Oct. 16, 1934. G. J. MEUER 1,977,078

ELECTRIC SNAP SWITCH

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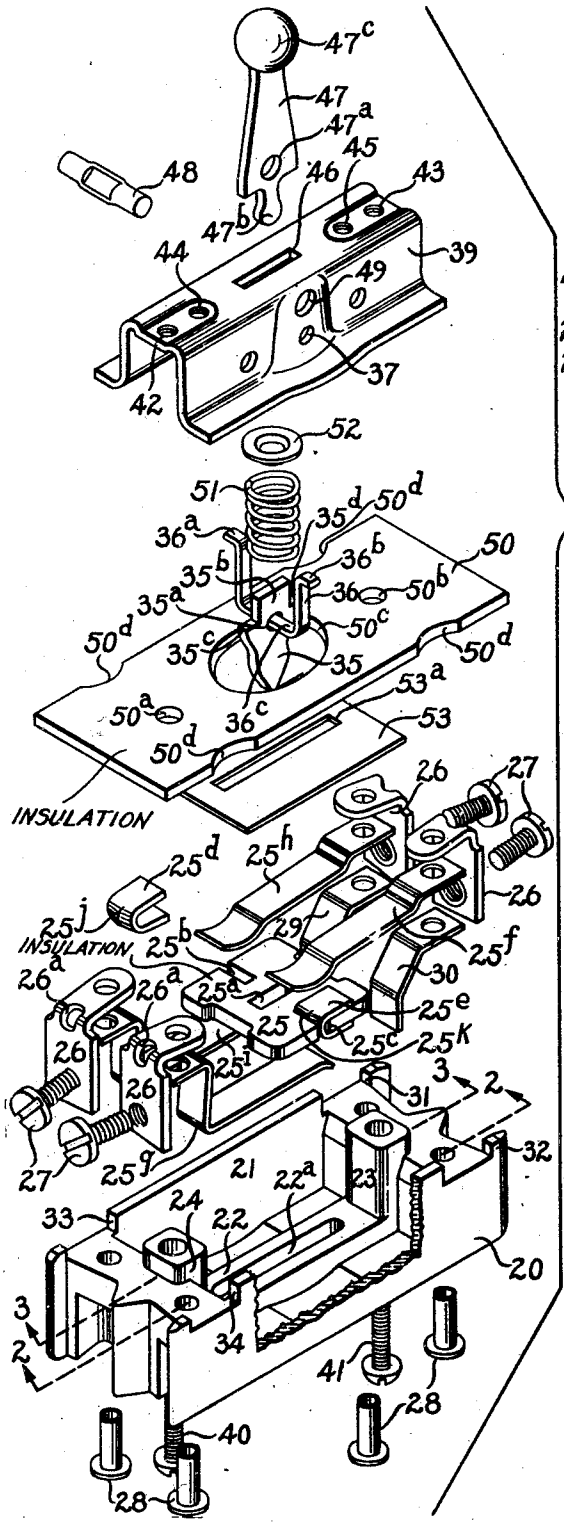


Fig. 1

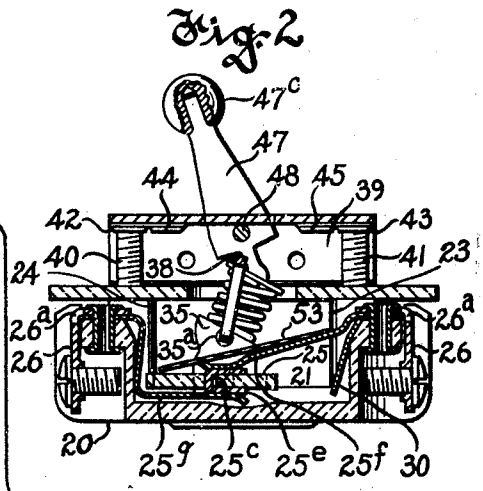


Fig. 2

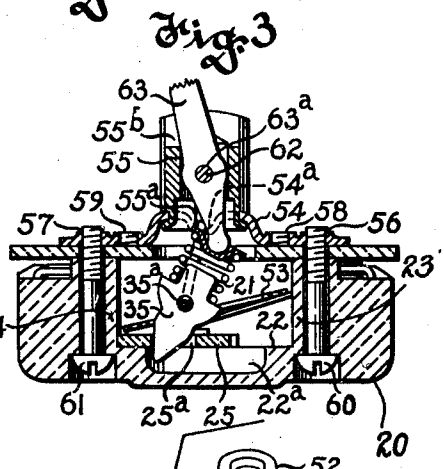


Fig. 3

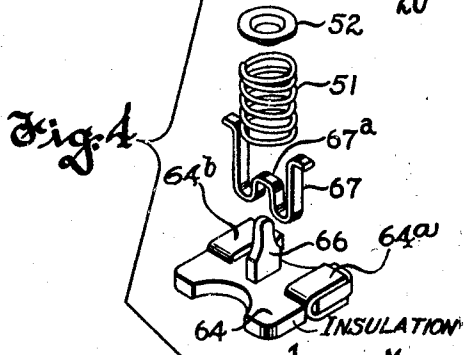


Fig. 4

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Fig. 5

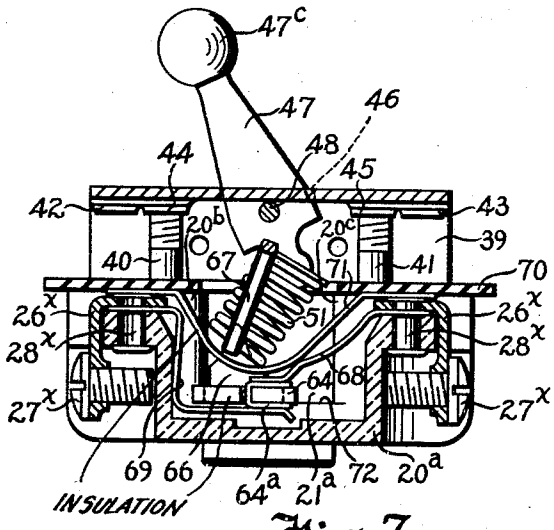


Fig. 6

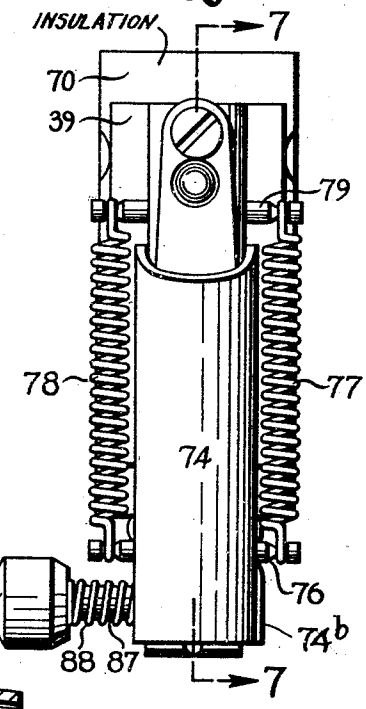


Fig. 7

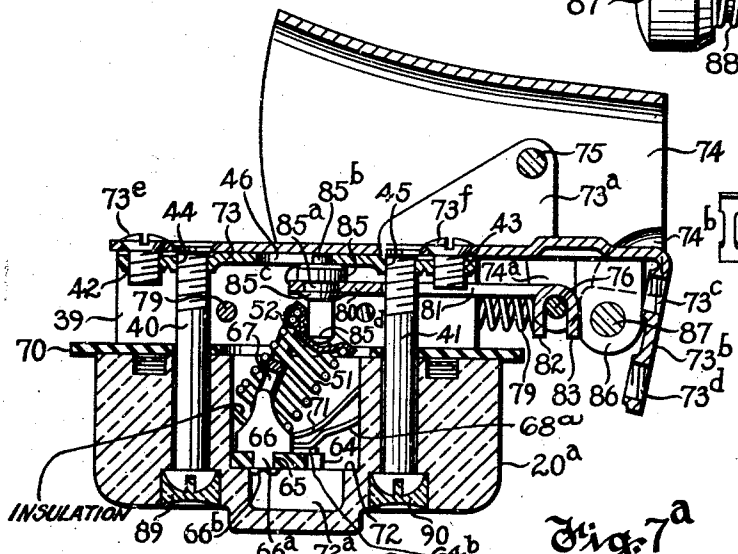


Fig. 8

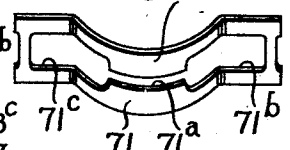


Fig. 10

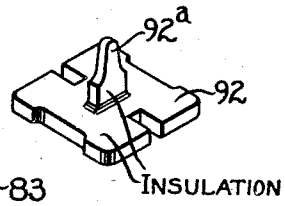


Fig. 9

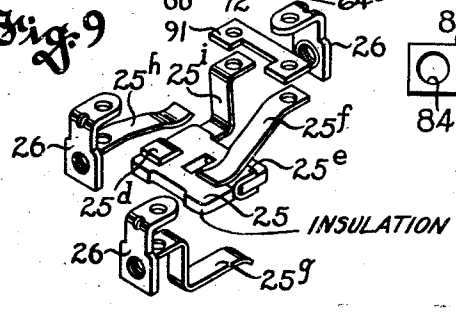
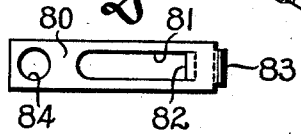


Fig. 7a



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Fig. 11

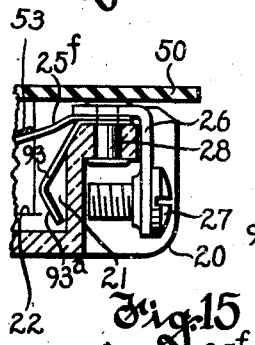


Fig. 12

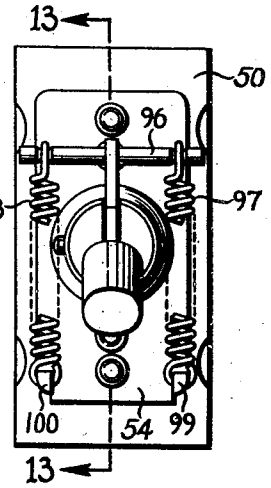


Fig. 13

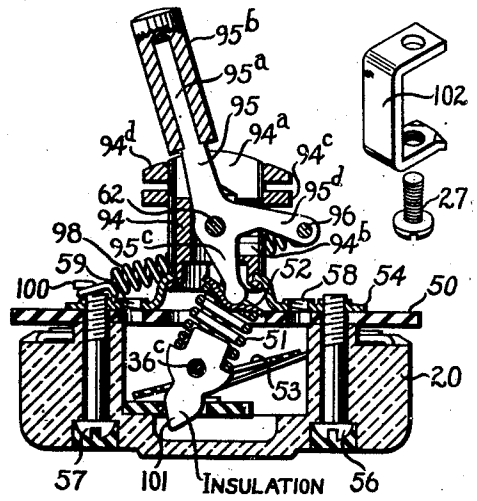


Fig. 14

Fig. 15

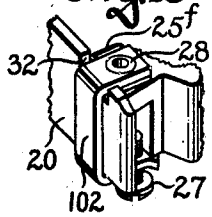


Fig. 16

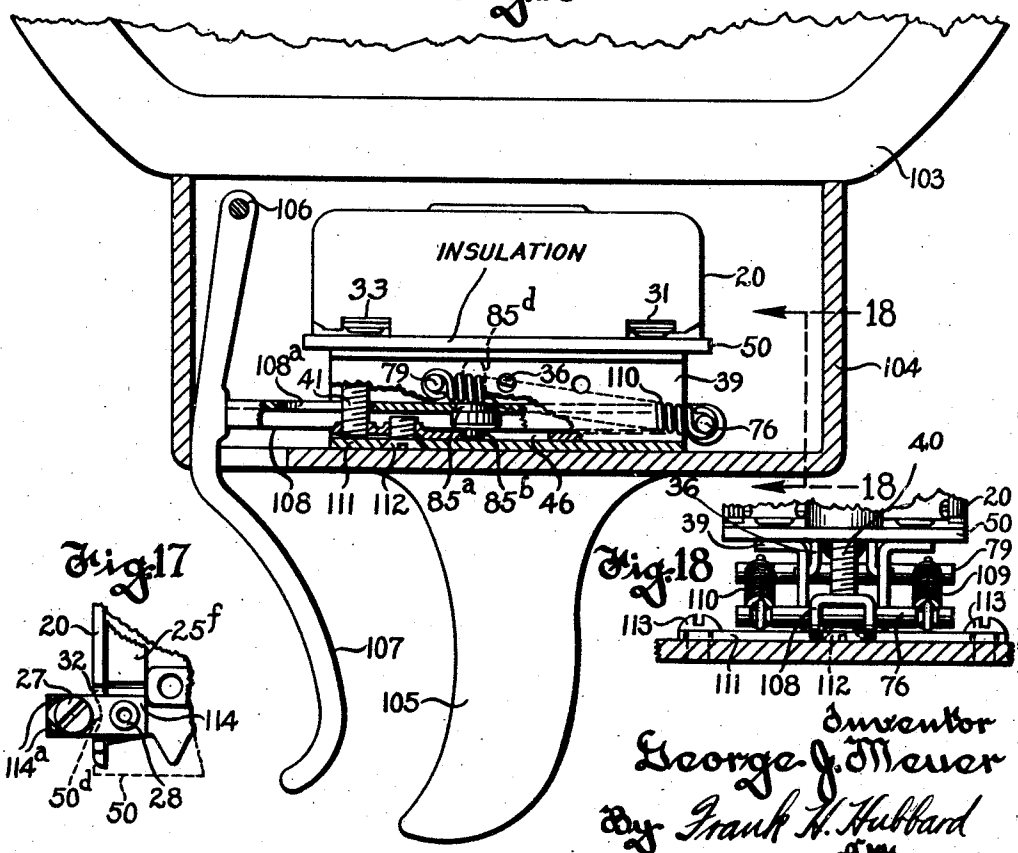


Fig. 17

Fig. 18

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Patented Oct. 16, 1934 1,977,078

UNITED STATES PATENT OFFICE

1,977,078

ELECTRIC SNAP SWITCH

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

Application April 15, 1933, Serial No. 666,252

19 Claims. (Cl. 200—76)

This invention relates to improvements in electric snap switches. While not limited thereto, the invention relates more particularly to snap switches of the tool-handle type.

An object of the invention is to improve and simplify the details of construction, assembly and operation of the switch parts.

Another object is to provide novel and inexpensive means for increasing the current carrying capacity of the switch.

Another object is to provide a snap switch embodying a sliding contact carrier wherein novel means are provided for cushioning certain movements of the latter.

Another object is to provide improved and simplified actuating means for the movable contactors of the switch.

Another object is to provide improved means for insulating the contacts and contactors with respect to the actuating elements of the switch.

Another object is to provide a single form of switch base adapted to accommodate wiring terminal elements of different forms, whereby top, bottom or end wiring of the switch may be effected.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate, in enlarged scale, 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.

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 sectional view, substantially on the dotted line 3—3 of Fig. 1,—but showing a modified form of top plate and actuating lever, to adapt the switch for one-hole mounting.

Fig. 4 is a perspective view in separated relation, of certain of the switch parts shown in Figs. 5 and 7.

Fig. 5 is a vertical sectional view similar to Fig. 2, on an enlarged scale, showing the parts as modified to provide a switch of relatively smaller capacity, and illustrating a modified form of insulating barrier.

Fig. 6 is a top plan view of a switch of the character illustrated in Fig. 5, but having a special form of actuator.

Fig. 7 is a sectional view on the line 7—7 of Fig. 6.

Fig. 7ª is a top plan view of one of the switch actuating elements shown in Fig. 7.

Fig. 8 is a perspective view of the insulating barrier shown in Figs. 5 and 7.

Fig. 9 is a perspective view, in separated relation, of an arrangement of stationary and movable contact elements to provide a switch of the three-point or multiple-circuit-controlling type.

Fig. 10 is a perspective view of a contact carrier similar to that shown in Figs. 4, 5 and 7, but consisting of a single molded insulating element.

Fig. 11 is a fragmentary sectional view, somewhat like Fig. 2, but showing a modified form of resilient element or buffer,—the metal top plate and the fastening means therefor being omitted.

Fig. 12 is a top plan view of a modified form of switch adapted for one-hole mounting, said switch having a special form of actuating lever and means for biasing the latter to a given extreme position.

Fig. 13 is a vertical sectional view, on the line 13—13 of Fig. 12.

Fig. 14 is a detail perspective view of a modified form of terminal element to provide for bottom wiring of the switch.

Fig. 15 is a fragmentary perspective view showing a switch provided with a terminal element of the character illustrated in Fig. 14,—and showing the manner in which the molded insulating base is notched or grooved to accommodate said element.

Fig. 16 is a fragmentary view, partly in section and partly in elevation, showing a portable electric tool having my improved switch mechanism applied thereto,—and showing a novel form of actuating means for the switch.

Fig. 17 is a fragmentary top plan view of a switch having a terminal element to provide for top wiring,—the insulating cover plate being shown in dotted lines, and

Fig. 18 is a view partly in elevation and partly in section on the line 18—18 of Fig. 16.

The present invention relates in general to improvements in electric snap switches of the character described and claimed in my Patent No. 1,889,259, dated November 29, 1932.

Referring first to Figs. 1 and 2 of the drawings, the numeral 20 designates the base which is molded from a suitable insulating material, such as the phenol formaldehyde condensation product sold commercially under the trade name of "bakelite". Base 20 is provided with a relatively deep substantially rectangular recess 21 which

opens to the upper surface of said base. Ribs 22, 23 and 24 project from the bottom and end walls of said recess 21, substantially in the manner disclosed in my Patent No. 1,889,259 aforementioned, the rib 22 having a flat upper surface against which the flat plate 25 of insulating material is adapted to bear. Plate 25 is preferably punched to the form shown,—the same having a centrally located rectangular opening 25^a and notches 25^b, 25^c which are alined with each other and are located at the mid-points of the length of the side edges of said plate. The arrangement of the notches 25^b, 25^c at the mid-points of the length of the side edges of plate 25 is advantageous in that it permits attachment of the movable contacts 25^d, 25^e to said plate with the arms of said contacts extending in either direction with respect to said notches, so long as the arms of both contacts extend in a like direction. Moreover, such arrangement of the notches 25^b, 25^c permits alternative use of plate 25 for a three-point or multiple-circuit controlling switch of the character disclosed in Fig. 9,—it being only necessary in the latter case to arrange the contacts 25^d, 25^e with the arms thereof extending in opposite directions respectively.

The longitudinally alined pairs of stationary contacts 25^f, 25^g and 25^h, 25^i are so formed and arranged as to provide for bridging engagement of the resilient tips thereof by the contactors 25^d, 25^e at one side of the vertical center line of the switch, as best illustrated in Fig. 2. For this reason the same stationary contacts 25^f, 25^g, 25^h and 25^i may be employed for the three-point switch illustrated in Fig. 9,—the contacts 25^h, 25^i being merely positioned in a reverse relation as compared with the positions thereof in Fig. 1.

As best illustrated at 25^c in Fig. 2 the width of notches 25^c, 25^b is preferably substantially greater than the thickness of the strip metal (such as silver, brass, copper, alloy, or the like) from which the contacts 25^d, 25^e are formed, and accordingly the bent portion of each of said contacts is medially distorted, as shown at 25^j, 25^k, Fig. 1, to provide for a fairly snug fit of said bent portions within said notches.

The stationary contacts aforedescribed are provided with terminal members 26 located within the respective grooves at the four corners of base 20, each member 26 having a tapped opening for cooperation with a binding screw 27, base 20 being recessed as shown to accommodate the shanks of said screws. The respective stationary contacts and their terminal members are attached to base 20 in any suitable manner,—eyelets 28 being shown for this purpose.

Located beneath the terminal portions of the upper stationary contacts 25^f, 25^h, and clamped in position by the fastening means for the latter, are a pair of resilient metal strips 29 and 30, the free end portions of which extend downwardly in slightly spaced relation to the corresponding end wall of recess 21 and preferably slightly below the flat surface of rib 22. As best illustrated in Fig. 2, said strips 29 and 30 are adapted to form resilient abutments for the contact-carrying plate 25 upon snap movement of the latter to that extreme position wherein the movable contacts are disengaged from the stationary contacts of the switch. The cushioning effect thus provided is substantially equivalent to the cushioning effect upon the plate 25 upon snap movement thereof to its opposite extreme position as an incident to bridging engagement of the movable contacts with the stationary contacts of the switch, and hence the shock and wear upon the movable parts of the switch, as an incident to operation thereof, is reduced to a minimum.

Base 20 is provided with top and end grooves as shown to accommodate the end-wiring terminal members shown in Figs. 1 and 2, and in addition I prefer to provide the upper surface of said base with communicating lateral grooves 31, 32 33 and 34 whereby said base may be utilized in conjunction with bottom-wiring terminal members of the character illustrated in Figs. 14 and 15, or top-wiring terminal members of the character illustrated in Fig. 17.

The means for effecting sliding movement of plate 25 preferably comprises a flat punched plate 35, which as shown in Figs. 1, 2 and 3 may consist of sheet metal. Obviously, however, a correspondingly shaped flat plate of insulating material may be employed,—as shown, for instance, at 101 in Fig. 13. Plate 35 is provided with a spear-shaped lower end which is adapted to penetrate the opening 25^a in plate 25 in the manner best illustrated in Fig. 3,—rib 22 being recessed as shown at 22^a to provide clearance for said lower end of plate 35.

Plate 35 is pivotally supported at 35^a by a substantialy U-shaped wire member 36 the outwardly extending ends 36^a and 36^b of which are adapted to snap into and pivotally engage the lower pair of alined openings 37, 38 in the top plate 39 of inverted channel shape. The wire of which member 36 is formed is preferably of rectangular cross section, as shown, to provide adequate clearance for the actuating spring while minimizing the external dimensions of said member 36. This arrangement also facilitates the forming operation of member 36. The top plate 39 is preferably of the same shape and size as the corresponding part illustrated in Figs. 1 and 2, for instance, of my Patent No. 1,889,259 aforementioned. The base 20, however, is of greater length than the base shown in said patent, and hence the screws 40 and 41 are spaced to cooperate with the outer tapped openings 42 and 43 in said top plate,—the inner tapped openings 44 and 45 being adapted to cooperate with suitably spaced screws (not shown) whereby the switch as a whole is attached to a tool handle or other suitable support.

As in my prior patent, the top plate 39 is provided with a rectangular slot or opening 46 to accommodate the flat punched sheet metal actuating lever 47 and to restrain the same against lateral displacement with respect to the top plate after the pivot pin 48 has been forced into position,—said lever having an opening 47^a to accommodate the enlarged intermediate portion of pin 48 with a drive fit, and the opposite ends of said pin being adapted to bear within the upper pair of alined openings one of which is shown at 49.

The flat punched insulating plate 50 to be interposed between the top plate 39 and base 20 is of slightly greater length than the latter, said plate 50 having openings 50^a, 50^b to provide clearance for screws 40 and 41, and a relatively large substantially elliptical opening 50^c to provide clearance for the oscillatory U-shaped member 36. The member 35 is provided with a reduced and shouldered upper end portion 35^b,—said end portion being adapted to enter the lower end of a coiled compression spring 51, and the shoulders 35^c, 35^d being located substantially in the plane of the connecting portion 36^c of member 36 whereby said parts jointly provide a

seat for the lower end of said spring. The upper end of spring 51 is provided with a cup 52, preferably of stamped sheet metal, to be engaged by the abutment 47b at the lower end of lever 47. Lever 47 is preferably provided with a recessed knob 47c which is driven or pressed onto the upper end of the former, as illustrated in Fig. 2.

Positioned loosely within recess 21 above the stationary and movable contact elements of the switch, but beneath the oscillatable member 36 is a relatively thin plate 53 of fiber or other suitable insulating material, said plate having a relatively long rectangular slot 53a (Fig. 1) to provide clearance for the member 35. Plate 53 thus acts to provide a substantially enclosed or auxiliary arcing chamber for the stationary and movable contact elements of the switch, whereby the member 36 is shielded from any arcs drawn incident to operation of the switch.

The wiring terminal members 26 are preferably provided with perforations 26a, as shown, to facilitate bending thereof to the form illustrated. Plate 50 is preferably provided with four arcuate notches 50d to assist in providing wire guards for the respective terminal screws when top-wiring terminals of the character illustrated in Fig. 17 are employed.

The switch illustrated in Fig. 3 is in most respects like that shown in Figs. 1 and 2, except that the same is provided with means to adapt the same for one-hole mounting. Said means as shown comprises a punched sheet metal top plate 54 having attached thereto an externally threaded hollow metal bushing 55. Bushing 55 is provided in its lower end with diametrically opposed notches or kerfs (one of which is shown at 55a) to provide clearance for the bent ends 36a, 36b of member 36, which ends are pivotally engaged in suitable depressions in the bulged portion of top plate 54, as shown in dotted lines at 54a. Top plate 54 is provided with spaced pairs of openings 56, 57 and 58, 59,—the former being adapted to cooperate with the screws 60, 61 whereby the switch parts are retained in assembled relation, and the openings 58, 59 being adapted to cooperate with screws (such as 60, 61) when top plate 54 is employed in conjunction with a relatively shorter insulating base of the character disclosed at 20a in Figs. 5 and 7.

The bushing 55 is provided with alined drilled openings to permit endwise insertion of pin 62 for pivotal support of the actuating lever 63. In practice it is unnecessary to provide for a drive fit of pin 62 within the opening 63a in lever 63, wherefore the aforementioned openings in bushing 55 need be only slightly larger than the cross sectional dimensions of said pin. Lever 63 preferably comprises a flat sheet metal stamping, and the upper end of bushing 55 is provided with a slot or kerf 55b to permit insertion of said lever 63 into the bushing. The side walls of kerf 55b act in conjunction with pin 62 to limit lever 63 to oscillatory movement in a single plane, and the shoulders formed by said kerf likewise act to limit the degree of oscillation of said lever.

In Fig. 4 I have shown a modified form of contact-carrying plate 64 of insulating material,—said plate being shown as relatively shorter than the plate 25 aforedescribed, merely to adapt the same to the relatively smaller dimensions of the recess in base 20a, Figs. 5 and 7. Thus it will be understood that a plate 64 of the same size as plate 25 might be employed in the switch devices of Figs. 1 to 3. Plate 64 is provided at the midpoints of the respective side edges thereof with notches to accommodate the contactors 64a, 64b, and said plate is provided with a centrally located rectangular opening 65 (Fig. 7) to snugly receive the reduced end 66a of a punched sheet metal plate 66,—said end being upset as shown at 66b (Fig. 7) to rigidly secure said parts to each other. The wire member 67 is preferably bent to substantially W-shape as shown,—the bend 67a thereof being adapted to accommodate the upper tapered end of member 66, whereby the lower coils of spring 51 are adapted to surround the bend 67a and said end of member 66, as best illustrated in Figs. 5 and 7. The manner in which spring 51 directly and alternately engages opposite edges of member 66 to effect snap movement of the latter and of plate 64 to opposite extreme positions will be apparent upon inspection of Figs. 5 and 7.

Referring more particularly to Fig. 5, it will be noted that base 20a is provided with a recess 21a of relatively smaller dimensions than the recess 21 shown in Figs. 1 to 3. I therefore employ stationary contacts 68 and 69, etc., of smaller dimensions than the corresponding contacts 25f, 25g, etc., aforedescribed, the movable contactors (one of which is shown at 64a in this figure) being of correspondingly reduced size. The terminal plates 26x, binding screws 27x and securing eyelets 28x are likewise preferably of reduced size. The insulating plate 70 is of substantially the same width as base 20a but is adapted to project to some extent beyond the opposite ends of the latter. With the switch actuating elements shown in Figs. 5 and 7 I prefer to employ a punched fiber member 71 of the form best illustrated in Fig. 8. Member 71 is provided with a slot 71a to provide clearance for member 66,—said slot being of increased width at opposite ends thereof, as indicated at 71b, 71c to fit around the upper end of the vertical ribs 20b, 20c. The opposite end portions of member 71 are thus clamped between plate 70 and the upper ends of eyelets 28x, as best illustrated in Fig. 5,—the intermediate portion being bent or bowed downwardly as shown to avoid interference with member 67 and spring 51. Member 71 thus acts to provide a substantially closed or auxiliary chamber for the stationary and movable contact elements of the switch.

The top plate 39 and lever 47 in Fig. 5 are identical with the corresponding parts shown in Fig. 2, but in Fig. 5 the screws 40 and 41 are arranged to cooperate with the inner pair of tapped openings 44 and 45. The insulating plate 64 in Figs. 5 and 7 is adapted to slide upon the flat upper surface of a central rib 72, said rib being provided with a recess 72a (Fig. 7) to provide clearance for the upset end 66b of member 66. Said recess is also adapted to provide clearance for an actuating member of the character illustrated at 35 in Figs. 1 to 3 when the latter form of mechanism is employed.

The switch mechanism illustrated in Figs. 6 and 7 is substantially like that shown in Fig. 5, and corresponding parts have been given like characters of reference. In Figs. 6 and 7, however, a punched and stamped sheet metal member 73 is attached to top plate 39, as by means of a pair of screws 73e and 73f,—member 73 having parallel upstanding lugs, one of which is shown at 73a, to which the saddle-shaped trigger lever 74 is pivotally secured, as by means of pin 75. Lever 74 is provided with a pair of downwardly extending lugs, one of which is shown at 74a, said lugs being perforated to accommodate a pin 76 to

the opposite ends of which the coiled tension springs 77 and 78 are respectively attached. The other ends of springs 77, 78 are attached to the respective ends of a pin 79 carried by top plate 39. One of the movable contactors is shown at 64^b in Fig. 7, and one of the upper stationary contacts is shown at 68^a.

A sheet metal member 80 is provided with a punched out portion 81 to provide clearance for screw 41,—the right hand end of said member being provided with downwardly extending lugs 82, 83 which straddle pin 76, whereby member 80 is driven by said pin. At its left hand end member 80 is provided with an opening 84 (Fig. 7^a) to receive the cylindrical portion 85^a of a stud or pin 85 whose upper reduced end 85^b is adapted to be guided by the walls of slot 46. Stud 85 is riveted to member 80 as shown at 85^c, and the lower end 85^d is adapted to engage the cup member 52.

In Fig. 7 the lever 74 is shown depressed with consequent movement of the switch parts to circuit closing position. Upon manual release of lever 74 the springs 77, 78 will act to return the switch parts automatically to circuit breaking position. The member 73, however, is provided with a pair of downwardly extending lugs, one of which is shown at 86,—said lugs being perforated to provide a support within which the pin 87 is slidable, said pin having a head or button 87^a which is depressible to provide for engagement of the flanged outer end (not shown) of said pin with the outwardly offset portion 74^b of lever 74 to prevent clockwise movement of the latter (Fig. 7) upon its pivot 75. The coiled compression spring 88 tends to bias pin 87 toward the left (Fig. 6), so that upon a slight additional depression of lever 74, the flanged end of pin 87 will be free to move under its bias out of latching relation to lever 74. The parts of this latching mechanism are shown in detail in Figs. 4, 5 and 6 of my Patent No. 1,889,259, and further description thereof herein is deemed unnecessary. As in my patent aforementioned, the member 73 is provided with a downwardly extending lug 73^b which is tapped at 73^c, 73^d to accommodate suitable securing screws (not shown). The heads of the aforementioned screws 40, 41 may be waxed in their respective countersunk recesses, as indicated at 89, 90 (Fig. 7) to prevent accidental loosening thereof.

In Fig. 9 I have shown an arrangement of the stationary and movable switch contacts to provide a switch of the three-point or multiple-circuit-controlling type. This arrangement merely involves a reversal of the position of stationary contacts 25^h, 25^i and the movable contactor 25^d with respect to the positions thereof illustrated in Fig. 1, for instance. The contact members 25^i, 25^f in this case are electrically connected, as by means of the bus member 91, and a terminal member 26 common to contacts 25^i, 25^f is employed,—all of the stationary contact and terminal members being secured to the insulating base of the switch as by means of the eyelets 28 aforedescribed.

Fig. 10 illustrates a part adaptable for use with the switch mechanisms illustrated in Figs. 4, 5 and 7, said part preferably comprising a molded insulating plate 92, corresponding with the plate 64 of the other figures,—said plate 92 having formed integrally therewith the insulating projection or stud 92^a which performs the function of the metal member 66 aforedescribed.

Fig. 11 is a fragmentary view of a switch illustrating a modified form of resilient abutment 93 for the contact carrying insulating plate of the switch mechanism,—said abutment having its lower end 93^a angled downwardly and inwardly toward the end wall of recess 21. By this means any tendency of the contact carrying plate (not shown) to move upwardly away from the flat surface of rib 22 is avoided.

Figs. 12 and 13 illustrate a switch mechanism quite similar to that shown in Fig. 3, and corresponding parts have been given like characters of reference. Thus I provide an externally threaded hollow metal bushing 94 having a kerf 94^a at the upper end thereof and a lateral drilled opening or kerf 94^b communicating therewith. A punched sheet metal actuating lever 95 is insertable within said bushing for pivotal support by means of pin 62. The upper end 95^a of said lever has attached thereto a recessed handle element 95^b, as by driving the latter onto the former. The lower end 95^c of lever 95 is provided with an abutment to engage cup 52. Extending laterally from lever 95 is an arm 95^d which carries a pin or rod 96 to the opposite ends of which are attached the coiled tension springs 97 and 98,—the opposite ends of the respective springs being attached to lugs or hooks 99 and 100 struck from the plate 54. Lever 95 is thus biased in a clockwise direction (Fig. 13) to a given extreme position to effect open-circuit positioning of the switch parts. Also in Fig. 13 I have shown the element 101 which comprises a punched or molded plate of insulation, whereby the member 36 and spring 51 are more positively shielded from arcs formed between the stationary and movable contacts of the switch. Nuts 94^c, 94^d are adapted to provide for attachment of the complete switch to a suitable support.

Fig. 14 shows a modified form of terminal member which may be substituted for the terminal members 26 aforedescribed to provide a switch adapted for bottom wiring, the usual wiring terminal screw 27 being employed. The manner in which member 102 and screw 27 are accommodated by the recesses in base 20 is shown in the fragmentary view of Fig. 15.

In Fig. 16 I have illustrated an adaptation of my switch mechanism to control by a special form of actuating means associated with a motor operated drill or other portable tool of well known form. In said figure the numeral 103 designates the motor casing to which is secured in any suitable manner a switch housing or supporting casing 104. Casing 104 is provided with a hand-grip 105 of suitable form, and pivotally supported within said casing, as at 106 is a trigger or lever 107 which is adapted upon movement thereof toward member 105 to effect circuit-closing operation of the switch. The switch as shown comprises a base 20 of relatively large dimensions as shown in Figs. 1 to 3, and it may be assumed that the stationary and movable switch parts are of the relatively high current-carrying capacity shown in said figures. The top plate 39 is of the size common to all of the switch mechanisms aforedescribed. The stud 85 is secured in the manner aforedescribed to a metal member 108 of inverted channel-shape,—the edges of the parallel arms of said member being adapted to slidably engage the inner surface of said top plate 39. Member 108 is provided with a slot 108^a affording clearance for the shank of screw 41. The right hand end of member 108 projects beyond the top plate 39 as shown, and said end carries the pin 76 to opposite ends of which the coiled compression

springs 109, 110 are attached, the opposite ends of said springs being respectively attached to the ends of pin 79 carried by plate 39. The left hand end of member 108 is thus biased into engagement with lever 107 to normally retain the latter in the position thereof illustrated in Fig. 16,—and to normally retain the switch parts in circuit opening position.

A plate 111 is attached to top plate 39 as by means of a pair of countersunk screws one of which is shown at 112, and said plate 111 is in turn secured to the inner surface of casing 104 as by means of a plurality of screws 113.

In Fig. 17 I have shown at 114 the form of terminal element which may be employed to provide for top-wiring of the switch,—the wiring terminal screw 27 having its shank extending downwardly in parallel relation to the outer side wall of base 20. The insulating plate 50 (dotted lines) is superimposed upon the inner end of terminal member 114. Said plate is provided with curved notches or cut-away portions 50^d adjacent to each of the four corners thereof to provide clearance for the heads of the respective screws 27, and to provide wire guards therefor additional to the bent end portions of the respective members 114, as indicated at 114^a.

It will be apparent to those skilled in the art that various other combinations of the parts illustrated in the several figures may be made. Resilient abutment elements of the character illustrated at 29, 30 and 93 shown in certain of the figures may be employed with any of the switch devices herein illustrated, or the same may be entirely omitted if desired. Similarly any one of the different types of contact-carrying insulating plates illustrated may be employed in a given switch provided the proper form of actuating means is associated therewith.

It is to be further noted that while I have illustrated insulating bases 20 and 20^a of different size, nevertheless each base is so formed as to accommodate the various forms of wiring terminal plates shown herein, whereby bottom, top or end wiring of the particular switch may be effected.

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, a plurality of pairs of lower and upper resilient stationary contacts located within said recess and biased toward each other, 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 plurality of conducting elements movable therewith into and out of bridging relation to said pairs of contacts, and resilient strip metal abutment members associated with certain of said stationary contacts and engageable by said slidable member upon movement of the latter toward one extreme position.

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, a plurality of pairs of lower and upper resilient stationary contacts located within said recess, the contacts of each pair being respectively biased toward each other, a relatively thin flat insulating member slidable upon said flat surface and interposed between the stationary contacts of each pair in all positions of the former, said insulating member having a plurality of conducting elements movable therewith into and out of bridging relation to the respective pairs of contacts, and resilient metal strip members associated with the upper contacts of each pair, said last mentioned members having the free end portions thereof located adjacent to one end of said recess in the plane of sliding movement of said insulating member, whereby a resilient abutment is provided for the latter upon movement of said conducting elements out of bridging relation to said contacts.

3. 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 wall 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 free ends of each longitudinally alined pair being located within said recess in overlapping relationship to each other, a relatively thin flat insulating plate located between the contact portions of the respective pairs and adapted to tension the latter, said plate being adapted to slidably engage said rib and having a pair of bridging contactors secured thereto and exposed on opposite sides thereof, means for insuring snap movements of said plate to opposite extreme positions respectively, auxiliary resilient metal strips associated with certain of said contacts, the free ends of said metal strips being engageable by said plate to cushion the snap movement of the latter to one of its extreme positions, and said free ends being angled downwardly toward the adjacent end wall of said recess, whereby said plate is restrained against upward displacement relatively to said rib upon movement thereof to said last mentioned extreme position.

4. 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 pair of alined notches formed therein at the mid-points of the opposite edges thereof respectively, said plate also having a relatively narrow slot extending in a plane at right angles to the plane of said notches and arranged symmetrically with respect to the latter, a pair of metal contactors of substantially U-shape in cross section, said contactors having the intermediate portions thereof located within said notches and having the opposite parallel arms thereof extending in reverse directions respectively longitudinally of said plate, two pairs of resilient fixed contacts, the tips of each pair being alined with and biased toward each other but said pairs being reversely arranged whereby the pairs of tips are offset relatively to each other longitudinally of said plate, said plate with its attached contactors being interposed between the respective pairs of contacts, and means including a coiled compression spring for effecting snap movement of said plate to opposite extreme positions respectively, whereby the respective contactors are alternately engaged with and alternately disengaged from their cooperating stationary contacts.

5. 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 relatively thin plate of insulating material 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, two pairs of resilient stationary contacts having the 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, means for effecting such movement of said plate with a snap action, said means comprising a wire member bent to provide a pair of substantially parallel arms and mounted for oscillatory movement relatively to said base, a coiled compression spring adapted to bias said oscillatable member to one extreme position or the other, and a flat member providing a lost-motion driving connection between said spring and said plate, said flat member being positioned in a plane parallel to the plane of oscillation of said wire member and having a portion thereof surrounded by a plurality of the lower end coils of said spring, whereby said spring is alternately engageable directly with opposite edges of said flat member to insure snap movement of the latter from each extreme position thereof to the other.

6. 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, a plurality of pairs of resilient stationary contacts located within said recess on opposite sides respectively of said rib, the tips of the contacts of the respective pairs being biased toward each other, a relatively thin flat insulating member slidable upon said flat surface and interposed between the tips of the respective pairs of contacts in all positions of the former, said insulating member having conducting elements attached thereto and movable therewith into and out of bridging relation to the tips of the respective pairs of contacts, snap actuating means for said insulating member including an oscillatable toggle element and a coiled compression spring extending into said recess, and a relatively thin member of insulating material located within said recess and positioned above the respective pairs of contact tips but below said toggle element and said spring, whereby passage of electric arcs from said contact tips to said toggle element and said spring is prevented.

7. 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 relatively thin plate of insulating material 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, said plate having a pair of alined notches formed therein at the mid-points of the opposite edges thereof respectively, a pair of metal contactors, said contactors having intermediate portions thereof located within the respective notches and opposed parallel arm portions extending longitudinally of said plate, two pairs of resilient fixed contacts, the tips of each pair being alined with and biased toward each other, said plate with its attached contactors being interposed between the respective pairs of contacts, means including a coiled compression spring for effecting snap movement of said plate to opposite extreme positions alternately, whereby the respective contactors are engaged with and disengaged from their cooperating stationary contacts, and means comprising a relatively thin punched insulating element positioned between the lower end of said spring and the stationary and movable contact elements of the switch, whereby a substantially closed arcing chamber is provided for the latter.

8. 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 wire yoke member having parallel arms pivotally supported independently of said base and having its lower end oscillatable within said recess, manually operable means including a lever having a spring abutment movable to opposite extreme positions across the pivotal center of said yoke, a coiled compression spring interposed between said abutment and the lower end of said yoke member, means providing a lost motion driving connection between said yoke member and said insulating plate, and a relatively thin punched member of insulating material located within said recess and positioned above the respective pairs of contact tips but below said yoke member and said spring whereby passage of electric arcs from said contact tips to said yoke member and said spring is prevented.

9. 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 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 wire yoke having parallel arms pivotally supported independently of said base and having its lower end oscillatable within said recess, manually operable means including a lever having a spring abutment movable to opposite extreme positions across the pivotal center of said yoke, a coiled compression spring interposed between said abutment and the lower end of said yoke, means providing a lost motion driving connection between said yoke and said insulating plate, said last mentioned means including an insulating element with which diametrically opposite portions of said coiled compression spring are adapted to engage, and a relatively thin member of insulating material located within said recess and positioned above the respective pairs of contact tips but below said yoke and said spring, whereby passage of electric arcs from said

contact tips to said yoke and said spring is prevented.

10. 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 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 wire yoke having parallel arms pivotally supported independently of said base and having its lower end oscillatable within said recess, manually operable means including a lever having a spring abutment movable to opposite extreme positions across the pivotal center of said yoke, a flat punched plate of insulating material pivotally supported by said yoke at the lower end of the latter, a coiled compression spring interposed between said last mentioned plate and said abutment, said first mentioned plate having an opening and said last mentioned plate having a portion thereof alternately engageable with the respective end walls of said opening to provide for snap movement of said first mentioned plate to opposite extreme positions upon corresponding movements of said yoke, and a relatively thin punched member of insulating material located within said recess and positioned above the respective pairs of contact tips but below said yoke and said spring, whereby passage of electric arcs from said contact tips to said yoke and said spring is prevented.

11. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, said base having ledges offset downwardly from said upper surface at points adjacent to the opposite ends of the latter, stationary contacts respectively having portions thereof superimposed upon said ledges at the four corners of said base, and said base having a plurality of notched portions or passages communicating with each of the respective ledges to alternatively accommodate wiring terminal elements of different forms, said wiring terminal elements being respectively adapted to provide for end, bottom or top wiring of the switch.

12. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, a rib formed in the bottom wall of said recess and having a flat upper surface, a relatively thin flat plate of insulating material slidable upon said flat surface and having its movements guided and limited respectively by the side and end walls of said recess, contactors carried by said flat plate and having portions thereof exposed on opposite faces of said plate, a plurality of pairs of resilient stationary contacts arranged on opposite sides of said rib and the contacts of each pair having tips respectively biased into engagement with opposite faces of said plate, said contactors being movable by said plate into and out of bridging engagement with the contacts of the respective pairs, means for effecting movements of said plate to opposite extreme positions with a snap action, said means comprising a pivoted wire yoke, an actuating lever, said lever having an abutment movable to opposite extreme positions across the pivotal axis of said yoke, a coiled compression spring positioned between the arms of said yoke, a cup member seated within the upper end of said spring and adapted to engage said abutment, the upper end of said spring being movable by said abutment independently of said yoke to effect storage of a predetermined degree of energy in said spring, whereupon said yoke is movable jointly with the lower end of said spring to release the energy so stored, means providing a lost motion driving connection between said spring and said plate, said means comprising an element engaged at one end thereof with said plate, the other end of said element extending upwardly into the lower end of said spring, and a relatively thin punched member of insulating material located within said recess and positioned above the respective pairs of contact tips but below said yoke and said spring, whereby passage of electric arcs from said contact tips to said yoke and said spring is prevented.

13. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, a rib formed in the bottom wall of said recess and having a flat upper surface, a relatively thin flat plate of insulating material slidable upon said flat surface and having its movements guided and limited respectively by the side and end walls of said recess, contactors carried by said flat plate and having portions thereof exposed on opposite faces of said plate, a plurality of pairs of resilient stationary contacts arranged on opposite sides of said rib and the contacts of each pair having tips respectively biased into engagement with opposite faces of said plate, said contactors being movable by said plate into and out of bridging engagement with the contacts of the respective pairs, means for effecting movements of said plate to opposite extreme positions with a snap action, said means comprising a pivoted wire yoke, an actuating lever, said lever having an abutment movable to opposite extreme positions across the pivotal axis of said yoke, a coiled compression spring positioned between the arms of said yoke, a cup member seated within the upper end of said spring and adapted to engage said abutment, the upper end of said spring being movable by said abutment independently of said yoke to effect storage of a predetermined degree of energy in said spring, whereupon said yoke is movable jointly with the lower end of said spring to release the energy so stored, means providing a lost motion driving connection between said spring and said plate, said means comprising a flat punched plate of insulating material pivotally engaged with said yoke, the lower end of said last mentioned plate being loosely engaged with said first mentioned plate, and the upper end of said last mentioned plate being adapted to fit within the lower end of said spring, whereby said first mentioned plate is subjected to the prying action of said second mentioned plate to insure initial movement of the former after storage of a given amount of energy in said spring, and a relatively thin member of insulating material located within said recess and positioned above the respective pairs of contact tips but below said yoke and said spring, whereby passage of electric arcs from said contact tips to said yoke and said spring is prevented.

14. In an electric snap switch of the tool-handle type, in combination, a molded insulating base having a recess, stationary and movable contact elements located within said recess, snap actuating means for said movable contact elements, said

means including a coiled compression spring one end of which extends outwardly from said recess, a channel-shaped member secured to said base with the open side thereof in registry with said recess, an element slidably engaging the bottom wall of said channel-shaped member and projecting from opposite ends of the latter, an abutment carried by said element and engaged with the upper end of said spring to throw the latter from one extreme position to the other, a pin carried at one end of said element and having its ends projecting laterally beyond opposite sides of said channel-shaped member, a second pin carried by said channel-shaped member and having its ends projecting laterally therefrom, a pair of contractile springs engaged under tension with the spaced ends of the respective pins whereby said abutment is biased to a given extreme position, and a lever pivotally supported independently of said switch mechanism, said lever having a portion thereof engageable with the opposite end of said element to provide for movement of said abutment to its opposite extreme position against the action of said biasing springs.

15. In a snap switch of the character described, in combination, a metal top plate, an externally threaded hollow metal bushing secured to said top plate, said bushing having a kerf extending downwardly from the upper end thereof to provide a lateral opening, a flat punched sheet metal actuating lever, said lever having alined upper and lower arms and a third arm extending outwardly through said lateral opening, a pivot pin penetrating said lever and engaging the walls of said bushing, a rod carried by said third arm exteriorly of said bushing, a pair of coiled tension springs each attached at one end to said top plate, the opposite ends of said springs being respectively attached to said rod at opposite ends of the latter, whereby said lever is biased to a given extreme position, the upper arm of said lever having a handle element secured thereto to facilitate manipulation thereof against said bias, a molded insulating base to which said top plate is secured, said base having a recess, a plurality of pairs of resilient stationary contacts located within said recess, the tips of the contacts of the respective pairs being biased toward each other, a thin flat insulating member interposed between the tips of the respective pairs of contacts, said insulating member having conducting elements attached thereto and movable thereby into and out of bridging relation to said contact tips, actuating means for said insulating member including an oscillatable toggle element, a coiled compression spring interposed between the lower arm of said lever and said toggle element, and a relatively thin punched member of insulating material located within said recess and positioned above the respective contact tips but below said toggle element and said spring, whereby passage of electric arcs from said contact tips to said toggle element and said spring is prevented.

16. In a snap switch of the character described, in combination, a metal top plate, an externally threaded hollow metal bushing secured to said top plate, said bushing having a kerf extending downwardly from the upper end thereof to provide a lateral opening, a flat punched sheet metal actuating lever, said lever having alined upper and lower arms and a third arm extending outwardly through said lateral opening, a pivot pin penetrating said lever and engaging the walls of said bushing, a rod carried by said third arm exteriorly of said bushing, a pair of coiled tension springs each attached at one end to said top plate, the opposite ends of said springs being respectively attached to said rod at opposite ends of the latter, whereby said lever is biased to a given extreme position, one arm of said lever having a handle element secured thereto to facilitate manipulation thereof against said bias, and a pair of nuts adjustably carried at the upper end of said bushing to provide for attachment of the latter to a suitable support.

17. In an electric snap switch, in combination, a molded insulating base having a recess, stationary and movable contact elements located within said recess, snap actuating means for said movable contact elements, said means including a coiled compression spring one end of which extends outwardly from said recess, a channel-shaped member secured to said base with the open side thereof in registry with said recess, an element slidably engaging said channel-shaped member and projecting from opposite ends of the latter, an abutment carried by said element and engaged with the upper end of said spring to throw the latter from one extreme position to the other, spring means for biasing said element to a given extreme position, and a lever pivotally supported independently of said switch mechanism, said lever having a part engageable with said element to provide for movement of the latter against the bias of said spring means.

18. In an electric snap switch, in combination, a molded insulating base having a recess, stationary and movable contact elements located within said recess, said movable contact elements being slidable relatively to said base into and out of engagement with said stationary contact elements, a channel-shaped member secured to said base with the open side thereof in registry with said recess, an element slidably engaging the bottom wall of said channel-shaped member and adapted to project alternately from opposite ends of the latter, a wire yoke having substantially parallel arms pivotally supported by said channel-shaped member and having the free end thereof oscillatable within said recess, an abutment carried by said slidable element and movable thereby across the pivotal center of said yoke, a coiled compression spring interposed between said abutment and the free end of said yoke, means providing a lost-motion driving connection between said yoke and said movable contact elements, a plurality of coiled tension springs connected with said channel-shaped member and said slidable member to bias the latter to a given extreme position, and means for effecting movement of said slidable member to its opposite extreme position against said bias, said means comprising a member movably supported independently of said switch mechanism.

19. 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, a plurality of pairs of lower and upper resilient stationary contacts, the tips of each pair of contacts being respectively biased toward each other, a relatively thin flat insulating member slidable upon said flat surface and interposed between the tips of each pair of contacts in all positions of the former, said insulating member having a plurality of conducting elements movable therewith into and out of bridging relation to the tips of the respective pairs of contacts, resilient metal strip members associated with the upper contacts of each pair, said last mentioned

members having the free end portions thereof located adjacent to one end of said recess in the plane of sliding movement of said insulating member, whereby a resilient abutment is provided for the latter upon movement of said conducting elements out of bridging relation to the tips of said pairs of contacts, snap actuating means for said insulating member including an oscillatable toggle element and a coiled compression spring extending into said recess, and a relatively thin punched member of insulating material located within said recess and positioned above the tips of the respective pairs of contacts but below said toggle element and said spring, whereby passage of electric arcs from said contact tips to said toggle element and said spring is prevented.

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