

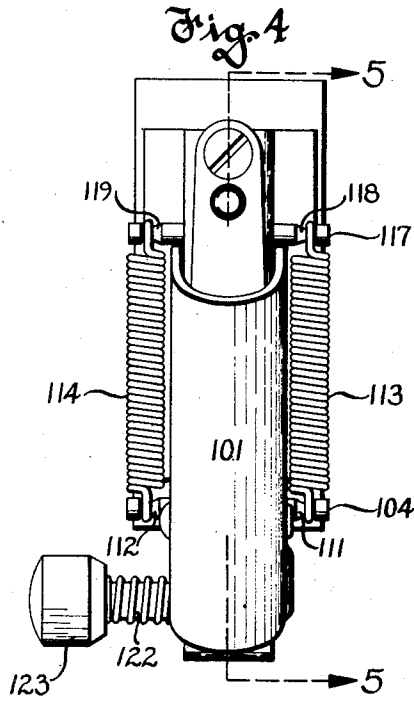
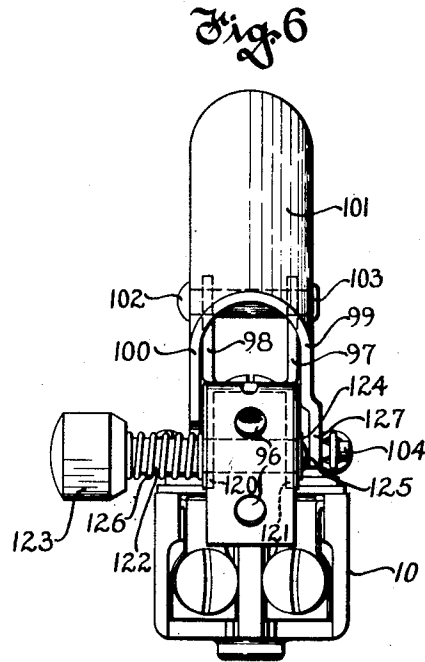
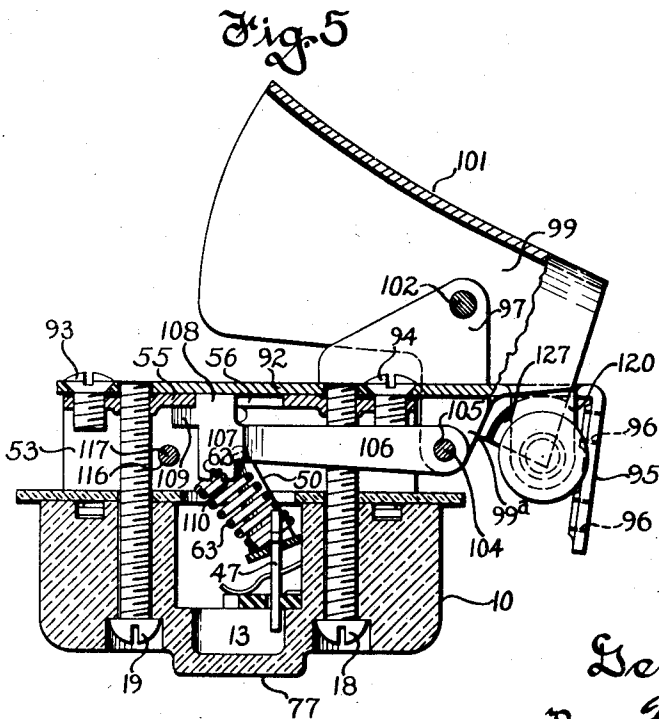
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ELECTRIC SWITCH

Original Filed Sept. 8, 1931 2 Sheets-Sheet 2



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ELECTRIC SWITCH

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

5 An object of the invention is to provide an improved snap switch mechanism of sturdy and compact construction.

Another object is to provide a snap switch mechanism the parts of which are readily
10 formed and quickly and easily assembled.

Another object is to provide improved means to minimize arcing between the stationary and movable contact elements of the switch.

15 Another object is to provide a snap switch having stationary and movable contact elements of improved form.

Another object is to provide improved means for effecting snap action of the movable contact elements of the switch.

Another and more specific object is to provide an improved form and arrangement of the wiring terminal elements of the switch.

Another object is to provide a switch having a novel form of actuating lever together with improved mounting means for the latter.

Other objects and advantages of the invention will hereinafter appear.

30 The accompanying drawings illustrate certain embodiments of the invention which will now be described, it being understood that the invention is susceptible of embodiment in other forms without departing from the scope of the appended claims.

In the drawings, Figure 1 is a perspective view, in separated relation, of the parts of a tool-handle snap switch constructed in accordance with my invention.

40 Fig. 2 is a vertical sectional view, along the dotted line 2-2 of Fig. 1, showing the switch parts in assembled relation.

Fig. 3 is a vertical longitudinal section of a switch similar to that shown in Figs. 1 and 2,—but with a modified form of metal cover plate and actuating lever.

50 Figs. 4, 5 and 6 are top plan, vertical sectional and end views, respectively, of another modified form of the switch illustrated in Figs. 1 and 2, and

Fig. 7 is a perspective view of a modified arrangement of the stationary contacts and the movable contactors to provide a switch of the three-point or multiple-circuit controlling type.

Referring to the drawings, wherein like parts are designated by like characters of reference,—and more particularly to Figs. 1 and 2; the numeral 10 designates a molded base of suitable insulating material, such, for example, as the phenolformaldehyde condensation product sold under the trade name of "bakelite." Base 10 is provided with a relatively deep substantially rectangular recess 11 opening to the upper surface thereof. The bottom wall of recess 11 is provided with a longitudinally extending rib or projection, the flat face 12 of which is located in a plane above said bottom wall. Opening to said face 12 is a supplemental recess 13 for a purpose to be described.

The end walls of recess 11 are likewise provided with internal vertically extending ribs or projections of semi-cylindrical form in cross section, as indicated at 14 and 15; base 10 being provided adjacent to said ribs with through passages or openings 16 and 17 to provide clearance for the shanks of a pair of securing screws 18 and 19,—openings 16 and 17 being countersunk or enlarged at the lower ends 16^a, 17^a thereof to accommodate the heads of said screws.

The upper surface of base 10 is provided at the four corners thereof with depressions or grooves 20, 21, 22 and 23, each of which is adapted to accommodate the upper horizontal portion of the respective resilient stationary contact elements 24, 25, 26 and 27. Overlying the horizontal portions of said contacts are the horizontal portions of terminal members 28, 29, 30 and 31; the base 10, the contact elements and said terminal members being provided with alined openings to accommodate the headed eyelets or rivets 32, 33, 34 and 35, the upper ends of which may be upset over said terminal members to secure said parts in assembled relation. Base 10 is recessed to a considerable distance from the lower surface thereof in alinement with grooves 20 to 23, as indicated at 21^a, 22^a and

23^a in Figs. 1 and 2 to permit the use of relatively short eyelets 32, 33, etc., and said recesses 21^a, 22^a, etc. open to the end walls of base 10 to provide clearance for the shanks of binding screws 36 carried by the vertically depending portions of the terminal members 28, 29, etc. The outer surfaces of the end walls of base 10 are formed as shown to provide ribs or barriers 37, 38 between the aforementioned depending portions of the terminal members.

As will be noted, all of the terminal members 28 to 31 are of identical form. The contact elements 24 and 25 are likewise of identical form,—the free end portions thereof extending into recess 11 on opposite sides of the aforementioned rib on the bottom wall of the latter, and being normally biased to a plane below the surface 12 of said rib. The contact elements 26 and 27 are of like form,—the same being bent to extend downwardly below the plane of surface 12 and the free ends thereof being normally biased toward a plane above said surface 12.

As best illustrated in Fig. 1, the grooves 20, 21 and 22, 23 are arranged to provide for extension of the free ends of contact elements 24, 25 and 26, 27 into recess 11 at slightly divergent angles with respect to the terminal members associated therewith. Interposed between the free and overlapping ends of the longitudinally alined pairs of contacts 24, 27 and 25, 26 is a thin flat plate 39 of fiber or other suitable insulating material. Said plate is preferably punched to substantially rectangular contour as shown, the same being provided with a substantially centrally located opening 40, preferably of rectangular shape; and the same is provided on opposite side edges thereof, and to one side of a line crossing said central opening, with a pair of relatively narrow notches or openings 41 and 42. A pair of substantially U-shaped contactors 43 and 44 formed of strip metal are provided; the bent portions of said contactors being insertable within said notches and the arm portions thereof being then pressed tightly against opposite sides of the plate whereby the contactors are retained in assembled position.

As indicated in Fig. 2 the free ends of the stationary contacts are biased toward plate 39 in all positions of the latter, so that in one extreme position of said plate (Fig. 2) electrical connection between the contacts of each pair 24, 27 and 25, 26 is interrupted, and in the opposite extreme position of said plate the contactors 43 and 44 are interposed between the respective pairs of contacts 24, 27 and 25, 26 to electrically connect the same. Plate 39 is preferably notched on opposite sides thereof, as indicated at 45 and 46 to accommodate the curved surfaces 14, 15 of the ribs on the opposite end walls of recess 11,—said end walls acting to limit movement

of said plate 39 in opposite directions respectively, and the side walls of recess 11 acting to guide plate 39 in its movements,—it being noted that the corners of plate 39 are preferably rounded as shown to insure against binding or fouling thereof within the recess.

A flat punched sheet metal pin or flipper 47 is provided, said pin having arms or lateral projections 48 adjacent to the upper end thereof, whereby the relatively long lower end portion thereof may be inserted through an opening 49 in the flat connecting portion of a substantially U-shaped member 50 and through the opening 40 in plate 39. As shown the pin 47 has a predetermined degree of lateral lost motion with respect to the walls of openings 49 and 40 whereby the same may assume a substantially vertical position in each extreme position of plate 39 (see Figs. 2 and 3). It will be understood, however, that the size of either or both of the openings 49 and 40 may be decreased or increased in size to vary the degree of lost motion of said pin with respect thereto.

The upper ends of the arms of member 50 are bent outwardly at substantially right angles thereto. As shown in Figs. 1 and 2 said arms are bendable to provide for forcible insertion of the ends thereof into the lower set of alined bearing openings 51 and 52 formed in the parallel sides of a metal cover plate 53 of inverted channel shape. Vertically alined with the respective openings 51 and 52 is a second pair of alined bearing openings, one of which is shown at 54 in Fig. 1. The flat top portion 55 of plate 53 is provided with a relatively narrow rectangular slot or opening 56 into which a flat punched sheet metal actuating lever 57 is insertable. Lever 57 is provided with an opening 58 of relatively smaller size than said second pair of bearing openings (see 54), and a pivot pin 59 is insertable through said bearing openings and the opening 58, said pin being slightly upset or otherwise enlarged intermediate its ends, as indicated at 60, to provide for a drive fit thereof within opening 58 whereby said parts are held in assembled relation to the top plate and whereby the fit of lever 57 within slot 56 prevents substantial endwise displacement of pin 59 in the bearing openings.

The lower end of lever 57 is notched at 61 to engage the diametrically disposed end portion 62 of a coiled compression spring 63, the lower end of said spring being engaged with the abutment formed at the upper end of pin 47 by the projections 48 on the latter. The upper end of lever 57 is provided with a suitable enlargement which may comprise a metal ball 64 having a recess therein to provide for a drive fit thereof onto said lever.

Plate 53 is provided with flat portions 65 and 66 to overlie the upper edges of the longitudinal walls of base 10,—a flat punched

plate 67 of insulating material, such as fiber, being preferably interposed between top plate 53 and the upper surface of base 10. Plate 67 is provided with a somewhat elliptical opening 68 to provide clearance for member 50,—the latter, as indicated in Figs. 2 and 3, being limited in its opposite movements by engagement thereof with the surfaces 14 and 15 of the end wall ribs aforementioned. Plate 67 is also provided with clearance openings 69 and 70 for the shanks of screws 18 and 19 which take into tapped openings 71 and 72 in the flat portion 55 of top plate 53. Tapped openings 73 and 74 are likewise provided for cooperation with suitable screws (not shown) whereby the device as a whole may be attached to the hollow handle of a tool or to any other suitable support.

The operation of my improved switch mechanism will be apparent from the foregoing description and the drawings. Thus in Fig. 2 assuming movement of lever 57 toward the left, the spring 63 will be further compressed until the upper end thereof is carried to the right beyond the pivotal center of member 50 whereupon the latter is moved with a snap action to its left-hand extreme position. Pin 47 provides a slightly articulated driving connection between member 50 and plate 39 whereby the aforescribed snap movement is transmitted to the latter, and consequently to the contactors 43 and 44 carried thereby. A corresponding snap movement of the parts in the reverse direction is effected upon oscillation of lever 57 toward the right. As shown in Fig. 1 the grooves 20, 21 and 22, 23 are preferably provided with connecting grooves 75, 76, respectively, whereby either set of stationary contacts 24, 25 or 26, 27 may be electrically connected by a suitable bus member (not shown) to provide a single-pole, four-break switch. It is to be understood that in the single-pole form of the switch the terminal members at one end of the base, and their associated binding screws, are preferably omitted.

The bottom surface of base 10 is provided with a boss or projection 77 to accommodate the auxiliary recess 13 without interruption of the continuity of said bottom wall. Also it will be noted that the openings, grooves and recesses are so arranged in base 10 as to provide for formation of the latter by a straight-line molding operation. Similarly, the base 10 is initially molded without metallic inserts of any kind. These features are of considerable importance from the viewpoint of economy in this art.

The switch illustrated in Fig. 3 is substantially like that shown in Figs. 1 and 2 and corresponding parts have been given like characters of reference. In this form of switch, however, the top plate 78 is made substantially flat, and of a width substantially

equal to the width of base 10,—plate 78 also being relatively shorter than the top plate 53 of Figs. 1 and 2. Plate 78 is provided with an intermediate raised portion 79 having a substantially circular opening 80 to receive the reduced lower end of an externally threaded hollow metal bushing 81,—said reduced lower end being upset over the lower face of raised portion 79 as indicated at 82 to secure said parts to each other. Diametrically opposed portions 82^a of said lower end of the bushing are preferably angled slightly as shown to provide a sort of cam surface to minimize friction of the spring coils thereagainst upon each operation of the switch mechanism. In practice the lower end portion of bushing 81 is notched or cut away at two diametrically opposite points (one of the notches being shown at 83), and plate 78 is provided with a pair of correspondingly located lugs (one of which is shown at 84), which lugs project into the area of opening 80 to provide bearings for the outwardly bent ends of the arms of member 50. The opening through bushing 81 is of different diameters at the upper and lower ends thereof as indicated at 85 and 86,—and alined openings are drilled through the upper end portion of said bushing to provide bearings for the pivot pin 59, the intermediate portion of said pin being enlarged, as shown at 60 in Fig. 1, to provide for a drive fit thereof within the relatively smaller opening 87 provided in the one-piece machined lever 88,—the lower end of said lever being provided with a kerf or notch 89 to engage the diametrically extending end 62 of spring 63. The screws 90 and 91 (which are relatively shorter than the screws 18, 19 of Figs. 1 and 2) take into tapped openings provided in plate 78.

The switch shown in Figs. 4, 5 and 6 is essentially like that shown in Figs. 1 and 2, but with certain additions and modifications to provide a trigger operated switch which is normally biased to open position, and which may be latched at will in closed position. Thus, I attach to the upper flat portion 55 of top plate 53 a plate 92, as by means of screws 93 and 94, said plate having a downwardly and inwardly angled end portion 95 which is provided with a pair of tapped openings 96 whereby the switch may be attached to a suitable support by a pair of screws (not shown). Plate 92 is provided with a pair of parallel upwardly extending arms 97, 98 which fit loosely within the parallel arms 99, 100 of a trigger member or lever 101 of substantially U-shape in cross section. Said pairs of arms are provided with alined openings within which the pin 102 is inserted,—the end 103 of the latter being upset to permanently secure said parts in assembled relation.

Arms 99 and 100 are provided with downward extensions or lugs (see 99^a, Fig. 5)

which are provided with openings to loosely receive a pivot pin 104, the intermediate portion of which also pivotally engages the opening 105 in one end of a lever 106. Lever 106 is reciprocable in a plane to one side of screw 18, the inner end portion 107 being offset to lie in the plane of the slot 56 in top plate 53, and the lug 108 formed on said end portion being slidable within said slot, whereby the walls of the latter guide and limit the movements of the former. The lug 109 formed on end portion 107 is bent to underlie the lower surface of flat portion 55 at one side of slot 56 whereby proper positioning of lever 106 is insured during assembly of the parts, and in the event of slight loosening of screws 93 or 94. End portion 107 is provided with a notch 110 to engage portion 62 of spring 63, as aforescribed.

As best shown in Fig. 4 pin 104 extends a considerable distance on each side of member 101, the end portions of said pin having portions 111, 112 of reduced diameter to receive and retain the looped ends of the respective tension springs 113, 114. The parallel sides of member 53 are provided with a pair of aligned openings 115, 116 within which a second pin 117 is adapted to fit, said pin having similar reduced portions 118, 119 to receive and retain the opposite looped ends of springs 113, 114.

As will be apparent, the springs 113, 114 normally bias the switch mechanism to the off position thereof as shown in Figs. 4, 5 and 6. However, I prefer to employ means operable manually at will for latching the switch in on position. Said means as shown comprises a downwardly extending pair of lugs 120, 121 formed on plate 92, said lugs being provided with openings to slidably receive shank 122 of a button 123,—the forward end of said shank being reduced to receive a relatively thin washer 124, and said end being upset as shown at 125 to retain the washer in position. A compression spring 126 is interposed between the head of button 123 and the lug 120, so that washer 124 is normally held in the position shown in Fig. 6,—arm 99 of member 101 having a lug or extension 127 normally adapted to traverse the center line of shank 122, but being offset outwardly to clear the washer 124. Thus when member 101 is operated to effect closure of the switch the button 123 may be pressed inwardly and thereafter a slight return movement of member 101 causes engagement of the lug 127 with shank 122 to prevent opening of the switch, and washer 124 engages lug 127 to prevent retraction of button 123 by spring 126. However, if member 101 is thereafter depressed or moved to the extreme position thereof corresponding to on position of the switch lug 127 releases washer 124 and button 123 is moved automatically to the normal position thereof shown in Figs. 4 and 6.

In the modified arrangement of stationary and movable switch parts illustrated in Fig. 7 I provide a switch of the three-point or multiple-circuit controlling type by employment of certain of the identical parts illustrated in the other figures, and by substitution of certain other elements of slightly different form. Thus stationary contact elements 24, 25, 26 and 27 are the same as those aforescribed, but the elements 25 and 26 are reversed in position with respect to the other forms of the switch illustrated. Likewise the terminal members 29 and 31 are identical with the corresponding parts aforescribed, but a one-piece combined bus and terminal member 28^a is substituted for the terminal members 28 and 30. Moreover, the punched plate 39^a of insulating material is provided with a centrally located opening 40 and a notch 41 as in the previous figures, but the notch 42^a is arranged on the opposite edge of plate 39^a is arranged on the opposite side of the center line of the latter. Contactor 43 is positioned on and attached to plate 39^a in the manner aforescribed whereas contactor 44 is merely reversed in position.

Thus, in one extreme position of plate 39^a contactor 43 will bridge contact elements 24 and 27 to complete a given circuit, and in the other extreme position of plate 39^a contactor 44 will bridge contact elements 25 and 26 to complete an alternative circuit. The three binding screws required for connection of the circuit wires have been omitted for clarity of illustration of the other parts. It is to be understood that the insulating base member employed may be the same as that illustrated a 10 in the other figures, and any of the several arrangements of the actuating elements and mounting means aforescribed may be employed.

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, a rib formed integrally with the bottom wall of said recess and having a flat surface located above said bottom wall, lower and upper resilient stationary contacts located within said recess and respectively biased above and below the plane of said flat surface, and a relatively thin flat insulating member slidable upon said flat surface and interposed between said stationary contacts in all positions of the former, said insulating member having a conducting element movable therewith into and out of bridging relation to said contacts.

2. In an electric snap switch, in combination, a molded insulating base having a recess, a rib formed integrally with the bottom wall of said recess and having a flat surface located above said bottom wall, lower and upper resilient stationary contacts located within said recess and respectively biased

above and below the plane of said flat surface, a relatively thin flat insulating member slidable upon said flat surface and interposed between said stationary contacts in all positions of the former, said insulating member having a conducting element movable therewith into and out of bridging relation to said contacts, actuating means for said insulating member comprising a U-shaped member pivotally supported with respect to said base, a flipper element carried by and extending downwardly from said U-shaped member and having an end portion in driving engagement with said insulating member, a spring abutment at the other end of said flipper element, an oscillatable actuating lever, and a coiled compression spring interposed between said lever and said abutment.

3. In a snap switch of the toggle type, in combination, an oscillatable actuating lever, an oscillatable member of substantially U-shape, a pin loosely carried by said U-shaped member and having oscillatory movement with respect thereto, a flat plate of insulating material having an opening with the walls of which the lower end of said pin is adapted to engage, an abutment formed at the upper end of said pin, a coiled compression spring interposed between said actuating lever and said abutment, a plurality of pairs of stationary resilient contacts normally biased into engagement with opposite sides of said plate and between which said plate is adapted to slide, and a plurality of contactors carried by said plate and movable thereby into and out of bridging engagement with said pairs of stationary contacts.

4. In an electric switch, in combination, a plurality of pairs of stationary resilient contacts, a relatively thin flat plate of insulating material interposed between the contacts of each pair respectively and slidable with respect thereto, said plate having notches formed in opposite edges thereof, a pair of U-shaped contactors having the bends thereof located within said notches and having the arm portions thereof located on opposite sides of said plate for movement by the latter into and out of bridging engagement with said stationary contacts, and means for effecting movements of said plate to opposite extreme positions with a snap action, said means comprising a pin having a lost motion driving connection with said plate, a pivoted substantially U-shaped member having a lost motion driving connection with said pin, an abutment formed on said pin, a coiled compression spring having one end thereof in engagement with said abutment, and means for carrying the other end of said spring across the pivotal center of said U-shaped member to effect snap movement of the latter and of said plate.

5. In an electric snap switch, in combination, a molded insulating base having a sub-

stantially rectangular recess formed in the upper surface thereof, a rib formed in said recess and projecting from the bottom and end walls of the latter, contact and terminal members secured to the four corners of said base, said base having external grooves in the end walls thereof to accommodate the wiring terminal portions of said members, the contact portions of said members being resilient and the ends of each longitudinally aligned pair being located within said recess in overlapping relation to each other, a relatively thin flat plate located between said contact portions and adapted to tension the latter, said plate being slidable upon the bottom wall portion of said rib, said plate having bridging contactors secured thereto and exposed on opposite sides thereof, and means for insuring snap movements of said plate to opposite extreme positions respectively.

6. The combination with a molded insulating base, said base having a relatively deep substantially rectangular recess formed therein and opening to the upper surface thereof, of aligned ribs formed interiorly and exteriorly upon the end walls of said base and upon the top surface of said base and the bottom surface of said recess to provide substantially separate compartments, pairs of resilient contact elements located within the respective compartments and having end portions arranged in overlapping relation to each other within said recess, terminal elements having wiring terminal portions located on opposite sides of the exterior ribs of the end walls, said terminal elements also having portions located on opposite sides of the ribs upon the upper surface of said base, said last mentioned portions being adapted to overlie the other end portions of said contact elements, and a plurality of metal eyelets penetrating corresponding openings in said base, contact and terminal elements and upset thereover to rigidly and permanently secure the parts in assembled relation.

7. In combination, a slidable contactor assembly for electric snap switches, said assembly comprising a relatively thin flat plate of insulating material, said plate having a substantially centrally located opening formed therein to loosely receive an actuating element of suitable form, said plate also having a pair of aligned notches formed in opposite edges thereof and to one side of said central opening, a pair of strip metal contactors bent to substantially U-shape, said contactors having the bent portions thereof located within said notches and the arm portions thereof located on opposite faces of said plate, said arm portions being pressed tightly against said faces of the plate whereby said parts are retained in assembled position, and a molded insulating base having a recess, the side and end walls of said recess being respectively adapted to guide and limit

movements of said plate, the bottom wall of said recess having a rib extending longitudinally thereof against which said plate is adapted to bear.

8. An electric snap switch comprising a molded insulating base having a substantially rectangular recess formed in the upper surface thereof, a rib extending longitudinally of the bottom wall of said recess, said rib having a flat upper surface, a thin flat plate of insulating material of substantially rectangular contour located within said recess and slidable upon the upper surface of said rib, said plate having its movements guided and limited, respectively, by the side and end walls of said recess, a pair of contactors of substantially U-shape in cross section, the arm portions of each contactor being bent into clamping engagement with opposite faces of said plate, and two pairs of stationary contacts having the resilient tips thereof respectively biased into engagement with opposite faces of said plate, whereby upon movement of said plate to opposite extreme positions said contactors are moved accordingly into or out of bridging relation to said pairs of contacts.

9. An electric snap switch comprising a molded insulating base having a substantially rectangular recess formed in the upper surface thereof, a rib extending longitudinally of the bottom wall of said recess, said rib having a flat upper surface, a thin flat plate of insulating material of substantially rectangular contour located within said recess and slidable upon the upper surface of said rib, said plate having its movements guided and limited, respectively, by the side and end walls of said recess, a pair of contactors of substantially U-shape in cross section, the arm portions of each contactor being bent into clamping engagement with opposite faces of said plate, two pairs of stationary contacts having the resilient tips thereof respectively biased into engagement with opposite faces of said plate, whereby upon movement of said plate to opposite extreme positions said contactors are moved accordingly into or out of bridging relation to said pairs of contacts, said plate having an opening formed therein, a flat punched sheet metal pin having driving engagement with the walls of said opening, a pivoted substantially U-shaped sheet metal member having a lost motion driving connection with said pin, an oscillatable actuating lever, and a coiled compression spring interposed between said lever and said U-shaped member to effect snap movements of the latter to opposite extreme positions respectively upon opposite movements of the former.

10. In an electric switch, in combination, an insulating base adapted to be formed by a straight-line molding operation, said base having a relatively deep substantially rec-

tangular recess formed in the upper surface thereof, a groove formed in the upper surface of the base at one corner of the latter, said base having a recess extending upwardly from the bottom surface thereof beneath said groove, said last mentioned recess opening to the end wall of said base, a resilient stationary contact having one end portion located within said groove and another end portion located within said first-mentioned recess, a terminal member having portions thereof bent at substantially right angles to each other, one of said portions being located within said groove in superimposed relation to said contact, a binding screw carried by the other of said portions and having its shank accommodated by said last mentioned recess, and a rivet penetrating aligned openings in said base, said contact and said terminal member and upset over the latter to secure the parts in assembled relation to each other.

11. In an electric snap switch, in combination, a molded insulating base having a recess, stationary contact elements located within said recess, an insulating plate slidably mounted within said recess, contactors carried by said plate and movable thereby into and out of bridging relation to said stationary contacts, actuating means for said plate comprising a pin having shoulders formed thereon intermediate the length thereof, a substantially U-shaped member adapted to carry said pin in a relation to provide for lost motion of the latter with respect thereto, a metal top plate with which said U-shaped member is directly engaged for pivotal support thereby, a lever, a coiled compression spring interposed between said lever and said U-shaped member, said lever having an opening formed therein, a pivot pin having an intermediate enlargement adapted for a drive fit within said opening, means associated with said top plate to provide bearing supports for the opposite ends of said pivot pin, and means also associated with said top plate to prevent movement of said lever laterally with respect to the plane of oscillation thereof to thereby insure against substantial endwise movement of said pivot pin.

12. In an electric snap switch, in combination, a punched and stamped sheet metal top plate of substantially inverted channel-shape, a pair of vertically aligned bearing openings formed in opposite sides of said channel-shaped plate, a substantially U-shaped sheet metal member having angularly bent end portions adapted to bear within the lower openings of the respective pairs, said plate having a substantially rectangular slot formed in the upper portion thereof, a flat punched sheet metal actuating lever insertable within said slot and restrained by the latter against movement laterally of said

plate, said lever having a relatively smaller opening to be alined with the upper set of bearing openings in said plate, and a pivot pin insertable endwise through said bearing openings and said lever opening, said pin having an intermediate enlargement to provide for a drive fit thereof within said lever opening, whereby said pin is restrained against endwise displacement in the assembled relation of said parts.

13. In an electric snap switch, in combination, a punched and stamped sheet metal top plate of substantially inverted channel-shape, said top plate having a pair of alined bearing openings formed in the opposite parallel sides thereof, a substantially U-shaped sheet metal member having angularly extending end portions adapted to bear within said openings, said plate having a relatively narrow rectangular slot formed in the upper portion thereof, a punched sheet metal actuating lever of substantially T-shape, one arm of the T being formed to provide a spring abutment, the other arm of the T being slidable within said slot and limited in its movements by the end walls of the latter, a second plate attached to said top plate and adapted to provide a bearing surface for said last mentioned arm of the T, said second plate having lugs formed integrally therewith and bent upwardly therefrom in parallel relation to each other, a trigger lever pivotally supported by said lugs, said trigger lever having spaced parallel lugs depending therefrom, a pin providing a pivotal connection between said last mentioned lugs and said T-shaped lever, and spring means for biasing said trigger lever to a given extreme position while permitting movement thereof to its opposite extreme position against the action of said bias.

14. In an electric snap switch, in combination, a punched and stamped sheet metal top plate of substantially inverted channel-shape, said top plate having a pair of alined bearing openings formed in the opposite parallel sides thereof, a substantially U-shaped sheet metal member having angularly extending end portions adapted to bear within said openings, said plate having a relatively narrow rectangular slot formed in the upper portion thereof, a punched sheet metal actuating lever of substantially T-shape, one arm of the T having a notch to provide a spring abutment, the other arm of the T being slidable within said slot and limited in its movements by the end walls of the latter, a second plate attached to said top plate and adapted to provide a bearing surface for said last mentioned arm of the T, said second plate having lugs formed integrally therewith and bent upwardly therefrom in parallel relation to each other, a trigger lever pivotally supported by said lugs, said trigger lever having spaced parallel lugs depending therefrom, a pin providing a pivotal connection between said

last mentioned lugs and said T-shaped lever, spring means for biasing said trigger lever to a given extreme position while permitting movement thereof to its opposite extreme position against the action of said bias, said spring means comprising a pair of coiled tension springs each having one end thereof connected to said pivot pin, and a second pin loosely carried by said top plate and to which the opposite ends of said springs are respectively attached.

15. In an electric snap switch, in combination, a punched and stamped sheet metal top plate of substantially inverted channel-shape, said top plate having a pair of alined bearing openings formed in the opposite parallel sides thereof, a substantially U-shaped sheet metal member having angularly extending end portions adapted to bear within said openings, said plate having a relatively narrow rectangular slot formed in the upper portion thereof, a flat punched sheet metal actuating lever of substantially T-shape, one arm of the T having a notch to provide a spring abutment, the other arm of the T being slidable within said slot and limited in its movements by the end walls of the latter, a second plate attached to said top plate and adapted to provide a bearing surface for said last mentioned arm of the T, said second plate having lugs formed integrally therewith and bent upwardly therefrom in parallel relation to each other, a trigger lever pivotally supported by said lugs, said trigger lever having spaced parallel lugs depending therefrom, a pin providing a pivotal connection between said last mentioned lugs and said T-shaped lever, spring means for biasing said trigger lever to a given extreme position while permitting movement thereof to its opposite extreme position against the action of said bias, said second plate also having an end portion bent downwardly at an angle to the main body thereof, and said end portion having a plurality of tapped openings for cooperation with the shanks of suitable securing screws.

16. In a snap switch of the tool-handle type, in combination, a molded insulating base, a punched and stamped sheet metal top plate therefor, stationary and movable switch parts carried by said base and said plate and substantially enclosed thereby, the stationary switch parts having terminal portions exposed adjacent to the lower surface of said base at opposite ends of the latter, and wiring terminal crews carried by said terminal portions, said ends of the base being recessed to accommodate the shanks of said terminal screws.

17. In an electric snap switch of the tool-handle type, in combination, snap switch mechanism including a reciprocable actuating element, a pivoted operating element having a driving connection with said actuating element, spring means for biasing said oper-

ating element to a given extreme position, manually operable means for latching said operating element in its opposite extreme position against the action of said biasing means, said operating means being operable independently of said latch to permit return of the former to its biased position, a plurality of pairs of resilient stationary contacts, the contacts of each pair being arranged in overlapping relation to each other, a relatively thin flat plate of insulating material interposed between said pairs of contacts, bridging contactors carried by said plate and movable thereby into and out of bridging engagement with said pairs of contacts, and means including a spring interposed between said actuating element and said plate to effect snap movements of the latter to opposite extreme positions respectively upon opposite movements of the former.

18. In combination, a movable contactor assembly for electric snap switches, said assembly comprising a relatively thin flat plate of insulating material, said plate having an opening formed therein to provide a lost motion connection between the same and a driving element of suitable form, a U-shaped contactor formed of strip metal, said contactor penetrating said plate and having the arm portions pressed tightly against the opposite faces of said plate whereby said parts are retained in assembled relation, and a molded insulating base having a recess, the side and end walls of said recess being respectively adapted to guide and limit movements of said plate, the bottom wall of said recess having a flat rib extending longitudinally thereof against which said plate is adapted to bear.

19. In an electric snap switch, in combination, a punched and stamped sheet metal top plate of substantially inverted channel-shape, said top plate having a pair of aligned bearing openings formed in the parallel sides thereof, a substantially U-shaped sheet metal member having angularly extending end portions adapted to bear within said openings, a punched sheet metal actuating lever, said lever having one end thereof formed to provide a spring abutment, a second plate attached to said top plate, said second plate having lugs formed integrally therewith and bent upwardly therefrom in parallel relation to each other, a trigger lever pivotally supported by said lugs, said trigger lever having spaced parallel lugs depending therefrom, a pin providing a pivotal connection between said last mentioned lugs and said actuating lever, spring means for biasing said trigger lever to a given extreme position while permitting movement thereof to its opposite extreme position against the action of said bias, and a coiled compression spring interposed between said actuating lever and said U-shaped member to effect snap movements of the latter to opposite extreme positions re-

spectively upon opposite movements of the former.

20. In an electric switch, in combination, an insulating base adapted to be formed by a straight-line molding operation, said base having a relatively deep recess formed in the upper surface thereof, a groove formed in the upper surface of the base at one corner of the latter, said base having a recess extending upwardly from the bottom surface thereof beneath said groove, said last-mentioned recess opening to the end wall of said base, a stationary contact having one end portion located within said groove and another end portion located within said first-mentioned recess, a terminal member having portions thereof bent at substantially right angles to each other, one of said portions being located within said groove in superimposed relation to said contact, a binding screw carried by the other of said portions and having its shank accommodated by said last-mentioned recess, and common means for securing said contact and terminal member in assembled relationship to each other and to said base.

21. In an electric snap switch, in combination, a molded insulating base having a recess, a rib formed integrally with the bottom wall of said recess and having a flat surface located above said bottom wall, lower and upper resilient stationary contacts located within said recess and biased toward each other, and a relatively thin flat insulating member slidable upon said flat surface and interposed between said stationary contacts in all positions of the former, said insulating member having a conducting element movable therewith into and out of bridging relation to said contacts.

22. In an electric snap switch, in combination, a molded insulating base having a substantially rectangular recess formed in the upper surface thereof, a rib formed in said recess and projecting from the bottom and end walls of the latter, contact and terminal members secured to the four corners of said base, the contact portions of said members being resilient and the ends of each longitudinally aligned pair being located within said recess in overlapping relation to each other, a relatively thin flat plate located between said contact portions and adapted to tension the latter, said plate being slidable upon the bottom wall portion of said rib, said plate having bridging contactors secured thereto and exposed on opposite sides thereof, and means for insuring snap movements of said plate to opposite extreme positions respectively.

23. The combination with a molded insulating base, said base having a substantially rectangular recess formed therein and opening to the upper surface thereof, of aligned ribs formed upon the end and bottom walls

of said recess and upon the top surface of said base to provide substantially separate compartments, pairs of resilient contact elements located within the respective compartments and having end portions arranged in overlapping relation to each other within said recess, wiring terminal elements having portions thereof located on opposite sides of the ribs upon the upper surface of said base, said last-mentioned portions being adapted to overlie the other end portions of said contact elements, and a plurality of members penetrating corresponding openings in said base, contact and terminal elements and engaging the latter to rigidly secure the parts in assembled relation.

24. In combination, a slidable contactor assembly for electric snap switches, said assembly comprising a relatively thin flat plate of insulating material, said plate having a substantially centrally located opening formed therein to loosely receive an actuating element of suitable form, said plate also having a pair of aligned notches formed in opposite edges thereof, a pair of metal contactors, said contactors having portions thereof located within said notches and portions thereof located on opposite faces of said plate, said last mentioned portions being pressed tightly against said faces of the plate whereby said parts are retained in assembled position, and a molded insulating base having a recess, the side and end walls of said recess being respectively adapted to guide and limit movement of said plate, the bottom wall of said recess having a rib extending longitudinally thereof against which said plate is adapted to bear.

25. An electric snap switch comprising a molded insulating base having a substantially rectangular recess formed in the upper surface thereof, a rib extending longitudinally of the bottom wall of said recess, said rib having a flat upper surface, a thin flat plate of insulating material of substantially rectangular contour located within said recess and slidable upon the upper surface of said rib, said plate having its movements guided and limited, respectively, by the side and end walls of said recess, a pair of contactors, each contactor having a connecting portion penetrating said plate and arm portions bent into clamping engagement with opposite faces of said plate, and two pairs of stationary contacts having the resilient tips thereof respectively biased into engagement with opposite faces of said plate, whereby upon movement of said plate to opposite extreme positions said contactors are moved accordingly into or out of bridging relation to said pairs of contacts.

26. In an electric snap switch, in combination, a top plate of substantially inverted channel-shape, said top plate having a pair of aligned bearing openings formed in the op-

posite parallel sides thereof, a substantially U-shaped sheet metal member having angularly extending end portions adapted to bear within said openings, said plate having a relatively narrow rectangular slot formed in the upper portion thereof, a metal actuating member of substantially T-shape, one arm of the T being adapted to provide a spring abutment, the other arm of the T being slidable within said slot and limited in its movements by the end walls of the latter, a second plate attached to said top plate and adapted to provide a bearing surface for said last-mentioned arm of the T, said second plate having lugs formed integrally therewith and bent upwardly therefrom in parallel relation to each other, a trigger lever pivotally supported by said lugs, said trigger lever having spaced parallel lugs depending therefrom, a pin providing a pivotal connection between said last-mentioned lugs and said T-shaped member, and spring means for biasing said trigger lever to a given extreme position while permitting movement thereof to its opposite extreme position against the action of said bias.

27. In an electric snap switch, in combination, a top plate of substantially inverted channel-shape, said top plate having a pair of aligned bearing openings formed in the opposite parallel sides thereof, a substantially U-shaped sheet metal member having angularly extending end portions adapted to bear within said openings, said plate having a relatively narrow rectangular slot formed in the upper portion thereof, an actuating member of substantially T-shape, one arm of the T being adapted to provide a spring abutment, the other arm of the T being slidable within said slot, a second plate attached to said top plate and adapted to provide a bearing surface for said last-mentioned arm of the T, said second plate having lugs formed integrally therewith and extending therefrom in parallel relation to each other, a trigger lever pivotally supported by said lugs, said trigger lever having spaced parallel lugs depending therefrom, a pin providing a pivotal connection between said last-mentioned lugs and said T-shaped member, spring means for biasing said trigger lever to a given extreme position while permitting movement thereof to its opposite extreme position against said bias, said second plate also having an end portion extending at an angle to the main body thereof, and said end portion having a plurality of openings formed therein to provide for attachment of the device to a suitable support.

28. In a snap switch of the tool-handle type, in combination, a molded insulating base, a top plate therefor, stationary and movable switch parts carried by said base and said plate and substantially enclosed thereby, the stationary switch parts having ter-

5 minal portions exposed adjacent to the lower surface of said base at opposite ends of the latter, and wiring terminal screws carried by said terminal portions, said ends of the base being recessed to accommodate the shanks of said terminal screws.

10 29. In combination, a movable contactor assembly for electric snap switches, said assembly comprising a relatively thin flat plate of insulating material, said plate having an opening formed therein to provide a lost motion connection between the same and a driving element of suitable form, a contactor having a connecting portion penetrating said
15 plate and arm portions pressed tightly against the opposite faces of said plate whereby said parts are retained in assembled relation, and a molded insulating base having a recess, the side and end walls of said recess being respectively adapted to guide and limit
20 movements of said plate, the bottom wall of said recess having a flat rib extending longitudinally thereof against which said plate is adapted to bear.

25 30. In an electric snap switch, in combination, a top plate of substantially inverted channel-shape, said top plate having a pair of aligned bearing openings formed in the parallel sides thereof, a substantially U-shaped sheet metal member having angularly
30 extending end portions adapted to bear within said openings, a metal actuating member, said member having means at one end thereof to provide a spring abutment, a second
35 plate attached to said top plate, said second plate having lugs formed integrally therewith and bent upwardly therefrom in parallel relation to each other, a trigger lever pivotally supported by said lugs, said trigger lever
40 having spaced parallel lugs depending therefrom, a pin providing a pivotal connection between said last-mentioned lugs and said actuating member, spring means for biasing
45 said trigger lever to a given extreme position while permitting movement thereof to its opposite extreme position against said bias, and a coiled compression spring interposed between said actuating member and
50 said U-shaped member to effect snap movements of the latter to opposite extreme positions respectively upon opposite movements of the former.

In witness whereof, I have hereunto subscribed my name,

55 **GEORGE J. MEUER.**