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ELECTRIC SNAP SWITCH

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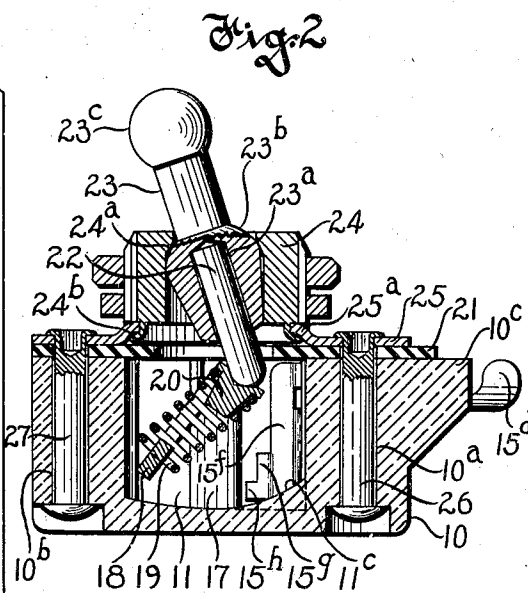
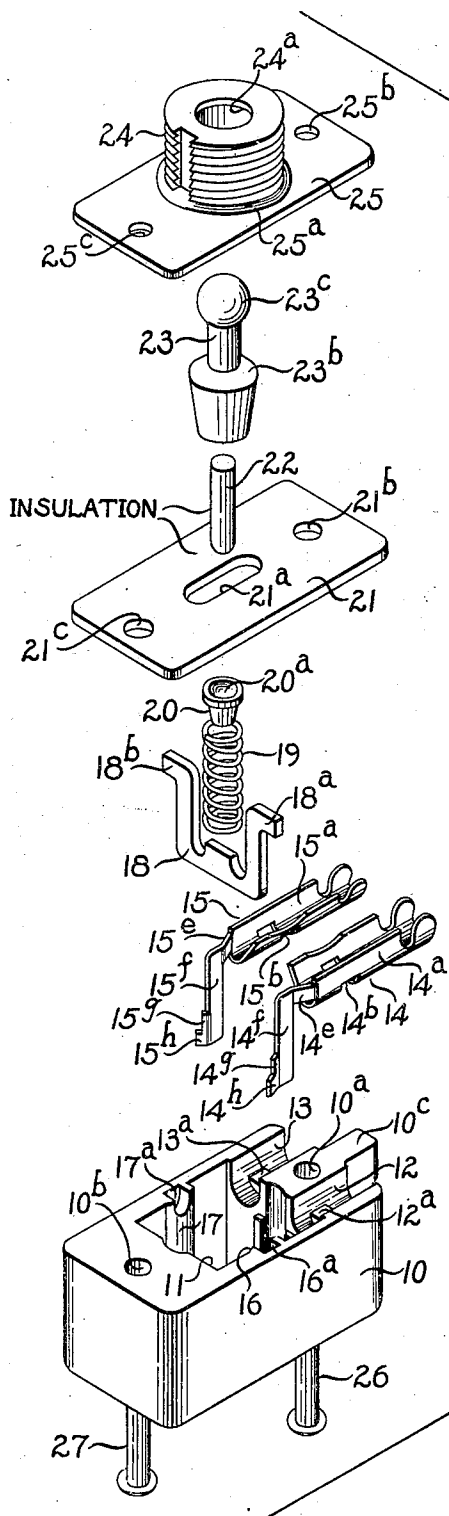


Fig. 1

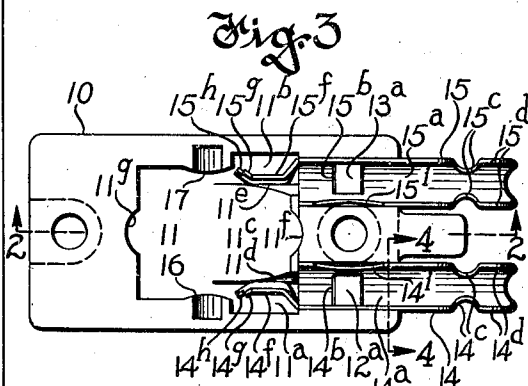
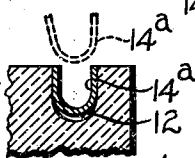


Fig. 4



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ELECTRIC SNAP SWITCH

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This invention relates to improvements in electric snap switches, and more particularly to toggle lever operated switches adapted for one hole mounting.

6 An object of the invention is to provide an electric snap switch of diminutive size for use with portable electrical appliances wherein the allowable space for the circuit controlling mechanism is extremely limited.

10 Another object is to provide a switch of the aforementioned character having an unusually high rating or current controlling capacity whereby the same may be employed in lieu of the larger and more expensive
15 switches of the prior art.

Another object is to generally improve the form and arrangement of the parts of switches of the aforementioned character whereby the above objects are attained.

20 Another object is to provide a movable contactor and combined stationary contact and terminal members of novel form, in conjunction with novel means for supporting the same in cooperative relationship to
25 each other.

Another object is to provide a substantially enclosed chamber for the stationary and movable contact elements of the snap switch, together with a novel form of insulating actuator for the movable contact whereby liability of grounding any of the current carrying parts is practically eliminated.

30 Another and more specific object is to minimize the number of parts of the snap switch as a whole and to facilitate the assembling of such parts.

Other objects and advantages of the invention will hereinafter appear.

40 The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that the embodiment illustrated is susceptible of modification in certain details of construction
45 thereof without departing from the scope of the appended claims.

In the drawing;

Figure 1 is an enlarged perspective view, in separated relation, of the several parts
50 of a toggle type snap switch, adapted for

one-hole mounting, as constructed in accordance with my invention.

Fig. 2 is a vertical sectional view, on the line 2—2 of Fig. 3,—but showing all of the snap switch parts in assembled position. 55

Fig. 3 is a top plan view of the insulating base illustrated in Figs. 1 and 2, and with the one-piece combined contact and terminal members shown in position, and

Fig. 4 is a fragmentary sectional view, on the line 4—4 of Fig. 3, and illustrating in dotted lines the initial cross sectional form of the terminal portion of one of the combined contact and terminal members. 60

Referring to the drawing, the numeral 10 65 designates a base formed of any suitable insulating material,—such material preferably being of the phenol-formaldehyde condensation type sold commercially under the trade name of "bakelite". Said base is
70 preferably of rectangular form as illustrated, and the same is provided with a relatively deep substantially rectangular recess 11 which opens to the upper surface thereof. As best illustrated in Fig. 3 the recess 11 75

is somewhat enlarged at one end thereof to provide the lateral pockets 11^a, 11^b which provide clearance for the flared ends of the resilient stationary contact elements of the switch. Base 10 is provided in its upper 80 surface with a pair of spaced parallel grooves 12 and 13 of substantially U-shape in cross section, said grooves having integral projections which preferably are in the form of straight-sided ribs 12^a, 13^a extending between the side walls of said
85 grooves at like points intermediate the length thereof. I prefer to employ a pair of one-piece combined contact and terminal members of the form best illustrated 90 at 14 and 15 in Fig. 1. The terminal portions 14^a, 15^a of said members are likewise of substantially U-shape in cross section,—the side walls of said terminal portions being initially slightly spread as shown in
95 Fig. 1, and as better illustrated in dotted lines in Fig. 4, to require a press fit thereof within said grooves in a relation substantially flush with the upper surface of base 10. Also as best illustrated in Fig. 4 the 100

grooves 12, 13 are of somewhat greater depth than the depth of the terminal portions 14^a, 15^a so that the latter must be held within said grooves under compression. Portions 14^a, 15^a are provided with openings 14^b, 15^b the edges of which fit rather closely against the straight sides of projections 12^a, 13^a to prevent substantial endwise displacement of said terminal portions in either direction within said grooves.

Said terminal portions 14^a, 15^a extend rearwardly beyond the end wall of base 10, and the side walls thereof are notched as indicated at 14^c, 15^c to provide end lugs 14^d, 15^d which may be pressed toward each other (as by means of a pair of pliers) after insertion of the circuit wires to clamp the latter in position and facilitate soldering thereof to said terminal portions. Notches 14^c, 15^c may also serve to accommodate the ends of circuit wires brought in at right angles to the terminal portions 14^a, 15^a for soldering thereof to the latter.

Formed integrally with the respective outer side walls of the terminal portions 14^a, 15^a and projecting forwardly at points spaced downwardly from the upper edges of the latter are the connecting portions 14^e, 15^e which are bent inwardly toward each other as shown to provide for positioning of the downwardly extending resilient contact portions 14^f, 15^f in planes intersecting the centers of the bottom walls of terminal portions 14^a, 15^a. Contact portions 14^f, 15^f extend downwardly at angles slightly convergent toward each other, and the bottom wall of recess 11 is provided with a projection 11^c against the opposite sides 11^a and 11^b of which the lower ends of said contact portions are adapted to yieldably abut to insure a predetermined minimum space relation therebetween. As best illustrated in Fig. 2 the lower ends of contact portions 14^f and 15^f are spaced a sufficient distance above the bottom wall of recess 11 to permit said ends to yield outwardly under the impact or pressure of the bridging contactor. Said lower ends of the contact portions 14^f and 15^f are respectively provided with forward projections 14^g, 14^h and 15^g, 15^h arranged in downwardly stepped relation to each other, and said projections are bent outwardly at an angle to said contact portions to facilitate movement of the contactor therebetween.

The recess 11 is provided in its opposite side walls with a pair of vertical ribs 16 and 17, said ribs having open bearings 16^a and 17^a formed in the upper ends thereof. The contactor consists of a flat punched sheet metal member 18 of substantially U-shape, the arms of said member having outward extensions 18^a and 18^b adapted to seat within said bearings. Upon oscillation of member 18 the arms thereof move in very close proximity to the surfaces of ribs 16 and 17.

Also as best illustrated in Fig. 3 the tips 14^h, 15^h at the lower ends of the contact portions are positioned at one side of ribs 16 and 17 respectively and slightly behind the outer surfaces of the latter. It follows that upon circuit interrupting movement of contactor 18 the same will transiently engage the flared projections 14^g, 15^g and any arcs formed incident to separation of the contactor will be drawn from the tips 14^h, 15^h; whereas due to the positioning of the latter the arcs so formed will be drawn by the contactor across the surfaces of the ribs 16 and 17, thus providing for cooling of such arcs for rapid extinguishment of the same.

In this connection I desire to point out that Figs. 2 and 3 are drawn to a scale of three times the actual size of the switch; and to the aforementioned structural details affording the arc minimizing and arc extinguishing characteristics I attribute the success of my switch in properly controlling currents of relatively high value. Thus the switch herein disclosed has a standard rating of 3 amperes—250 volts or 6 amperes—125 volts. Other structural details of the combination of course contribute to attainment of the desired results. Thus, I am enabled to employ an oscillatable contactor having a relatively small amount of inertia, whereby the speed thereof under the driving force of spring 19 is very rapid.

The lower end of spring 19 engages an abutment of usual form. Fitted into the upper end of spring 19 is an abutment member 20, which is preferably machined in the manner illustrated to provide a dished or cone-shaped upper surface 20^a. Adapted to overlie the upper surface of base 10 is a flat punched plate 21 of fiber or other suitable insulating material, said plate being adapted to substantially close the open upper end of recess 11, and said plate having a relatively narrow slot 21^a extending longitudinally thereof to provide clearance for an insulating plunger or pin 22 and to guide and limit the latter for movement thereof in a single plane,—pin 22 being preferably of cylindrical form as illustrated, and the same having a convex lower end for proper bearing engagement thereof with the abutment member 20.

The upper portion of pin 22 is somewhat loosely fitted into the cylindrical recess 23^a formed in the lower end of a manually operable toggle lever 23. Lever 23 is provided with a rounded or hemispherical enlargement 23^b which is adapted to bear against the annular internal shoulder 24^a formed in the externally threaded metal bushing 24. Bushing 24 is provided at its lower end with a flange 24^b which extends through an opening of corresponding size provided in the metal top plate,—said plate being bulged or offset around said opening as shown at 25^a

in Fig. 2 and said flange being upset over the under surface of said bulged portion to rigidly and permanently secure said parts to each other.

Base 10 is provided with passages 10^a and 10^b extending upwardly therethrough at opposite ends thereof to accommodate the shanks of suitable securing elements such as the rivets 26 and 27, the base being provided with recesses or countersinks as shown in Fig. 2 to accommodate the rivet heads. Insulating plate 21 is provided with openings 21^b and 21^c and metal top plate 25 is provided with openings 25^b and 25^c to respectively receive the hollow upper ends of rivets 26 and 27, said ends being upset as shown in Fig. 2 to rigidly and permanently secure all of the switch parts in assembled relation. The insulating plate 21 will thus be clamped in position by the metal top plate 25, and said insulating plate 21 will in turn act to clamp the combined contact and terminal members 14 and 15 in position.

As shown in Figs. 1 and 3 the adjacent walls of the U-shaped terminal portions 14^a, 15^a are cut away slightly at the points 14ⁱ, 15ⁱ to provide proper electrical clearance between the same and rivet 26. If desired, of course, the openings 25^b, 25^c in metal top plate 25 may be tapped to receive the shanks of screws as substitutes for the rivets 26, 27; but I prefer to employ the arrangement illustrated whereby accidental separation of the switch parts is insured against.

Base 10 may have formed integrally therewith the end extension 10^c to form an insulating barrier between the outer ends of the terminal portions 14^a, 15^a and the circuit wires connected thereto.

As will be understood the spring 19 is at all times compressed to a suitable degree whereby the same exerts a downward force to retain the contactor 18 in its bearings while at the same time exerting an upward pressure to retain the enlargement 23^b of lever 23 in bearing engagement with the flange 24^a of bushing 24. Moreover, it will be apparent that the lower end of lever 23 is of such size as to engage the upper surface of plate 21 upon a slight downward displacement of said lever. The arrangement is therefore such that all grounded parts of the device are at all times located outside of the switch chamber.

Lever 23 is preferably provided at the outer end thereof with a knob 23^c, said knob being freely insertable upwardly through the bushing 24. Due to the interfitting relationship between the insulating pin 22 and lever 23 the latter is likewise limited to oscillatory movement in a single plane. The end walls of recess 11 are preferably provided with vertical grooves 11ⁱ and 11^j of arcuate cross section to provide proper clearance for the lower end of spring 19.

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

1. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, said base having a pair of spaced grooves formed in said upper surface at one end thereof and communicating with said recess, said grooves being of substantially U-shape in cross section, a pair of one-piece combined contact and terminal members, the terminal portions of said members being also of substantially U-shape and the sides thereof being initially slightly spread to provide for a press fit thereof within the respective grooves in a relation substantially flush with the upper surface of said base, said terminal portions having openings formed in the bottom walls thereof, said grooves having projections formed integrally with the bottom walls thereof and adapted to engage the walls of said openings, and an insulating plate secured to the upper surface of said base and having clamping engagement with the upper edges of said terminal portions.

2. In an electric snap switch, in combination, a molded insulating base having a recess, a plurality of resilient stationary contacts secured to said base and having the free end portions thereof located within said recess, said end portions being normally biased toward each other and said recess having abutments formed in the walls thereof and engaged by said end portions for positive spacing of the latter, said recess having a pair of vertical ribs formed in the opposite side walls thereof respectively, said ribs having open bearings formed in the upper ends thereof, and a flat punched sheet metal contactor of substantially U-shape adapted to pivotally engage said bearings, the arms of said contactor being movable in close proximity to said ribs into and out of engagement with said stationary contacts whereby any arcs formed incident to separation of said contactor from said contacts are drawn across said ribs to cool said arcs and assist in extinguishing the same.

3. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, spaced grooves formed in the upper surface of said base and communicating with said recess, a plurality of one-piece combined contact and terminal members the terminal portions of which are insertable with a press fit into said grooves in a relation substantially flush with said upper surface and the resilient contact portions of which extend downwardly into said recess, the free ends of said contact portions being normally biased toward each other and said recess having abutments formed

therein to retain said ends in definitely spaced relation, said recess having a pair of vertical ribs formed in the opposite side walls thereof, the free ends of said contact portions being flared to extend behind said ribs respectively, said ribs having open bearings formed in the upper ends thereof, and a U-shaped flat punched sheet metal contactor oscillatably supported within said bearings, the side edges of said contactor being movable in close proximity to said ribs into and out of engagement with said contacts.

4. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, spaced grooves formed in the upper surface of said base and communicating with said recess, a plurality of one-piece combined contact and terminal members the terminal portions of which are insertable with a press fit into said grooves in a relation substantially flush with said upper surface and the resilient contact portions of which extend downwardly into said recess, the free ends of said contact portions being normally biased toward each other and said recess having abutments formed therein to retain said ends in definitely spaced relation, said recess having a pair of vertical ribs formed in the opposite side walls thereof, the free ends of said contact portions being flared to extend behind said ribs respectively, said ribs having open bearings formed in the upper ends thereof, a U-shaped flat punched sheet metal contactor oscillatably supported within said bearings, the side edges of said contactor being movable in close proximity to said ribs into and out of engagement with said contacts, a coiled compression spring having one end thereof in engagement with said contactor, an abutment member at the other end of said spring, a relatively thin flat plate of insulating material overlying said recess and substantially closing the same, said plate having a relatively narrow slot formed therein and extending longitudinally thereof, a manually operable lever pivotally supported above said base, and an insulating member extending from said lever through said slot into engagement with said spring abutment member to provide for snap movements of said contactor to opposite extreme positions respectively upon corresponding movements of said lever.

5. In an electric snap switch, in combination, a molded insulating base having a recess, resilient stationary contacts located within said recess, a flat punched sheet metal contactor pivoted directly upon the side walls of said recess, and means for effecting snap movements of said contactor into and out of bridging engagement with said con-

tacts, said means comprising a coiled compression spring having one end thereof in engagement with said contactor, an abutment member fitted into the other end of said spring, a relatively thin plate of insulating material overlying said base and adapted to substantially close said recess, said plate having a relatively narrow slot extending longitudinally thereof, an insulating rod having one end thereof extending through said slot and engaging said abutment member, a manually operable lever having a socket to receive the other end of said rod, and a bushing providing a ball and socket bearing for said lever, said spring acting to retain said lever and said contactor within their respective bearings.

6. In an electric snap switch, in combination, a molded insulating base having a recess, resilient stationary contacts located within said recess, a flat punched sheet metal contactor pivoted directly upon the side walls of said recess, and means for effecting snap movements of said contactor into and out of bridging engagement with said contacts, said means comprising a coiled compression spring having one end thereof in engagement with said contactor, an abutment member fitted into the other end of said spring, a relatively thin plate of insulating material overlying said base and adapted to substantially close said recess, said plate having a relatively narrow slot extending longitudinally thereof, an insulating rod having one end thereof extending through said slot and engaging said abutment member, a manually operable lever having a socket to receive the other end of said rod, a bushing providing a ball and socket bearing for said lever, said spring acting to retain said lever and said contactor within their respective bearings, the walls of said slot acting to limit said insulating rod and said lever to movements in a single plane, and said insulating plate also acting to prevent substantial downward displacement of said lever from said bearing socket.

7. In an electric snap switch, in combination, a molded insulating base having a recess opening to the upper surface thereof, said base having a pair of grooves of substantially U-shape in cross section formed in said upper surface and communicating with said recess, a pair of combined contact and terminal members the terminal portions of which are of U-shape in cross section and initially formed to require a press fit thereof within said grooves, an insulating top plate secured to said base and having clamping engagement with said terminal portions to retain the latter in assembled position, the contact portions of said members extending downwardly within said recess and being spaced from the bottom wall of the latter, said contact portions being resiliently biased

toward each other and the bottom wall of said recess having abutments formed thereon to be engaged by said contact portions whereby the latter are normally maintained in predetermined spaced relation, a flat punched sheet metal contactor pivotally supported directly by said base and movable into and out of bridging relation to said contact portions, and a pair of ribs formed integrally with the opposite side walls of said recess and in close proximity to which said contactor is adapted to move, whereby arcs drawn between said contactor and said contacts are quickly cooled and extinguished by engagement thereof with said ribs.

8. In an electric snap switch, in combination, a molded insulating base having a recess, a pair of resilient stationary contacts secured to said base and having the free ends thereof biased toward each other and spaced from the bottom wall of said recess, abutments formed on said bottom wall and engaged by said free ends to insure a predetermined spacing of the latter, a pair of vertical ribs formed on the respective side walls of said recess intermediate the length of the latter, said free ends of the contacts having flared tips extending behind said ribs at one side of the latter respectively, said ribs having open bearings formed therein at the upper ends thereof, a U-shaped sheet metal contactor having lateral projections pivotally engaging said bearings, the arms of said contactor being movable in close proximity to said ribs into and out of engagement with said contacts, a flat plate of insulating material overlying the upper surface of said base and adapted to substantially close said recess, said plate having a relatively narrow slot formed therein and extending longitudinally thereof, a metal top plate overlying said insulating plate, an externally threaded hollow metal bushing secured to said metal top plate, said bushing having an internal annular shoulder forming a socket, a manually operable lever having an enlargement adapted to bear within said socket, an insulating element extending from said lever through said slot and limited by the side walls of the latter to movement in a single plane, and a coiled compression spring interposed between said insulating element and said contactor to effect snap movements of the latter into and out of engagement with said contacts upon corresponding movements of said lever.

9. In an electric snap switch, in combination, a molded insulating base having a recess, a flat punched plate of insulating material overlying said base and adapted to substantially close said recess, said plate having a relatively narrow slot extending longitudinally thereof, a metal top plate overlying said insulating plate, means for securing said top plate to said base and in

clamping engagement with said insulating plate, an externally threaded hollow metal bushing carried by said top plate, said bushing having an internal annular flange, a manually operable lever having an enlargement adapted to bear against said flange, said lever having a cylindrical recess in the lower end thereof, a cylindrical rod of insulating material located within said recess and having a portion projecting therefrom to be guided by the side walls of said slot whereby said lever is limited to oscillatory movement in a single plane, stationary and movable contact elements located within said recess, said movable contact being pivotally supported by the walls of said recess for oscillatory movement into and out of engagement with said stationary contacts, and a coiled compression spring interposed between said insulating rod and said movable contact to effect snap movements of the latter upon corresponding movements of said lever.

10. In an electric snap switch, in combination, a molded insulating base having a recess, a flat punched plate of insulating material overlying said base and adapted to substantially close said recess, said plate having a relatively narrow slot extending longitudinally thereof, a metal top plate overlying said insulating plate, means including a pair of headed rivets adapted to penetrate corresponding openings in said base, said insulating plate and said top plate and upset over the latter to secure said parts in assembled relation, an externally threaded hollow metal bushing carried by said top plate, said bushing having an internal annular flange, a manually operable lever having an enlargement adapted to bear against said flange, said lever having a cylindrical recess in the lower end thereof, a cylindrical rod of insulating material located within said recess and having a portion projecting therefrom to be guided by the side walls of said slot whereby said lever is limited to oscillatory movement in a single plane, stationary and movable contact elements located within said recess, said movable contact being pivotally supported by the walls of said recess for oscillatory movement into and out of engagement with said stationary contacts, a coiled compression spring interposed between said insulating rod and said movable contact to effect snap movements of the latter upon corresponding movements of said lever, said spring acting to normally retain said enlargement in bearing engagement with said flange, and said insulating plate acting to prevent substantial downward displacement of said lever whereby said switch recess is at all times freed from the presence of grounded elements.

11. In an electric snap switch, in combination, a molded insulating base having a recess, a pair of one-piece combined contact

and terminal members having the terminal portions thereof secured to the upper surface of said base and having the resilient contact portions thereof extending downwardly into said recess, the lower ends of said contact portions being normally biased toward each other, the bottom wall of said recess having abutments formed thereon for engagement by said lower ends to insure a predetermined space relation of the latter, said lower ends of the contact portions having forward edge extensions which are bent outwardly at an angle to each other to facilitate movement of a bridging contactor into engagement therewith, said lower ends having additional forward edge extensions located below and in stepped relation to said first mentioned extensions, said additional extensions acting as arcing tips for said contact portions, and a flat punched sheet metal contactor pivotally supported directly by the walls of said recess and movable into and out of engagement with said contact portions, said arcing tips being most closely adjacent to the side edges of said contactor after final separation thereof from said contact portions.

12. As an article of manufacture, a one-piece combined contact and wiring terminal member for electric snap switches, said member having a wiring terminal portion of substantially U-shape in cross section, the side walls of said terminal portion being notched to provide lugs bendable into clamping engagement with a circuit wire, whereby soldering of the wire to said terminal portion is facilitated, and said terminal portion also having an opening formed in the bottom wall thereof, the walls of said opening being adapted for engagement with shoulders formed on a suitable support, whereby endwise movement of said terminal portion is prevented upon clamping thereof in assembled position.

13. As an article of manufacture, a one-piece combined contact and wiring terminal member for electric snap switches, said member having a wiring terminal portion of substantially U-shape in cross section, the side walls of said terminal portion being notched to provide lugs bendable into clamping engagement with a circuit wire, whereby soldering of the wire to said terminal portion is facilitated, said terminal portion also having an opening formed in the bottom wall thereof, the walls of said opening being adapted for engagement with shoulders formed on a suitable support, whereby endwise movement of said terminal portion is prevented upon clamping thereof in assembled position, and a resilient contact portion formed integrally with one side wall of said terminal portion and projecting downwardly at substantially right angles to the latter, said contact portion being of increased width at the lower end thereof, and

said end being bent in the line of the forward edge of said contact portion to facilitate engagement therewith of a movable contactor of suitable form.

14. As an article of manufacture, a one-piece combined contact and wiring terminal member for electric snap switches, said member having a wiring terminal portion of substantially U-shape in cross section, the side walls of said terminal portion being notched to provide lugs bendable into clamping engagement with a circuit wire, whereby soldering of the wire to said terminal portion is facilitated, said terminal portion also having an opening formed in the bottom wall thereof, the walls of said opening being adapted for engagement with shoulders formed on a suitable support, whereby endwise movement of said terminal portion is prevented upon clamping thereof in assembled position, and a resilient contact portion formed integrally with one side wall of said terminal portion and projecting downwardly at substantially right angles to the latter, said contact portion being offset inwardly from said side wall to extend in a plane intersecting the center of the bottom wall of said terminal portion, said contact portion having forward extensions arranged in stepped relation at the lower end thereof, and said end being bent in the line of the forward edge of said contact portion to facilitate engagement therewith of a movable contactor of suitable form.

In witness whereof, I have hereunto subscribed my name.

ALVIN W. KRIEGER.