April 28, 1936. N. C. SCHELLENGER 2,039,117

SLOW BREAK SWITCH

Filed March 6, 1933 2 Sheets-Sheet 1

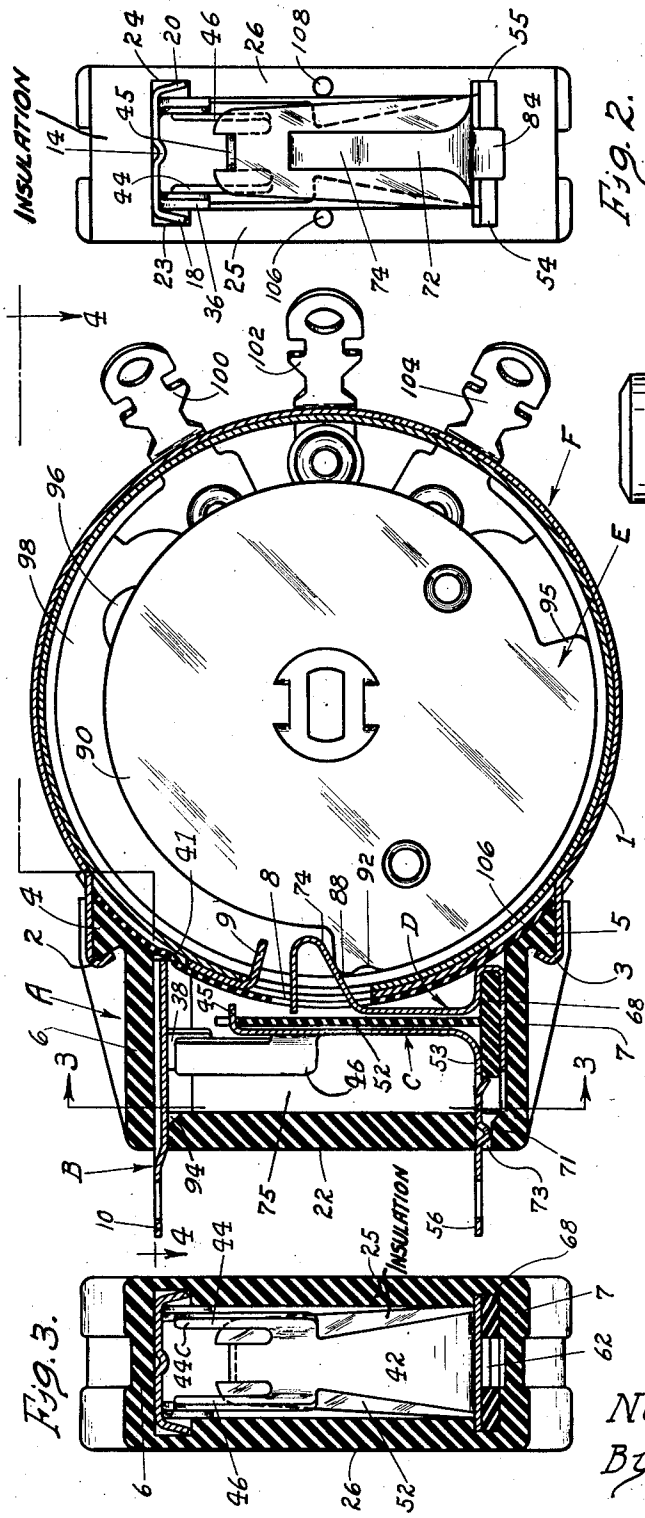


Fig. 3.

Fig. 2.

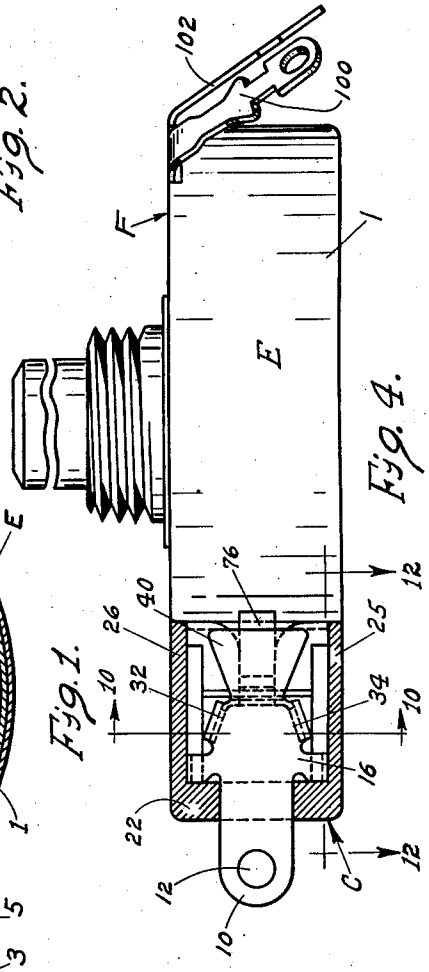


Fig. 4.

Fig. 1.

Inventor
Newton C. Schellenger
By. Harry Sangsam
Atty.

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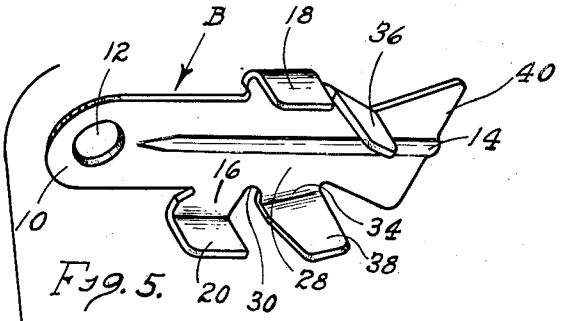


Fig. 5.

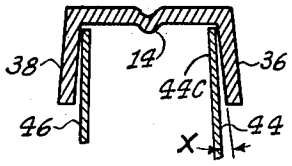


Fig. 10.

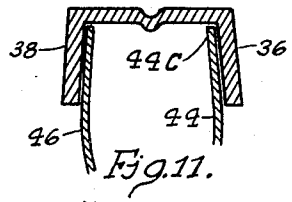


Fig. 11.

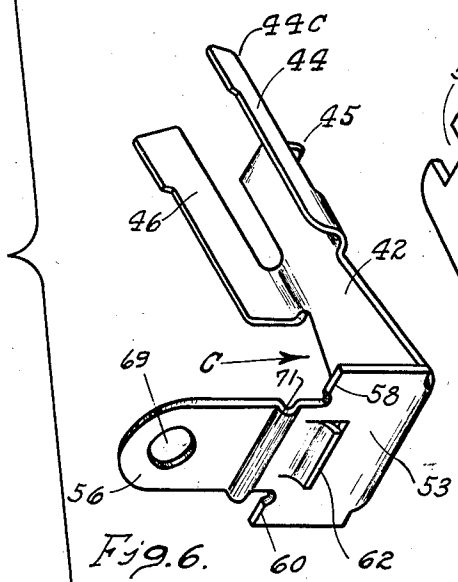


Fig. 6.

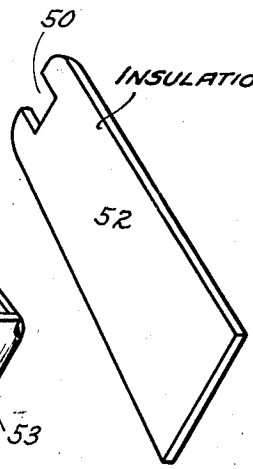


Fig. 7.

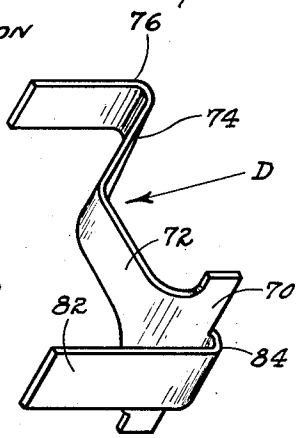


Fig. 8.

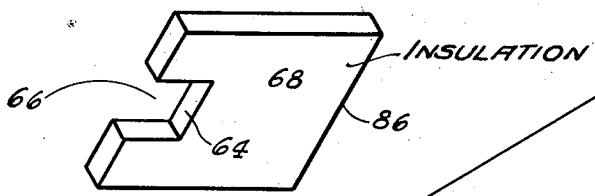


Fig. 9.

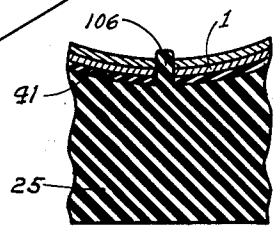


Fig. 12.

Inventor:
Newton C. Schellenger
By Harry Langsam
Atty.

Patented Apr. 28, 1936

2,039,117

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SLOW BREAK SWITCH

Newton C. Schellenger, Elkhart, Ind., assignor to Chicago Telephone Supply Co., Elkhart, Ind., a corporation of Indiana

Application March 6, 1933, Serial No. 659,708

8 Claims. (Cl. 200—164)

My invention relates to opening and closing of electrical circuits and applies particularly to a slow-break switch.

Heretofore, switches have been employed which are relatively large in size for a given current and voltage rating and wherein the cost of manufacturing and assembly are relatively high; so the use of such switches as aforementioned is undesirable in places where space is at a premium and quality is demanded at a low cost.

In the use of slow-break switches the arcing which occurs when the circuit is broken and/or completed tends to pit the contact terminals which eventuates into high resistance contacts and, also, reaches the stage where a continual arc occurs to entirely destroy the contact terminals. If an arc in such simple structural devices could be taken by one set of related contact jaws and a second set of contacts be continually clean and smooth, the life of the switch would be materially increased and the contact resistance continually low.

A more satisfactory manner of keeping the contact jaws clean and insuring longevity to meet all conditions is to utilize two sets of jaws formed to meet as dihedral angles. With such a construction one pair of meeting members will continually arc so the tip of the movable member will wear away. After the switch has operated sufficiently to eat a portion of the tip of one jaw, then the other jaw breaks the current so as to draw the arc. Meanwhile, the contact surfaces of both sets of jaws are kept smooth and clean because of the wiping action. The arc which started at one set of jaws, then moved to the second set of jaws, will now move back to the first set of jaws, thus causing an alternate arcing, at long intervals, to continue until the contacts are completely pitted away; however, there is the assurance of good low resistance contacts during the intervening period of operation. As the arc and its detrimental effect—pitting—is small, the switch will operate for a long period.

It is, therefore, an object of my invention to construct a switch which may have its mechanical parts inserted within the casing and then have the parts locked therein when the switch is placed in operative position.

A further object of my invention is to construct a switch which has a positive circuit opening means and a resilient inherent closing means.

A further object is to utilize a plurality of contact surfaces, one of which always takes the arc.

Another object is to provide a switch mechanism which may be readily incorporated with and be actuated by a common positive actuating shaft of a rheostat.

A further object is to provide a low sounding signal, as a "click", to inform the operator when the circuit is opened or when closed.

Another object is the switch may be provided with an electrostatic shield that effectively prevents hum pick-up by the volume control from live parts of the switch.

Another object is to construct a switch wherein the contact surfaces may engage with a wiping action.

Another object is to embody contactors in a switch of such area that suitable heat dissipation is readily effected.

Another object is to have the contact initially made at one part of each jaw and the continuous circuit at another part of the jaw.

With the above objects in view my invention is embodied in a switch having a casing, a unitary stationary terminal comprised generally of a soldering lug, a holding structure and a plurality of contact jaw members; and a resilient engaging movable terminal comprised of a soldering lug, holding structure, and a plurality of contact jaw members; the jaw members of each terminal positioned not only to open and close the electrical circuit but to react with a burnishing or a wiping action in order that the jaws be kept clean; a switch operating arm adapted to oscillate the resilient terminal contact jaw members and the operating arm engageable at a predetermined position by a suitable resistance adjusting arm of an adjoining rheostat.

My invention has particular application in radio sets for automobiles where space is at a premium. As heretofore employed, the switch is mounted upon the back base of the rheostat with valuable space above and below the switch being unoccupied, whereas if the switch is mounted within the extended transverse planes of the bases of the rheostat casing diametrically opposed to the rheostat terminals, space adjacent the lateral surface of the cylindrical rheostat casing which otherwise would not be occupied, is then filled.

Furthermore, it is of the utmost importance to construct the parts of the switch mechanism so they may be readily assembled in their proper position in manufacturing quantities.

Other objects of this invention are to provide an improved device of the character described, that is easily and economically produced, sturdy in construction and having a maximum efficiency and accuracy.

With these and related objects in view, my invention consists in the following details of construction and combination of parts, as will be more fully understood from the following specification, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a fragmentary sectional view of my invention combined with a rheostat;

Figure 2 is an end view looking in on the switch per se;

Figure 3 is a side elevational view of my invention looking into the switch mechanism chamber;

Figure 4 is a sectional view taken on the line 4—4 of Figure 1;

Figure 5 is a perspective view of a fixed terminal, which when taken together with Figs. 6, 7, 8 and 9 gives an exploded view of the switch mechanism;

Figure 6 is a perspective view of the resilient terminal;

Figure 7 is a perspective view of an insulated block adjoining the resilient terminal;

Figure 8 is a perspective view of the terminal actuating element;

Figure 9 is a perspective view of the insulated block upon which the resilient terminal rests;

Figure 10 is an exaggerated view, taken on the line 10—10 of Figure 4, wherein the contact jaws first are engaging;

Figure 11 is a view similar to Fig. 10 wherein the contact jaws are in complete engagement; and

Figure 12 is a fragmentary sectional view taken on the line of 12—12 of Fig. 4.

The particular switch herein described is of a type which finds considerable use in radio receiving sets. It is adapted to be mounted on the side of a rheostat, potentiometer or similar volume or tone control devices by means of clamps or other suitable fastening means.

The switch in the preferred embodiment is actuated by a suitable pin, lobe or protrusion mounted on the rotating, or even a translatory, contact arm of the volume or tone control unit.

The body or casing, generally designated A, of the switch is made of moulded insulating material having suitable recesses therein. A phenol condensation product is particularly suitable.

The mechanism of the switch consists of a fixed terminal, generally designated B, and forming the engaged element of the switch; a resilient terminal, generally designated C, constituting the movable engaging element for the switch and the positive actuating member, generaly designated D.

Referring now in detail to the drawings, the combined rheostat and switch unit is generally shown in Fig. 1. This unit comprises the casing or housing which contains the rheostat, generally designated E, and the casing or housing A which contains the switch for controlling the power circuit to which the unit is connected. The rheostat E is contained within a cylindrical cup shaped shell member F completely enclosed and dust proof. The shell F has a cylindrical wall 1 enclosed between flat bases. The two housings are held in cooperative relationship by means of pressed out ears 2 and 3 of the cylindrical rheostat wall 1 which cooperate with raised lugs 4 and 5 formed on the ceiling 6 and floor 7 of the switch casing. A window 8 in the rheostat casing is formed by pressing inwardly the tongue 9 which acts, as will hereinafter be described, in the dual capacity as an audible signal means and as a stop.

The unitary fixed terminal B of the switch is generally comprised of a soldering lug, a holding structure and a contact member, hereinafter described in detail. The soldering lug or arcuate end 10 of the terminal B has an aperture 12 therethrough to which suitable flexible lead-wires may be attached in any manner well known to the art. The holding structure and the contact member, connected to the soldering lug, have a median, longitudinally positioned, strengthening and holding rib 14 therethrough. The soldering lug 10 merges into a wider holding structure or retaining portion 16 (see Fig. 5) having flanges 18 and 20 bent downwardly; the flanges of the widened or broadened structure 16, are adapted to engage a front wall 22, and sides of grooves 23 and 24, in the upper extremity of side walls 25 and 26, respectively, of the casing (see Figs. 1, 2, 3 and 4), whereby turning of the terminal as well as lateral movement is prevented. The holding structure 16 is connected to a contact jaw supporting member 28 by a bight section 30.

The contact member or contact jaw supporting member 28 has angularly projecting resilient arms 32 and 34, which in turn have projecting downwardly therefrom (slightly less than 90°, see Fig. 10), resilient flat planar contact jaws 36 and 38, respectively. The contact jaws 36 and 38 are angularly displaced relative to the transverse and longitudinal axes of the terminal B. A triangularly shaped end 40, of the terminal B having an apex attached to the supporting member 28, acts as an abutting member to engage an insulating strip 41 against the casing 1 of the rheostat, generally designated F; and as the ears 18 and 20 of the same terminal B abut against the chamber front wall 26, any longitudinal displacement of that terminal is prevented.

The integral resilient terminal C is comprised of a soldering lug, a holding base structure and a resilient contact member which oscillates to open or close the circuit, hereinafter described in greater detail. The oscillating arm 42 of terminal C has two angularly disposed elongated contacting jaws 44 and 46, which are adapted to wipe and contact its respective complemental jaws 36 and 38, on the engaged terminal B. The jaws 44 and 36, and 46 and 38 are so disposed as to form a dihedral angle which is instrumental in effecting the burnishing as hereinafter further described. Spaced a short distance from the end is a pressed out tongue 45 which passes through a suitably alined aperture 50 of an adjoining insulating strip or shield 52. The oscillating arm widens as it approaches a holding member base 53; which is of sufficient width to easily slide within side wall grooves 54 and 55 cut into the lower extremity of the side walls 25 and 26.

The base 53 narrows sharply at its junction with the soldering lug 56, so that two short shoulders 58 and 60 are formed therein, which are adapted to engage the vertical side walls and front wall of the casing chamber grooves 54 and 55, whereby movement of the base to the left (as viewed in Fig. 1) is limited and a tongue 62 stamped downwardly from the base prevents movement to the right (as viewed in Fig. 1) when the insulating strip 52 is held rigid, thus longitudinal or transverse movement of the base, as well as twisting, is prevented. The downwardly projecting stamped out tongue 62 having the lowermost edge extending to the right (Fig. 1) is adapted to engage a portion of an edge 64 in a notched section 66 of an insulating strip 68. The soldering lug 56 has an aperture 69 therein to which suitable flexible lead wire or wires may be readily attached, as is well known

in the art. A ridge 71 in the soldering lug is adapted to close an alined opening 73 in the front wall 22, so no dust, dirt, solder or soldering flux may enter the switch chamber 75.

The positive actuating member D, for transmitting motion from the rheostat mechanism to the oscillatory switch arm has a substantially rectangular base 70 which rests on the surface of the insulating strip 68, the base side edges being located in contact with side walls of grooves 54 and 55. An integral vertical tapered resilient oscillatory arm 72, attached to the base, diverges from the vertical plane of the insulating strip 52 as its end is approached to form a lobe 74 and then reverses itself as indicated at 76 to form a substantial U-shaped section. The ends of the U-shaped section lie in the same plane and engage a face of the insulating strip 52, which strip in turn has its opposite face or surface against the oscillating contact arm 42.

Attached to the base 70, as an integral part thereof, is an off-set arm 82 connected to the base 70 by the bend 84. The base 70 sits upon the upper surface of the insulating strip 68 as the bend 84 engages an edge 86 of the strip and the arm 82 partially encloses the bottom of the strip.

A lobed surface 88, (see Fig. 1) on the rheostat rotatable arm member 90 coacts with the lobe 74 of the actuating member D to break the circuit when engagement occurs and to close the circuit when disengaged. A notched or depressed section 92 on the rheostat rotatable member at the extremity of the lobe 88 cooperates with lobe 74 of the actuating member D to effect a nesting or anchoring thereof within said section.

When the circuit is closed and it is desirable to open the circuit, movement of the shaft causes the lobe 88 of arm member 90 to engage the lobe 74; further movement oscillates arm 72 whereby its end 76 (see Fig. 8) is forced against the insulating member 52. Member 52 in turn is forced against the contact arm 42 which is oscillated to break the circuit. When the lobe 88 passes over lobe 74 the latter snaps into notched section 92 thereby anchoring or engaging lobe 74 in the section 92. Substantially simultaneously with the snapping of lobe 74 into section 92 the lobe 88 will snap against the stop member or tongue 9, producing by this snap action an audible "click".

It is to be noted that the resilient contact arm 42 may have a slight twist therein so that one of the contact jaws thereon will be in advance of the other contact jaw. By such arrangement the arc will be made by that particular jaw when the circuit is completed, and, as is obvious the arc is also taken by the same jaw when the circuit is broken. Thus, the second coacting pair of jaws is clean and free of any pit marks so the contact resistance is practically constant for the switch which insures long life for carrying heavy currents at relatively high voltages.

However, I prefer to have the complemental sets of jaws positioned so the movable jaws 44 and 46 engage the jaws 36 and 38 substantially simultaneously, as more adequately shown in the exaggerated views of Figs. 10 and 11. The surfaces will thus not only contact but rub each other so that a burnishing and cleaning of the surfaces thereby occurs.

As the arrangement of jaws is symmetrical, but one set of complemental jaws 36 and 44 will be described. The tip 44C of the jaw 44, first approaching the stationary contact 36, draws the arc (Fig. 10) forming a diherdral angle X. As the jaw 44 finally sweeps into place against the jaw 36, as shown in Fig. 11, the dihedral angle X is closed, the jaw 44 as it sweeps along completes the wiping action. Upon breaking the contact, the above wiping action likewise occurs in the order of Figs. 11 and 10.

After the switch has operated sufficiently to eat a portion of the tip of one jaw, the arcing will then move to the second set of jaws, until the tip of one jaw of that set is obliterated to a greater extent than the first mentioned jaw. Meanwhile, the contact surfaces of both sets of jaws are kept smooth and clean because of the wiping action. The arc which started at one set of jaws, then moved to the second set of jaws, will upon further usage move back to the first set of jaws, thus causing alternate sets of jaws to arc, until eventually the contacts are completely obliterated; however, there is the assurance of good low resistance contacts during the long intervening period of operation.

Assembly

The various elements are constructed to provide exact, rapid commercial methods of assembly. The casing A has side walls 25 and 26, the front wall 22, and top and bottom walls 6 and 7 forming the chamber 75 wherein the switch mechanism is installed. An entrance or opening to the chamber 75 fits adjacent the window 8 in the casing of the rheostat and the casing is held rigidly to the rheostat as hereinbefore described.

With the rib 14 depressed downwardly from the upper wall and the ears 18 and 20 resting in the grooves 23 and 24 in the side walls of the chamber, upon assembly the resilient terminal C is inserted in the alined opening 73 with the positive actuating member D but with the insulating strips 52 and 68 interposed properly between the terminal C and member D and the entire unit is then pressed into the chamber so the soldering lug 56 will project through the alined opening 73 in the side wall of the casing.

The fixed terminal B is then inserted in an alined terminal opening 94 with the upper surfaces of the holding section 16 and the supporting jaw members 28 against the ceiling of the chamber 75. The ears 2 and 3 of the rheostat casing are then clamped over the raised lugs 4 and 5, respectively, of the switch casing. The tongue 9 is engaged by one side of the lobe 88 of the arm 90 when the lobe 88 moves clockwise (see Fig. 1) for breaking the circuit, and by the ledge 95, when the arm 90 moves counterclockwise, to the limit of its path.

A shoe 96 driven by the rheostat arm 90 engages a suitable resistor 98 of the rheostat. The corelation of the lobe 88 and the contact shoe of the resistor is such that but a slight movement of the shoe over the resistor opens or closes the switch and the resistor terminals 100, 102 and 104 are located on the rim of the casing diametrically opposite the location of the switch casing. It is thus seen that a substantial flat rectangular shaped combined rheostat and switch is thus embodied which when inserted on a radio panel will occupy but a minimum volume in comparison with the former structure as employed in the art.

It is to be noted that the stationary jaws may be flexible and the movable jaws more rigid to effect the same result and operation.

The rheostat arm 90 moves but a small arcuate distance to open or close the switch whereby prac-

tically the entire length of the resistance is effectually to be utilized for its particular function.

Lugs 106 and 108 (Fig. 2), mounted centrally upon the circular segmental portion of the walls 25 and 26, respectively, or molded integrally with the switch casing A, protrude through suitable alined openings in the insulating strip 41, the rheostat casing 1 and the rheostat lining (see Fig. 12) for the purposes of providing definite, predetermined alining relationship of the rheostat and the switch; for providing extra supports for the switch casing when positioned on the rheostat casing; and to prevent turning of the casings with respect to one another.

Although the invention has been described in considerable detail, such description is intended as illustrative rather than limiting, as the invention may be variously embodied, and the scope of the invention is to be determined as claimed.

I claim:—

1. In combination with a switch, a casing comprising a plurality of side walls, back wall, a ceiling and a floor completing a chamber, a plurality of grooves in said side walls located near the ceiling and floor of said chamber, a stationary terminal having a holding portion thereof adapted to be retained within the top grooves of the side wall and the ceiling of said chamber, a resilient oscillatory terminal having a base, contact portions and a resilient member thereon, a positive actuating arm having a base and adapted to oscillate said resilient member, a plurality of insulating members separating the positive actuating means and the resilient terminal, said resilient terminal base and positive actuating means base adapted to be held within the grooves in the side wall adjacent the floor of said chamber to prevent lateral movement and twisting.

2. In combination with a switch having a grooved casing, a unitary stationary element comprising a soldering lug, a plurality of flanges to engage side walls of said grooves whereby side motion and rotation is prevented, a plurality of angularly disposed contact portions and an abutment member connected to the body of said terminal, a longitudinally extending rib in said terminal, a second terminal having a plurality of portions to engage the contact portions of said first terminal whereby an electrical circuit may be completed.

3. In combination with a switch, a fixed terminal having a soldering lug, a holding portion and a plurality of contact portions on said fixed terminal, a holding base, a resilient arm on said base and a plurality of contact portions formed on said resilient arm, said sets of contact portions positioned to coact with each other to form a dihedral angle between contacting surfaces.

4. In combination with a switch, a casing comprising a housing having an open face, a plurality of grooves formed in the interior of the housing and extending to the open face, a stationary terminal having a holding portion thereof retained within certain of said grooves, a resilient oscillatory terminal having a base secured in grooves spaced from the stationary terminal, and a positive actuating arm having base and arm portions, the base portion being secured in certain of said grooves.

5. In combination with a switch, a casing comprising a housing having an open face, a plurality of grooves formed in the interior of the housing and extending to the open face, a stationary terminal having a holding portion thereof retained within certain of said grooves, a resilient oscillatory terminal having a base secured in grooves spaced from the stationary terminal, a positive actuating arm having base and arm portions, the base portion being secured in the same grooves with the base of the resilient terminal, and insulating means retained in said grooves between the bases of the terminal and actuating member.

6. In combination with an internally grooved casing, a switch structure comprising a unitary stationary terminal element and a unitary oscillatory terminal element, said elements being retained in spaced grooves in the casing, the stationary element comprising a soldering lug extending from the casing, a plurality of lateral flanges engaged in the casing grooves, a plurality of spaced contact portions, and an extended abutment portion, the oscillatory terminal comprising a soldering lug, a base portion and a resilient portion carrying contact portions to coact with the contact portions of the stationary element.

7. In combination with an internally grooved casing, a switch structure comprising a unitary stationary terminal element and a unitary oscillatory terminal element, said elements being retained in spaced grooves in the casing, the stationary element comprising a soldering lug extending from the casing, a plurality of lateral flanges engaged in the casing grooves, a plurality of spaced contact portions, and an extended abutment portion, the oscillatory terminal comprising a soldering lug, a base portion and a resilient portion carrying contact portions to coact with the contact portions of the stationary element, and an actuating member having a securing arm fitted in the grooves with the base portion of the oscillatory terminal and an actuating arm adjacent the resilient portion of the oscillatory member.

8. In combination with an internally grooved casing, a switch structure comprising a unitary stationary terminal element and a unitary oscillatory terminal element, said elements being retained in spaced grooves in the casing, the stationary element comprising a soldering lug extending from the casing, a plurality of lateral flanges engaged in the casing grooves, a plurality of spaced contact portions and an extended abutment portion, the oscillatory terminal comprising a soldering lug, a base portion and a resilient portion carrying contact portions to coact with the contact portions of the stationary element, an actuating member having a securing arm fitted in the grooves with the base portion of the oscillatory terminal and an actuating arm adjacent the resilient portion of the oscillatory member, insulating means fitted in the grooves between the actuating member and oscillatory member, and an insulating member extending between the actuating arm and the resilient portion of the oscillatory member.

NEWTON C. SCHELLENGER.