metal members having heads of polygonal contour adapted to seat within correspondingly shaped recesses in the bottom surface of said base, the shanks of said members being upset over the respective contacts to secure the latter to said base, a corresponding number of binding screws having threaded engagement with said members and being accessible from said bottom surface of said base, a one-piece metal top plate superimposed upon the upper surface of said base and secured thereto, a flat plate of insulating material interposed between said top plate and said base, and said top plate having in integral portion thereof extending forwardly and downwardly in a vertical plane at right angles to one end of said base, said portion having openings formed therein to provide for attachment of the switch as a unit to a suitable support.

11. In an electric snap switch of the character described, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, two pairs of upper and lower resilient stationary contacts, the tips of each pair of contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat plate of insulating material continuously interposed between the tips of the respective pairs of contacts, contactors carried by said plate and movable thereby into and out of bridging engagement with said pairs of contact tips, means for securing said contacts to said base, said means comprising a corresponding number of internally threaded tubular metal members having shouldered portions of polygonal contour adapted to seat within correspondingly shaped recesses in the bottom surface of said base, the shanks of said members having shoulders engaging the respective contacts to secure the latter to said base, a corresponding number of binding screws having threaded engagement with said members and being accessible from said bottom surface of said base, a one-piece metal top plate superimposed upon the upper surface of said base and secured thereto, said top plate having a portion of inverted channel-shape, a flat plate of insulating material interposed between said top plate and said base, a guide link of inverted channel-shape slidable between said insulating plate and said top plate and projecting beyond one end of said base above the upper surface of the latter, said guide link having a spring abutment at the inner end thereof, a coiled compression spring interposed between said abutment and a part associated with said first mentioned insulating plate whereby snap movement of the latter is effected, said top plate having an integral vertical portion thereof extending beyond the aforementioned end of said base, a lever pivotally supported by said extension, said lever having a pivotal connection with said guide link, and means comprising a single coiled tension spring associated with said top plate and said guide link to bias each of the movable parts of the switch to a given extreme position.

12. In an electric snap switch of the character described, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, two pairs of upper and lower resilient stationary contacts, the tips of each pair of contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat plate of insulating material continuously interposed between the tips of the respective pairs of contacts, contactors carried by said plate and movable thereby into and out of bridging engagement with said pairs of contact tips, means for securing said contacts to said base, said means comprising a corresponding number of internally threaded tubular metal members having shouldered portions adapted to seat against the bottom surface of said base, the shanks of said members having shoulders engaging the respective contacts to secure the latter to said base, a corresponding number of binding screws having threaded engagement with said members and being accessible from said bottom surface of said base, a one-piece metal top plate superimposed upon the upper surface of said base and secured thereto, said top plate having a portion of inverted channel-shape, a flat plate of insulating material interposed between said top plate and said base, a guide link of inverted channel-shape slidable between said insulating plate and said top plate and projecting beyond one end of said base above the upper surface of the latter, said guide link having a spring abutment formed at the inner end thereof, a coiled compression spring interposed between said abutment and a part associated with said first mentioned insulating plate whereby snap movement of the latter is effected, said top plate having integral parallel vertical portions thereof extending beyond the aforementioned end of said base, a lever pivotally supported by said extending portions, said lever having a pivotal connection with said guide link, means comprising a single coiled tension spring associated with said top plate and said guide link to bias each of the movable parts of the switch to a given extreme position, and means comprising a pin carried by said parallel vertical portions of said top plate extension, said pin being manually operable to engage said lever in a given position thereof to restrain the same and said link against movement under the bias of said tension spring.

13. In an electric snap switch of the character described, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, two pairs of upper and lower resilient stationary contacts, the tips of each pair of contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat plate of insulating material continuously interposed between the tips of the respective pairs of contacts, contactors carried by said plate and movable thereby into and out of bridging engagement with said pairs of contact tips, means for securing said contacts to said base, said means comprising a

corresponding number of internally threaded tubular metal members having shoulders adapted to seat against the bottom surface of said base, the shanks of said members having shoulders engaging the respective contacts to secure the latter to said base, a corresponding number of binding screws having threaded engagement with said members and being accessible from said bottom surface of said base, a one-piece metal top plate superimposed upon the upper surface of said base and secured thereto, said top plate having a portion of inverted channel-shape, a flat plate of insulating material interposed between said top plate and said base, a guide link of inverted channel-shape slidable between said insulating plate and said top plate and projecting beyond one end of said base above the upper surface of the latter, said guide link having a spring abutment formed at the inner end thereof, a coiled compression spring interposed between said abutment and a part associated with said first mentioned insulating plate whereby snap movement of the latter is effected, said top plate having integral parallel vertical portions thereof extending beyond the aforementioned end of said base, a lever pivotally supported by said extending portions, said lever having a pivotal connection with said guide link, means comprising a single coiled tension spring associated with said top plate and said guide link to bias each of the movable parts of the switch to a given extreme position, means comprising a pin carried by said parallel vertical portions of said top plate extension, said pin being manually operable to engage said lever in a given position thereof to restrain the same and said link against movement under the bias of said tension spring, and a coiled compression spring associated with said pin to provide for movement thereof out of latching position upon a predetermined degree of manual operation of said lever.

14. In an electric switch, in combination, a molded insulating base of substantially rectangular contour having a recess opening to the upper surface thereof, the side and end walls of said base being uninterrupted, a plurality of pairs of resilient stationary contacts, the tips of each pair of stationary contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat punched plate of insulating material interposed between and adapted to slidably engage the tips of the respective pairs of contacts in all positions of said plate, contactors carried by said plate and movable thereby into and out of bridging relation to said pairs of contacts, a flat punched plate of insulating material secured to the upper surface of said base and seated against the peripheral upper edge of the recess walls, actuating means extending above and below said last mentioned plate for effecting movement of said first mentioned plate in opposite directions respectively, and a plurality of wiring terminal members electrically connected with the respective contacts and exposed upon the lower surface of said base in positively interlocked relationship to the latter, said wiring terminal members having threaded passages to accommodate the shanks of a corresponding number of binding screws.

15. In an electric switch, in combination, a molded insulating base of substantially rectangular contour having a recess opening to the upper surface thereof, the side and end walls of said base being uninterrupted, a plurality of pairs of resilient stationary contacts, the tips of each pair of stationary contacts being biased toward each other in spaced relationship to the bottom wall of said recess, a flat punched plate of insulating material interposed between and adapted to slidably engage the tips of the respective pairs of contacts in all positions of said plate, contactors carried by said plate and movable thereby into and out of bridging relation to said pairs of contacts, a flat punched plate of insulating material secured to the upper surface of said base and seated against the peripheral upper edge of the recess walls, actuating means extending above and below said last mentioned plate for effecting movement of said first mentioned plate in opposite directions respectively, a plurality of wiring terminal members electrically connected with the respective contacts and exposed upon the lower surface of said base in positively interlocked relationship to the latter, said wiring terminal members having threaded passages to accommodate the shanks of a corresponding number of binding screws, and said lower surface of said base having a plurality of barriers formed integrally therewith and interposed between the exposed portions of said wiring terminal members to insulate the latter from each other.

16. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the upper surface thereof, relatively movable switch contacts located within said recess, a stamped sheet metal cover member secured to said base at the upper surface thereof, a flat punched plate of insulating material interposed between said cover member and said base, said cover member having integral parallel vertical portions thereof extending beyond one end of said base and respectively located above the plane of the upper surface of said base, one of said parallel vertical portions having a perforated downward extension to provide for attachment of the switch to a suitable support, a manually operable lever pivotally supported by said parallel vertical portions of said extension, a guide link of inverted channel-shape slidable between said cover member and said insulating plate and having an operative connection with said lever, a coiled compression spring having an operative connection with said guide link to provide for snap movement of the switch contacts relatively to each other, and a single coiled tension spring attached at one end to said cover member and at the other end to said guide link to bias the latter and said lever to given extreme positions respectively.

17. In combination, a stamped sheet metal cover member for electric snap switches of the tool-handle type, said cover member having parallel vertical portions extending from one end thereof, one of said parallel vertical portions having a perforated downward extension to provide for attachment thereof to a suitable support, a manually operable lever pivotally supported by said parallel vertical portions of said extension, a sheet metal link slidably engageable with said cover member and with said parallel vertical portions to be guided thereby, said link having an operative connection with said lever, lugs carried respectively by said cover member and said link, a coiled tension spring positioned between said parallel vertical portions and having its ends attached to said lugs respectively, and a cross connecting portion rigidly attached to said parallel vertical portions to assist in spacing and strengthening the latter, said cross con-

necting portion being so arranged as to insure clearance for said spring under all conditions.

18. In combination, a one-piece sheet metal top plate for electric snap switches of the tool-handle type, said top plate having a portion of inverted channel-shape, a sheet metal link of inverted channel-shape slidable within the channel portion of said top plate and projecting beyond one end of the latter, said top plate having parallel vertical portions extending from the aforementioned end thereof to assist in guiding said link, a manually operable lever pivotally supported by said parallel vertical portions, said lever having a pivotal connection with said projecting portion of the link, means comprising a single coiled tension spring respectively attached to said top plate and to said link to bias the latter and said lever for movement thereof in a given direction, said link having an abutment formed at the inner end thereof for cooperation with a switch actuating spring, means comprising a bolt carried by said parallel vertical portions, said bolt being manually operable to engage said lever in a given position thereof to latch the same and said link against movement under the bias of said tension spring, and a coiled spring associated under compression with said bolt to provide for movement of the latter out of latching position upon a predetermined degree of manual operation of said lever.

19. In a switch actuating device, in combination, a metal top plate of substantially channel-shape, said plate having a pair of spaced parallel arms projecting from one end thereof, a trigger lever of approximately saddle-shape adapted to straddle said arms and pivoted to the latter, a pivot pin carried by said trigger lever at the lower end of the latter and bodily movable thereby, said pivot pin being engageable with said arms to limit movement of said trigger lever in one direction, a punched and stamped sheet metal guide link positioned within the channel of said top plate and between the arms of the latter for movement with respect thereto, one end of said guide link being attached to said pivot pin and the other end thereof having an abutment for cooperation with a switch actuating spring, a coiled spring interposed between said top plate and said guide link to bias the latter and said trigger lever for movement thereof in said one direction, and one of said arms being formed to facilitate attachment of the device to a suitable support.

20. In a switch actuating device, in combination, a stamped sheet metal top plate of substantially channel-shape, said plate having a pair of arms of approximately triangular contour formed integrally therewith and projecting laterally and upwardly in parallel planes from one end thereof, a stamped sheet metal trigger lever of approximately saddle-shape adapted to straddle said arms and pivotally supported by the latter adjacent to the upper ends thereof, a movable sheet metal link positioned within the channel of said top plate and between the arms of the latter to be guided thereby, a pivot pin penetrating the lower end of said trigger lever and said link to provide for movement of said link by said lever, that portion of the link positioned within the channel of said plate carrying an abutment for cooperation with one end portion of a coiled compression spring, said top plate and one of said pair of arms being respectively provided with openings which are alternatively adapted for use to facilitate attachment of the device to a suitable support, said link having a lug extending upwardly from the end thereof adjacent to said pivot pin, said top plate having a lug formed integrally therewith between said arms at the inner ends of the latter, a coiled tension spring having hooked ends respectively attached to said lugs whereby said link and said lever are biased in one direction toward a given extreme position, means for latching said trigger lever against movement toward said extreme position, said means comprising a bolt extending transversely of and carried by said pair of arms, said bolt being arranged to normally provide clearance between the same and said trigger lever, said bolt being manually movable endwise in a given position of said trigger lever, other than the aforementioned extreme position of the latter, for cooperative engagement with said trigger lever, spring means associated with said bolt to bias the same toward its normal position, and a flange on said bolt engageable with said trigger lever under the conditions last mentioned to restrain said bolt against its bias.

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