Oct. 20, 1931. G. J. MEUER 1,828,059

ELECTRIC SNAP SWITCH

Filed Oct. 7, 1929

Fig. 1

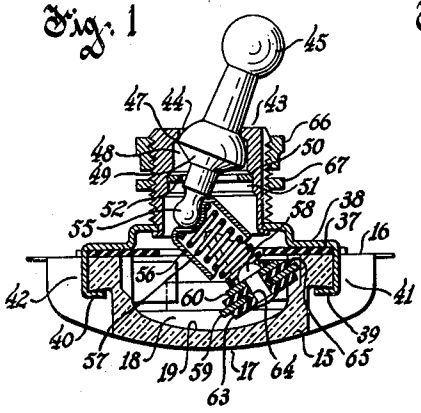


Fig. 2

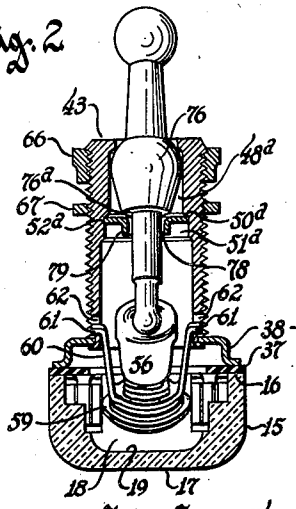


Fig. 3

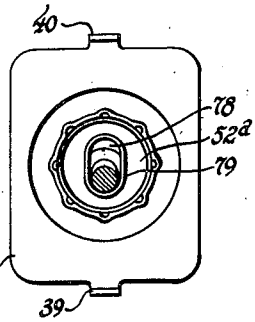


Fig. 3a

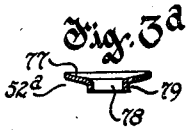


Fig. 4

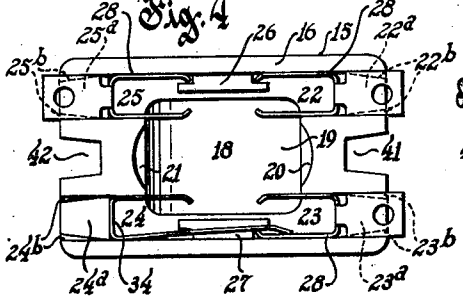


Fig. 5

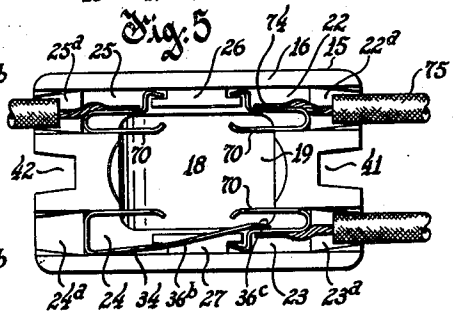


Fig. 6

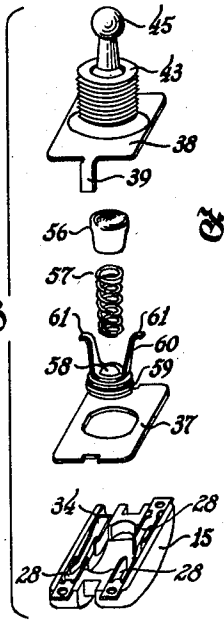


Fig. 7

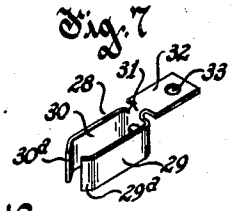


Fig. 8

Fig. 9

Fig. 12

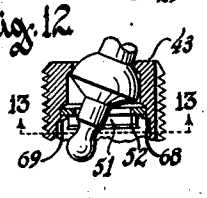


Fig. 10

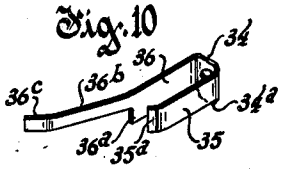


Fig. 11

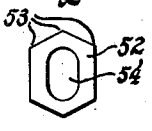
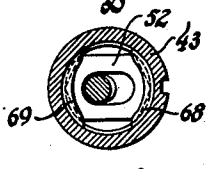


Fig. 13



Inventor

George J. Meuer

By Fauler & Stubbard

Attorney

Patented Oct. 20, 1931 1,828,059

UNITED STATES PATENT OFFICE

GEORGE J. MEUER, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO CUTLER-HAMMER, INC., OF MILWAUKEE, WISCONSIN, A CORPORATION OF DELAWARE

ELECTRIC SNAP SWITCH

Application filed October 7, 1929. Serial No. 397,828.

This invention relates to improvements in electric snap switches, and more particularly to switches of the toggle type adapted for one-hole panel mounting.

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

Another object is to provide improved supporting means for the oscillatable actuating lever of the switch.

Another object is to provide improved forms of stationary contacts and supporting means therefor.

Another object is to provide simple means enabling production of a three-point or multiple circuit controlling switch.

Another object is to provide novel means for positively initiating actuation of the movable contactor of the switch.

Another object is to minimize the amount of material required for production of the stationary contacts of the switch.

Other objects and advantages of the invention will hereinafter appear.

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

In the drawings, Figure 1 is a vertical sectional view of a switch constructed in accordance with my invention.

Fig. 2 is a vertical sectional view of a modified form of switch embodying my invention,—the section being taken in a plane at right angles to the section in Fig. 1.

Fig. 3 is a bottom plan view of the metallic cover plate and bushing of Fig. 2,—the actuating toggle lever being shown in assembled relation.

Fig. 3ª is a sectional view of the supporting and guiding plate of Figs. 2 and 3 in its initial form.

Fig. 4 is a top plan view of the molded insulating base having therein a form of stationary contact and terminal members to adapt the switch to external wiring.

Fig. 5 is a similar view of the base, but showing a modified form of contacts having lead wires attached thereto.

Fig. 6 is an exploded perspective view of the switch parts shown in Figs. 1 and 4.

Fig. 7 is a perspective view of one of the combined stationary contact and terminal members shown in Fig. 4.

Figs. 8 and 9 are perspective and side elevational views, respectively, of one of the contact members shown in Fig. 5.

Fig. 10 is a perspective view of a form of contact common to Figs. 4 and 5 whereby a switch of the three-point type is provided.

Fig. 11 is a plan view of the supporting and guiding plate for the actuating lever shown in Fig. 1.

Fig. 12 is a fragmentary sectional view similar to Fig. 1 but showing additional means for securing the guiding and supporting plate in position, and

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

Referring to the drawings, the numeral 15 designates the molded insulating base of the switch. Said base as shown is preferably of elongated substantially rectangular contour, having a flat upper face 16 and a longitudinally curved lower face 17.

Base 15 is provided with a centrally arranged relatively deep and substantially rectangular recess 18 the bottom wall 19 of which is curved longitudinally, as best illustrated in Fig. 1.

The longitudinally spaced end walls of recess 18 are provided with vertical notches the curved walls 20 and 21 of which are adapted to accommodate the movable switch contactor, as hereinafter more fully described.

Adjacent to each of the four corners of base 15 are the relatively smaller and shallower substantially rectangular recesses 22, 23, 24 and 25, and leading outwardly from said recesses are substantially semicircular channels or grooves 22ª, 23ª, 24ª and 25ª, respectively. Between the longitudinally spaced pairs of recesses 22—25 and 23—24 are substantially T-shaped abutments 26 and 27,—said abutments being terminated in a plane a considerable distance below the face 16 of the base.

As shown, each of said smaller recesses opens on two sides thereof into the larger recess 18, and frictionally engaging the side walls of said smaller recesses are the stationary contacts of the switch. Three of the resilient metal contacts 28 shown in Figs. 1, 2, 4 and 6 are of the form best illustrated in Fig. 7, and comprise essentially the integrally connected parallel arms 29 and 30 the free ends 29^a, 30^a of which are bent toward each other. One of said arms extends within a vertical channel formed by one of the abutments 26 or 27, the other arm being exposed within the recess 18.

Integral with and extending upwardly and then rearwardly from the arms 29, 30 is a narrow neck portion 31, and integral with and extending rearwardly from said neck portion is a wiring terminal portion 32,—said portion 32 having the usual perforation 33 through which a terminal wire may be looped prior to soldering thereof.

Adjacent to the upper ends of channels 22^a, 23^a, etc. are pairs of shallow ledges 22^b, 23^b, etc. upon which the terminal portions 32 are adapted to seat,—thus insuring positioning of the contacts with the lower edges thereof a substantial distance above the bottom walls of the respective recesses. The exposed arms of said contacts are therefore free to flex laterally under the impact of the movable bridging contactor of the switch.

The other stationary contact 34 of the switch is of the special form best illustrated in Fig. 10, and comprises essentially a reflexed metal strip having spaced substantially parallel arms 35 and 36,—the free end 35^a of arm 35 being bent inwardly to facilitate sliding engagement of the movable contactor therewith. The lower corner 36^a of arm 36 is adapted to extend within one of the vertical channels formed by abutment 27 (Fig. 4),—the relatively narrow extension 36^b of arm 36 being bent outwardly at an angle to the latter and having an outwardly angled tip 36^c which is biased into engagement with the inner surface of the outer arm of the longitudinally opposed contact 28 upon assembly of the parts.

As will be noted the upper edge of the arm 35 of contact 34 is spaced downwardly from the other edge portions of the latter which are adapted to extend flush with the face 16 of the base 15. Contact 34 is likewise provided with a downward projection 34^a which seats upon the bottom wall of recess 24. By this means the arm 35 of the contact is likewise free to flex laterally under the impact of the movable contactor of the switch.

Overlying all of the recesses in the base is a perforated plate 37 of fiber or other insulating material, said plate being held by the perforated metal cover plate 38 in clamping engagement with the terminal portions of contacts 28 and the upper edge portion of contact 34 to retain said contacts in assembled relation to the base. Plate 38 is preferably provided with integral lugs or projections 39 and 40 adapted to be bent into engagement with the undercut shoulders formed in notches or channels 41 and 42 in base 15, whereby said parts are secured to each other.

Rigidly secured to the cover plate 38 in a well known manner is an externally threaded hollow metal bushing 43 having a bore with portions of different dimensions. Thus the portion 44 at the upper end of the bushing is sufficiently large to permit free upward passage of the handle portion 45 of the actuating toggle lever, said lever having an enlargement intermediate its length; the upper hemispherical surface 46 of said enlargement being adapted to bear against the tapered annular flange 47 formed between the portion 44 and the portion 48 of larger diameter adjacent thereto.

The lower surface 49 of said enlargement is preferably of frusto-conical shape, as shown in Fig. 1, and seated against a shoulder 50 formed between the portions 48 and 51 of the bore is a perforated flat metal plate 52. Plate 52 is preferably of slightly larger dimensions than the portion 51 of the bore, so that a press fit of the former within the latter is provided for, said plate being preferably provided with sharp corners 53 to bite into the wall of said bore. Plate 52 is thus adapted to restrain the toggle lever against substantial downward displacement.

Moreover, the perforation in plate 52 is preferably in the form of a relatively narrow or elliptical slot 54 whereby oscillation of the lever is permitted, but is substantially limited to a single plane. The lower end 55 of the lever is preferably rounded as shown and the same is adapted to bear within the closed and indented or depressed end of a substantially cup-shaped metal member 56 which encloses the upper portion of a spiral compression spring 57.

The lower end of said spring engages the head 58 of a rivet which is adapted to secure the bridging contactor 59 to a substantially U-shaped carrier 60, said carrier having arms the ends 61 of which are sprung into alined bearing openings 62 adjacent to the lower end of the bushing. The contactor 59 is insulated from the carrier and from the securing rivet as by means of insulating disks 63, 64 and 65,—this contactor and carrier assembly being more specifically described in my copending application Serial No. 319,943, filed Nov. 16, 1928.

The switch is provided with the usual clamping nuts 66 and 67 to provide for one-hole mounting thereof upon a panel or the like. With all parts of the switch in assembled relation as aforedescribed it will be seen that snap movement of the bridging con-

tactor from each extreme position to the other is effected upon corresponding oscillatory movements of the actuating lever.

Moreover, it will be noted that the cup-shaped member 56 is adapted for cooperative engagement with lower end of the bushing upon each oscillation of the lever, whereby movement of the carrier from each of its extreme positions is positively initiated. By this means the difficulties incident to sticking or "freezing" of the cooperating switch contacts and undue buckling of the spring are effectively overcome.

In Figs. 12 and 13 I have shown means for more rigidly or permanently securing the plate 52 within bushing 43. Thus after effecting the drive fit of plate 52 within the portion 51 of the bore and against shoulder 50, I preferably insert a suitable tool (not shown) to upset or curl inwardly certain portions of the wall of the bore, said upset portions 68 and 69 being pressed against the lower face of plate 52 at opposite ends thereof to permanently secure the latter in position.

Three of the stationary contacts 70 shown in Fig. 5 are of the form best illustrated in Figs. 8 and 9. Said contacts comprise essentially a reflexed resilient metal strip having an arm 71 to be exposed for cooperation with the bridging contactor of the switch, and an arm 72 substantially parallel with the arm 71. The end of arm 71 is bent inwardly as shown at 71^a, whereas the end 72^a which is of less width than the arm 72 is bent outwardly at substantially right angles to the latter and then inwardly at an angle less than ninety degrees as shown at 72^b to provide a sort of hook for engagement with the aforementioned abutments 26 or 27 in the base 15.

Contacts 70 are perforated as shown at 73 to increase the flexibility thereof. The exposed end 74 of a conductor 75 is adapted to be welded, brazed, soldered or otherwise secured to the outer surface of arm 72 of the respective contacts prior to insertion thereof within the base recesses. As best shown in Fig. 9, the arm 72 is provided with lower and upper projecting edges 72^d and 72^c for engagement with the bottom wall of its cooperating recess and with the insulating clamping plate, whereby the contacts are properly secured in position while providing for lateral flexure of the arms 71 of said contacts.

The switch shown in section in Fig. 2 is in many respects identical with that aforedescribed. However, a bushing of greater length is employed in the switch of Fig. 2, and this necessitates use of a lever of correspondingly increased length. The enlargement 76 on the lever is also of slightly different form, and the portion 48^a of the bore is of slightly greater length to accommodate said enlargement.

The supporting and guiding plate 52^a of Figs. 2, 3 and 3^a is preferably of circular form, and as shown at 77 in Fig. 3^a the same is initially slightly dished or concave to permit ready insertion thereof within the portion 51^a of the bore and against the shoulder 50^a. Thereafter the plate 52^a is flattened out by means of a suitable pressing tool, thereby increasing the diameter of the piece to cause binding engagement of the periphery thereof with the wall of the bore.

Plate 52^a when thus positioned is adapted for engagement by the lower surface 76^a of the enlargement to prevent substantial downward displacement of the lever with respect to the bushing. The guiding slot 78 in said plate is preferably provided with a flange 79 extending vertically downward, said flange being adapted to prevent deformation of the slot during the pressing operation and to further assist in guiding the lever.

The fourth contact 34 shown in Fig. 5 is identical with that aforedescribed and performs a like function. It will be apparent that by omitting the two contacts from the recesses 24, 25 at the right hand end of Figs. 4 and 5 a single pole switch may be provided. Similarly, by substituting for the contact 34 in Figs. 4 and 5 another contact 28 or 70, respectively, a two circuit switch may be provided.

Also it will be understood that the longitudinally opposed stationary contacts at the lower side of Figs. 4 and 5 might be made from a single piece of metal, or otherwise rigidly united.

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

1. In an electric snap switch of the toggle type, in combination, a shallow molded insulating base of elongated substantially rectangular contour, a centrally located substantially rectangular recess in the upper face of said base, a relatively smaller and shallower recess at each of the four corners of said base and opening laterally to said first mentioned recess, substantially U-shaped resilient contact members positioned edgewise within and frictionally engaging the walls of three of said smaller recesses, channels leading outwardly from each of said last mentioned recesses, ledges formed in said channels, wiring terminal portions integral with the respective contacts, said terminal portions being adapted to seat upon said ledges to insure a predetermined spacing of said contacts with respect to the bottom walls of the respective recesses, and a contact positioned within the other of said smaller recesses, said last mentioned contact having an integral angular extension biased by its resiliency into engagement with an outer arm of one of said first mentioned contacts.

2. In an electric snap switch of the toggle type, in combination, a shallow molded insulating base of elongated substantially rec-

tangular contour, a centrally located substantially rectangular recess in the upper face of said base, a relatively smaller and shallower recess at each of the four corners of said base and opening laterally to said first mentioned recess, substantially U-shaped resilient contact members positioned edgewise within and frictionally engaging the walls of three of said smaller recesses, channels leading outwardly from each of said last mentioned recesses, ledges formed in said channels, wiring terminal portions integral with the respective contacts, said terminal portions being adapted to seat upon said ledges to insure a predetermined spacing of said contacts with respect to the bottom walls of the respective recesses, a contact positioned within the other of said smaller recesses, said last mentioned contact having an integral angular extension biased by its resiliency into engagement with an outer arm of one of said first mentioned contacts, and substantially T-shaped abutments integral with said insulating base and located between each pair of longitudinally spaced recesses, the outer arms of each of said contacts being arranged to engage one of said abutments to assist in maintaining said contacts in assembled relation to said base.

3. In an electric snap switch of the toggle type, in combination, a shallow molded insulating base of elongated substantially rectangular contour, a centrally located substantially rectangular recess in the upper face of said base, a relatively smaller and shallower recess at each of the four corners of said base and opening laterally to said first mentioned recess, substantially U-shaped resilient contact members positioned edgewise within and frictionally engaging the walls of three of said smaller recesses, channels leading outwardly from each of said last mentioned recesses, ledges formed in said channels, wiring terminal portions integral with the respective contacts, said terminal portions being adapted to seat upon said ledges to insure a predetermined spacing of said contacts with respect to the bottom walls of the respective recesses, a contact positioned within the other of said smaller recesses, said last mentioned contact having an integral angular extension biased by its resiliency into engagement with an outer arm of one of said first mentioned contacts, substantially T-shaped abutments integral with said insulating base and located between each pair of longitudinally spaced recesses, the outer arm of each of said contacts being arranged to engage one of said abutments to assist in maintaining said contacts in assembled relation to said base, a perforated insulating plate overlying said base, and a metallic cover member secured to said base and adapted to hold said plate in clamping engagement with the terminal portions of said contacts.

4. In an electric snap switch of the toggle type, in combination, a shallow molded insulating base of substantially rectangular contour, a centrally arranged substantially rectangular recess in the upper face of said base, a relatively smaller and shallower recess at each of the four corners of said base and opening to said first mentioned recess, and a reflexed resilient contact positioned edgewise within each of said smaller recesses, said contacts having curved ends projecting into said larger recess in spaced relation to each other.

5. In an electric snap switch of the toggle type, in combination, a shallow molded insulating base of substantially rectangular contour, a centrally arranged substantially rectangular recess in the upper face of said base, a relatively smaller and shallower recess at each of the four corners of said base and opening to said first mentioned recess, and a reflexed resilient contact positioned edgewise within each of said smaller recesses, said contacts having curved ends projecting into said larger recess in spaced relation to each other, one of said contacts having a resilient extension normally biased into engagement with the contact longitudinally opposed thereto whereby three-point circuit connections for the switch may be provided.

6. In an electric snap switch, in combination, a hollow metal bushing having an inwardly extending annular flange at the upper end thereof, an actuating lever the handle portion of which is freely insertable upwardly through the opening provided by said flange, said lever having an enlarged bearing portion engageable with said flange to limit the upward movement of the former, said bushing having portions of different internal diameters whereby a shoulder is provided beneath the bearing portion of said lever, and a substantially flat punched metal plate having a press fit at its edge within said bushing and having a face thereof abutting against said shoulder whereby said bearing portion is retained in position, said plate having a perforation providing clearance for the lower end of said lever during oscillatory movement of the latter.

7. In an electric snap switch, in combination, a hollow metal bushing having an inwardly extending annular flange at the upper end thereof, an actuating lever the handle portion of which is freely insertable upwardly through the opening provided by said flange, said lever having an enlarged bearing portion engageable with said flange to limit the upward movement of the former, said bushing having portions of different internal diameters whereby a shoulder is provided beneath the bearing portion of said

lever, and a substantially flat punched metal plate having a press fit at its edge within said bushing and having a face thereof abutting against said shoulder whereby said bearing portion is retained in position, said plate having a perforation providing clearance for the lower end of said lever during oscillatory movement of the latter, the walls of said perforation being shaped to limit said lever to oscillatory movement in a single plane.

8. In an electric snap switch, in combination, a hollow metal bushing having a cylindrical bore with portions of different internal dimensions, said bore having a portion of smallest dimensions at the upper end of said bushing, the portion of next larger dimensions being connected with said first mentioned portion by a tapered portion or shoulder, the portion of next larger dimensions being connected with said second mentioned portion by a similar shoulder, an actuating lever having an enlargement intermediate the length thereof, the rounded upper surface of said enlargement being adapted for bearing engagement with said first mentioned shoulder a substantially flat punched metal plate having a drive fit at its edge within said portion of largest dimensions, said plate acting to restrain said lever against substantial downward displacement, and means comprising inwardly struck lugs integral with said bushing to permanently secure said plate therewithin.

9. In an electric snap switch, in combination, a hollow metal bushing having a cylindrical bore with portions of different internal dimensions, said bore having a portion of smallest dimensions at the upper end of said bushing, the portion of next larger dimensions being connected with said first mentioned portion by a tapered portion or shoulder, the portion of next larger dimensions being connected with said second mentioned portion by a similar shoulder, an actuating lever having an enlargement intermediate the length thereof, the rounded upper surface of said enlargement being adapted for bearing engagement with said first mentioned shoulder, a flat punched sheet metal plate having a drive fit at its edge within said portion of largest dimensions, said plate acting to restrain said lever against substantial downward displacement, and means integral with said bushing to permanently secure said plate therewithin, said means comprising a pair of arcuate lugs upset from the inner wall of said bushing against the lower face of said plate at opposite ends of the latter.

10. In an electric snap switch of the toggle type, in combination, an externally threaded hollow bushing, a toggle lever oscillatably supported at the upper end thereof, diametrically opposed bearing openings adjacent to the lower end thereof, a substantially U-shaped metal carrier having its arms in pivotal engagement with said bearing openings, a bridging contactor secured to said carrier but insulated therefrom, a spiral compression spring interposed between the lower end of said lever and said carrier, and a cup-shaped metal member enclosing the upper end of said spring and engaged by said lever, said cup-shaped member being adapted for cooperative engagement with the lower end of said bushing to positively initiate each oscillatory movement of said carrier.

11. In an electric snap switch, in combination, an externally threaded hollow metal bushing, said bushing having an inwardly extending annular flange at the upper end thereof, an actuating lever having a handle portion freely insertable upwardly through the opening provided by said flange, said lever being provided with an enlargement intermediate the length thereof, said enlargement having an upper hemispherical surface adapted for bearing engagement with the lower surface of said flange, and means for restraining said lever against substantial downward displacement with respect to said bushing, said means comprising lugs integral with said bushing and formed by upsetting portions of the inner wall surface thereof.

12. In an electric snap switch, in combination, an externally threaded hollow metal bushing, said bushing having an inwardly extending annular flange at the upper end thereof, an actuating lever having a handle portion freely insertable upwardly through the opening provided by said flange, said lever being provided with an enlargement intermediate the length thereof, said enlargement having an upper hemispherical surface adapted for bearing engagement with the lower surface of said flange, and means for restraining said lever against substantial downward displacement with respect to said bushing, said means comprising lugs integral with said bushing and formed by upsetting portions of the inner wall surface thereof, said restraining means also including means to substantially limit said lever to oscillation in a single plane.

13. In an electric snap switch of the toggle type, in combination, a shallow molded insulating base having a substantially rectangular recess at one corner thereof, a substantially semicircular channel leading outwardly therefrom, a shallow ledge adjacent to the upper edge of said channel, an abutment forming a vertical channel at one end of said recess, a substantially U-shaped resilient contact positioned edgewise under lateral compression within said recess, one arm of said contact being adapted to engage the walls of said vertical channel, a relatively larger and deeper recess opening to said first mentioned recess and into which the other arm of said contact is adapted to project, a wiring termi-

nal portion integral with said contact, said terminal portion extending outwardly from said contact in a plane spaced upwardly from and parallel to the upper edge of the latter, said terminal portion being seated upon said ledge, a metallic cover member overlying said recesses and secured to said base, and a perforated insulating plate interposed between said cover member and said base and in clamping engagement with said terminal portion.

14. In an electric snap switch of the toggle type, in combination, a molded insulating base of substantially rectangular contour, said base having a flat upper face and a longitudinally curved lower face, relatively shallow recesses adjacent to each of the four corners of said base, channels leading outwardly from the respective recesses, abutments forming vertical channels at the adjacent ends of each longitudinally spaced pair of recesses, shallow ledges formed in said first mentioned channels, a relatively larger and deeper central recess opening to said first mentioned recesses, substantially U-shaped resilient contacts seated edgewise under lateral compression within each of said first mentioned recesses, certain of said contacts having resiliently interengaging parts to provide an electrical connection therebetween, three of said contacts being adapted for direct electrical connection to their respective terminal wires, a perforated insulating plate overlying said base and adapted to retain said contacts in position, a metallic cover member secured to said base in clamping engagement with said plate, an exteriorly threaded hollow bushing rigidly secured to said cover member, an oscillatable and freely rotatable bridging contactor pivotally supported from said bushing, a toggle lever having a ball and socket connection with said bushing at the upper end of the latter, a metal plate rigidly secured within said bushing and adapted to prevent substantial downward displacement of said lever, said plate having a slot engageable by said lever to limit the latter to oscillatory movement in a single plane, a spiral compression spring interposed between the lower end of said lever and said bridging contactor, and a cup-shaped metal member enclosing the upper end of said spring, said cup-shaped member cooperating with the lower end of said bushing to positively initiate each oscillatory movement of said contactor.

15. A one-piece combined contact and wiring terminal for electric snap switches, comprising a reflexed resilient metal strip having parallel arms of equal width and length with a flat connecting portion therebetween, the free ends of said arms being bent toward each other, an integral narrow neck portion extending upwardly in the plane of said connecting portion and then rearwardly with respect to said arms, and a perforated wiring terminal portion integral with said neck portion and extending rearwardly from said arms in a plane parallel to the upper edges of the latter, said terminal portion being utilized as a suspension support for said contact.

In witness whereof, I have hereunto subscribed my name.

GEORGE J. MEUER.