

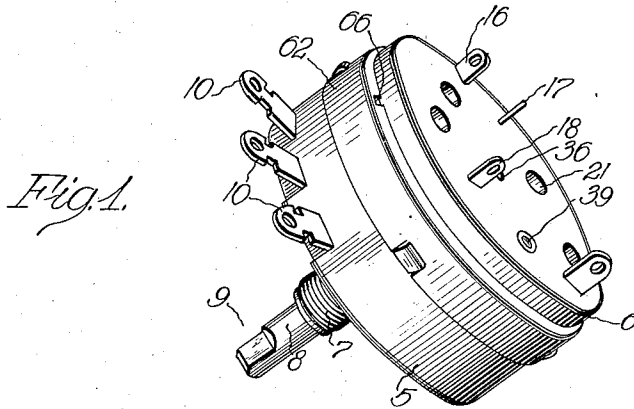
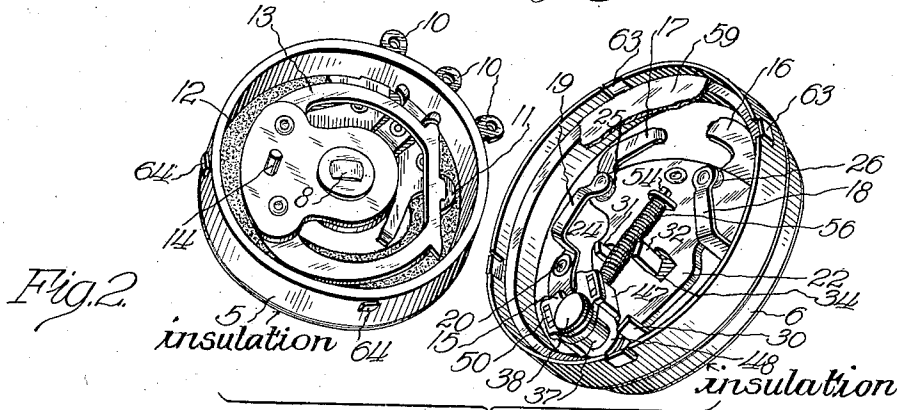
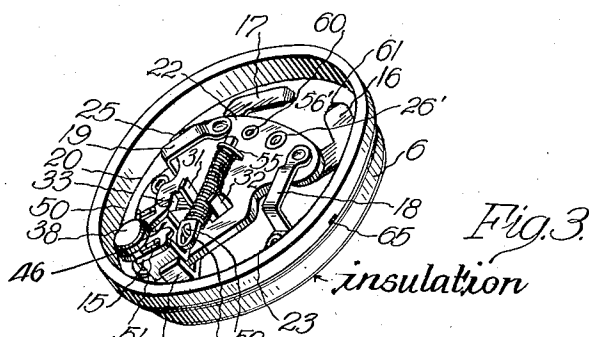
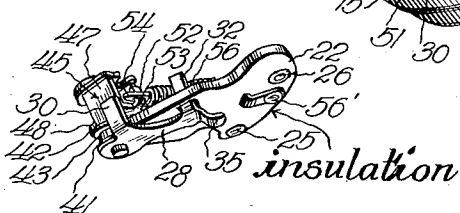
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N. C. SCHELLENGER

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SWITCH

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Inventor:
Newton C. Schellenger
By *Brown, Fennell & Co.* Attys.

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SWITCH

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

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This invention relates to switches of the so-called snap variety and more particularly to switches adapted to be used for controlling the power circuit in radio sets, and other similar devices where certainty of operation is essential, and space is at a premium.

The preferred form of the switch is a double pole single throw switch and is of the type employing a spring thrown switch arm. The arm may be actuated by any suitable control means, and carries the circuit closing contacts.

The present switch is adapted to be enclosed in a combined switch and volume control, both operating from the same control shaft, especially if the switch is to be used in connection with a radio control. Thus, the preferred embodiment is shown in connection with such a combined unit. The unit shown constitutes a combination volume control with a double pole single throw switch for putting the set into or out of operation.

In a switch adapted for this class of service, a switch mechanism must be compact without sacrifice to its operating mechanism, so that the switch and its associated parts may occupy a minimum space in the housing or shell in which the switch is to be mounted.

It is a very important feature that the switch be adapted to be readily positioned and secured in operative engagement with the volume control or rheostat. The switch shell should have very limited depth in order to provide a compact combined switch and volume control that will require relatively limited space within the apparatus.

The switching contacts and associated parts must be thoroughly insulated from each other and from the associated volume control, in order to prevent any arcing or the possibility of current leaks. Satisfactory insulation for these parts has been extremely difficult to provide inasmuch as the parts are very closely and compactly arranged. The moving parts and switch contacts should all be disposed within the insulating switch housing or shell. The switch must also be of a type that will not interfere with the characteristics of the volume control, and yet will possess a positive opening and closing action. Other difficulties, such as the molding operations necessary to produce the switch shell or housing, and the production of the parts in a standardized and efficient manner, also present requirements which are satisfied in my device.

The present invention is directed to the provision of a combined switch and volume control which includes the desirable features pointed out

above, and which, in addition, is capable of economical production and assembly.

The present switch is of the type having a pivotally mounted switch arm carrying circuit closing contact means, the pivotally mounted arm being snapped into and out of circuit closing position by means of a spring and a pitman arrangement operating through a toggle or snap joint in response to cam movements. These cam movements are controlled by an operating pin, the pin being rotated by rotation of the control shaft that controls both the operation of the switch and the volume control. The movable switch arm of the present invention is adapted to be loosely pivoted on a mounting stud, and is so formed as to possess sufficient inherent flexibility for assuring firm electrical connection when snapped into circuit closing position. This flexibility permits the movable arm to conform to the plane of the switch contacts, and the spring and pitman arrangement is adapted to force the flexibly mounted arm into firm engagement therewith.

One of the most important improvements of the present invention resides in the form of the switch arm and the contacts carried thereby. I employ a sheet or barrier of insulating material between the stationary contacts of the switch and this sheet or barrier carries a through contactor which need be only slightly greater in length than the thickness of the sheet. By motion of the barrier the contactor is carried to or away from the stationary contacts in the operation of the switch, with a high degree of interrupting capacity and with a minimum separation of the stationary contacts. The disposition of this barrier between the stationary contacts permits the contacts to be spaced much closer to each other than would be possible without this insulating medium. Another important feature in connection with this formation of the switch arm is the ability to adapt the switch readily to single throw or double throw operation with a minimum of change of construction.

One feature of my invention resides in the producing of various parts of the switch by well known and standardized operations such as stamping and punch press operations, which result in the switch being produced very economically.

I also provide a single metal stop member which is adapted to accomplish a plurality of purposes, such as acting as a limiting stop for the cam, acting as a stop for limiting movement of the pivotally mounted switch arm, and also acting as a

"knock off" member against which the spring and pitman strike to force the arm to move out of engagement with the contact members in response to the cam action. In connection with this feature, all metal parts excepting the contacting fingers, the lower contact member and the circuit closing means, are effectively insulated from the electrical circuit of the switch.

Another particularly desirable feature of this switch is the manner in which the terminals are brought out to the bakelite shell or insulating housing resulting in an almost gas tight casing, and also the manner in which the switch shell is coupled to the rheostat or volume control shell.

As pointed out above, by changing the position of one of the circuit closing members carried by the switch arm, the switch can be made to operate as a single pole double throw switch. This feature can be incorporated in any of the switches by the mere modification of the switch arm used.

I also provide coupling means for changing the position of the switch with reference to the rheostat mechanism, this being advantageous in that it may be desirable to have the switch operate at either end of the resistance means employed in the rheostat.

I provide an actuating connection for the switch arm which lies at a very short radial distance from the pivot of the switch arm, this permits the switch to be actuated with a minimum motion of the actuating shaft of the variable resistor or other mechanism with which it may be associated.

Other novel features and advantages of my invention will appear more fully from the following detailed description which, taken in connection with the accompanying drawing, will disclose to those skilled in the art the particular manner in which my novel switch is constructed and assembled.

Referring to the drawing:

Figure 1 is a perspective view of the combined switch and volume control as assembled;

Figure 2 is an exploded perspective view of the rheostat or volume control and the switch, the switch being in closed position;

Figure 3 is a perspective view of the switch in open position; and

Figure 4 is a perspective detail view of the pivotal stud and the parts associated therewith.

Referring now in detail to the drawing, the volume control housing or shell is indicated generally by the reference numeral 5, and the switch housing or shell is indicated by the reference numeral 6. Extending outwardly from the volume control housing 5 is a thimble or bushing 7 which is adapted to receive a control shaft 8. The thimble is adapted to secure the entire assembly to a suitable panel or the like. The control shaft 8 has the flattened portion 9 for engaging with a cooperating flattened portion of a dial member or control knob (not shown) for controlling the rotation of the shaft 8.

Suitable contact terminals, indicated at 10, are provided for connecting the volume control into the electrical circuit. The volume control comprises a contact shoe 11 adapted to ride upon the surface of a resistance element 12 and which is forced into engagement by means of a spring member 13. A suitable operating pin, indicated at 14, is electrically insulated from the spring member 13 and the control shaft 8, and is adapted to be rotated upon rotation of the control shaft to operate the switch.

In the normal position of operation, the contact pin 14 engages the flat cam member 15 of the switch to throw the switch to closed position before the shoe member 11 has traveled an appreciable extent upon the surface of the resistance element 12. However, this operation of the switch member by means of an operating pin carried by the volume control or rheostat is well known in the art, and needs no detailed description.

Referring now more particularly to the novel switch of the present invention, there is provided the four terminals or contacts 16 to 19, inclusive. These terminals or contacts may be of the solder lug type, wherein the conductor is soldered or otherwise suitably secured to the terminal, or they may be of the wire lead type, in which the connector is suitably fastened, as by means of a screw, to the contact member. These contact terminals extend through the shell or housing 6 and are suitably held in position by means of eyelets 20 which staple the contacts to the shell through corresponding openings 21 in the base of the shell. The contact members 16 and 17 are adapted to lie flat upon the inner bottom surface of the housing 6, and form suitable guide or bearing members for the pivotally mounted arm 22 to slide upon. The contact members 18 and 19, however, have an upwardly extending portion which is bent over and provided at its extremity with depressed contact fingers adapted to form spring contact means for securing a firm electrical connection upon actuation of the switch.

The pivotally mounted arm or barrier member 22 is stamped from a sheet of suitable insulating material and diverges generally outwardly from its pivotally mounted end portion. It is provided with cut-out portions 23 and 24 which are adapted to fit around the upstanding portion of the contact fingers 18 and 19 when the switch arm is snapped from side to side.

Secured peripherally along the outer edge of the member 22 are two circuit closing eyelets or electrical conductor bridging members 25 and 26. These eyelets are stamped into the insulating arm, and are composed of a material having a relatively low resistance.

Upon actuation of the switch arm, the eyelets are carried into circuit closing position between the depressed fingers of the contacts 18 and 19 and the upper surface of the lower contacts 16 and 17.

Referring now in more detail to Figure 4, I have shown a single metal stop member which is adapted to perform three functions in the operation of my novel switch. This stop member is indicated generally by the reference numeral 28. It may be formed of a single piece of metal suitably stamped or pressed into the desired shape. As shown, it comprises the two rear upwardly extending prongs which act as limiting stops for movement of the cam member. These prongs are indicated at 30. The member 28 then extends inwardly toward the center of the switch housing and is provided with a second pair of upwardly extending prong members 31 and 32. These two prongs extend through suitable apertures 33 and 34 formed in the insulating switch arm and serve as stops for limiting pivotal movement of the arm 22. These stop members also serve as "knock off or kick-off" members against which the spring and pitman strike to force the arm to move out of engagement with the contact members in response to cam action. A depressed tongue member 35 is struck out of the metal strip

and is inserted through a corresponding opening 36 formed in the shell or housing to secure the stop member 28 in position. The stop member 28 has a circular aperture formed therein which is adapted to be axially aligned with the pivotal stud 37 upon which the switch arm is mounted.

This pivotal stud member is indicated by number 37, and comprises a metal pin having an enlarged cap member 38 and has a reduced portion extending through the insulating shell which is spun over or otherwise suitably secured to the outer surface of the shell 6, as indicated at 39. The stud or pin 37 extends through the stop member 28 and through suitable spacing washers 41 and 42 which separate the insulated switch arm 22 from the stop member and the cam member. The switch arm 22 has a perforated end 43 which fits around this stud member 37 and which permits lateral movement of the switch arm relative to the stud member to permit flexibility of the arm in a vertical direction.

Referring in more detail to the cam member, this cam comprises the upper flat cam member 15 which is engaged by the operating pin 14 carried by the central shaft of the rheostat, and the U-shaped member which forms with the member 15 a well braced rigid cam which has two bearing supports upon the pivotal stud 37. As shown in Figure 4, the U-shaped member is indicated at 45 and comprises the two upwardly extending arms 46 and 47 and the rearwardly extending flattened portion 48 which is provided with a cooperating opening adapted to fit around the pivotal stud member 37.

The two arms 46 and 47 are provided at their upper edges with projecting boss portions 50 and 51 which are adapted to be inserted through corresponding slots in the cam member 15 and which are then flattened or bent over to secure the two members in rigid relationship. As pointed out, this provides a cam member of very rigid construction which is provided with two bearing surfaces on the pivotal stud 37 and which is capable of being formed from metal stampings. The U-shaped member 45 is provided with a forwardly extending portion having the upwardly extending or turned-up tongue having the end 52 slightly larger than the neck portion 53. The neck portion 53 is adapted to form a bearing surface for the pitman 54.

The pitman 54 may be made from a single punch press operation and can be blanked out of an ordinary piece of sheet metal of relatively thin section. The pitman is provided with an elongated aperture in its pivotal end which permits it to be dropped over the enlarged end 52 of the upturned tongue portion 53. In normal position, however, the pitman cannot be displaced from the neck 53 since at no time is it aligned with the enlarged end 52 of the neck 53 so that it may be removed. The pitman extends inwardly from its bearing 53 and its opposite end is seated in an upwardly extending support 55 which extends through a slot in the insulating switch arm 22. The other end of the support 55 extends along the lower surface of the arm 22 and is suitably stapled to the arm by means of the eyelet 56.

A helical spring 56 encircles the pitman, and is biased at one end against the enlarged pivotal head thereof, and at its other end bears against the support or stop 55. The spring serves to provide the snap action for moving the switch arm into and out of circuit closing position.

It is apparent that the arm 22, because of its

relatively loose fit about the pivotal stud 37, and because of the tendency of the spring and pitman arrangement to force the arm downwardly, will always remain in good frictional contact with the surface of the lower contact members 16 and 17. Thus the arm 22 will adapt itself to the plane of the contact members and will therefore at all times serve to secure a good electrical connection between the upper contact members 18 and 19 and the lower contact members 16 and 17 when it is snapped into circuit closing position.

As will be more apparent from Figure 3, in which the switch is shown in open position, the insulating arm 22 provides a layer of insulating material between the respective pairs of circuit contacts when the switch is in open position, thereby permitting these contacts to be spaced in much closer relation to each other and permitting a much thinner switch assembly. Upon actuation of the switch into circuit closing position, the spring contact fingers 18 and 19 will force the flexible switch arm 22 downwardly when the eyelets 25 and 26 contact therewith, thus assuring a firm electrical connection from the contact fingers through the eyelets to the lower contact members.

In connection with the snapping of the switch into closed position to effect closing of the circuit, it is to be noted that the striking of the pitman and spring against the "knock off" members 31 and 32 effects a prying action which permits the use of a relatively small helical spring and yet provides a very strong contact pressure between the contact fingers, the eyelets and the lower contact members, and also permits the switch to be snapped into open position without any excessive pressure being required to move the switch arm 22 out of engagement with the contact springs or fingers 18 and 19.

By constructing the arm 22 of insulating material, it is possible to insulate all parts of the switch except the contact fingers 18 and 19, the circuit closing eyelets and the lower contact members from the electrical circuit. The pitman and its associated bearing members are insulated from the circuit by means of the arm 22, which extends about the pivotal stud 37 and thus separates the cam member and the stop member 28 from contact with any of the circuit conducting parts.

Referring to Figures 1 and 3, it will be noted that the contact members 16 to 19, emerge from the shell or housing 6 through relatively thin slots formed in the shell. However, viewing the interior of the shell, as in Figure 3, it will be noted that these members pass downwardly through the shell through circular openings indicated at 60 and 61, in Figures 2 and 3. This particular point of construction permits the shell to be molded with very little difficulty, and yet very economically, and further provides a construction which will permit the use of stranded wire leads for terminals instead of solid metallic terminals. When it is desired to use wire leads, a drill is run through the round or circular openings, such as 60 and 61, from the inside of the shell, and the circular openings are drilled entirely through the shell. This operation permits the opening to be of a suitable size to accommodate the stranded wire lead. However, when solder lug types of terminals are to be used, the shell may be molded with the circular opening extending only partially through the bottom wall of the shell, and the relatively narrow slot can be formed readily. To form a slot of such narrowness

through the entire bottom section of the shell 6 would require very fragile punches which would materially increase the cost of the molding operation.

It will be noted that the volume control housing 5 and the switch housing 6 are coupled together by means of a ring member 62. A suitable insulating disk 59 is positioned between the two housings and has a cut-out portion for accommodating movement of the operating pin in the cam member. The ring member 62 is provided with a plurality of ears, such as 63, which cooperate with raised lugs 64 on the periphery of the rheostat shell, and which prevent the ring from rotating with respect to the shell when the ears carried by the ring are engaged over the lugs carried by the shell.

The switch shell or housing 6 has two depressions 65 which are formed at diametrically opposite points on the periphery thereof. These depressions 65 cooperate with two tongues 66 which are struck down from the inner edge of the ring 62 to prevent the switch shell from rotating or moving with respect to the ring. It is thus apparent that the ring serves to couple the housings 5 and 6 together in aligned position and serves to prevent rotation of the housings with respect to each other. If it is desired to change the position of the switch with reference to the rheostat mechanism, it is only necessary to change the engagement of the depressions 65 with reference to the tongues 66.

A very important feature of my invention is the possibility of converting the switch from a double pole single throw type of switch to a single pole double throw type of switch. This may be readily accomplished by changing the position of the eyelet member 26. If this member is moved outwardly so that it will engage between the contacts 16 and 18 when the switch is in the position shown in Figure 3, the switch will then operate as a single pole double throw switch. Thus, by merely providing a modified type of switch arm, the switch may be converted from a double pole single throw type of switch to a single pole double throw type of switch without changing any of the associated parts.

It is thus apparent that I have provided a switch which is very compact and permits of adjacent assembly of the respective circuit conducting parts, while providing sufficient insulation between these types to prevent arcing or loss of current. Also, I have provided a novel positive acting snap mechanism for operating the switch arm, the parts of the switch operating assembly being formed from metal stampings or from punch press operations, the result being the production of a very reliable type of switch with a minimum of manufacturing cost.

It is to be understood that I do not intend to be limited to the exact details shown and described in connection with the particular embodiment of the switch disclosed in the drawings, but only in so far as defined by the scope and spirit of the appended claims.

I claim:

1. In a switch comprising an insulating base having spaced electrical contacts, a pivotally mounted barrier member positioned between said contacts, a bridging electrical contact carried by said barrier member, means for snapping said bridging electrical contact into and out of engagement with said electrical contacts, a plurality of apertures in said barrier member, and means including prongs fixed relatively to said base and

passing through said apertures in the barrier member to limit the movement of said barrier and provide a positive initiation of the snapping of said bridging electrical contact.

2. A switch comprising a housing, a stationary contact, a movable contact, a flat arm carrying said movable contact and disposed parallel to a wall of said housing, means including a pivot mounting said arm for movement in said housing, an actuating element for said arm mounted on said pivot, a spring toggle mechanism connected between said actuating elements and said arm, and a stop member secured to said wall of said housing and having an upstanding lug constituting a stop for said actuating element and a second upstanding lug constituting accelerating means for said spring toggle mechanism.

3. The invention as set forth in claim 2 wherein said stop member is disposed between said arm and said wall and said second-named lug projects through a perforation in said arm.

4. A switch comprising a housing, a barrier member pivotally mounted in said housing, a circuit closing member in said barrier member adapted to cooperate with adjacent contact members, means for snapping said barrier member to and fro to move said circuit closing member into and out of engagement with contact members, an aperture in said barrier member, and a prong positioned in said housing and projecting through said aperture, said prong serving as an intermediate fulcrum for the barrier snapping means and constituting a preliminary motion transmitting means for said barrier.

5. A switch comprising an insulating housing, spaced contacts associated therewith, said housing having openings formed in the base thereof for receiving the integral projecting terminal ends of said contacts that extend to the exterior of said housing, said openings having the major portion thereof of circular section but having a portion of rectangular section conforming to the section of said terminal ends for providing close-fitting terminal openings, a barrier member between said contacts, and through contactor means engageable between said contacts.

6. A switch comprising, a stationary contact, a movable contact, an arm carrying said movable contact, and means for moving said arm including an actuating element having a base portion, a pair of upstanding arms integral with said base portion and a slotted cam member disposed parallel to said base portions and engaged by said arms.

7. A switch comprising a housing, a stationary contact, a movable contact, an arm carrying said movable contact, means for moving said arm including an actuating element having parallel base and cam portions connected by parallel side walls, said base and cam portions having aligned perforations therein, means extending through said perforations for pivotally mounting said actuating element in said housing, and means connecting said actuating element to said arm.

8. A switch structure comprising a pair of spaced contacts, a barrier member having through contactor means adapted to be engaged between said contacts, a stud for pivotally mounting said barrier member, snapping mechanism including a spring and pitman secured at one end to said barrier member, a bearing member secured about said stud and having an extending tongue engaging the other end of said pitman, a planar cam member spaced above and secured to said bearing

member and forming a second bearing about said stud.

9. A switch comprising a pair of spaced contacts, a barrier member, electrical bridging contactor means on said barrier member adapted to engage said contacts, a stud pivotally mounting said barrier member, a mechanism for snapping said barrier member past dead center including a spring and pitman, said pitman being movably connected at one end to said barrier member, a bearing member pivotally mounted about said stud and having an extending tongue engaging the other end of said pitman, and a planar cam member spaced from and secured to said bearing member and forming a second bearing about said stud.

10. A switch structure comprising a base, a plurality of pairs of spaced contacts secured to said base, one contact of each of said pairs of contacts being rigidly mounted in said housing and the cooperating contact of the pair being resiliently supported above said rigidly mounted contact, a planar barrier member having electrical bridging means adapted to be engaged between said contacts upon the movement of said barrier member to closed circuit position, a pivotally mounted cam member, and means interposed between said cam member and said barrier to provide a snap action for said barrier for closing and opening of the circuit between each pair of contacts, upon the rotation of said cam member.

11. In a switch comprising a pair of spaced electrical contacts, a barrier member, a pair of electrical conductor bridging members carried by said barrier member and adapted to engage said pair of spaced electrical contacts, a stud having the barrier member pivotally mounted thereon, snapping mechanism including a pitman and a spring encircling said pitman, a support having an aperture, said support being secured to said barrier member and one end of said pitman passing through the aperture of the support, said support engaged by one end of said spring, a bearing member also pivotally mounted about said stud and being engaged by the other end of the pitman, a planar cam member spaced from and secured to said bearing member, and a bearing member in said planar cam member in alignment with the first bearing member.

12. An actuating element for a switch comprising a pair of flat members spaced from and connected to each other, aligned journal bearings in said flat members, cam means in one of said members for imparting motion to said element,

and means for connecting said element to a switch mechanism in one of said members.

13. In a snap-action switch mechanism, a contact arm having a contact element therein for cooperation with a plurality of contacting members, an actuator, a pitman and spring mechanism for imparting motion from said actuator to said contact arm, a pivot element provided with an enlarged flattened end fixed on said actuator, the pitman provided with an elongated slot at one end, whereby the pitman may be fitted over the said flattened end to be pivotally mounted on said pivot element.

14. A switch having in combination, a housing, cooperative movable and stationary contact elements, an oscillatory arm carrying said movable contact element actuating means for said arm, stop means for limiting the movement of said actuating means, said stop means provided with a portion projecting through said housing for securing said stop means to the housing.

15. In a switch having cooperative movable and stationary contact elements, actuating means for imparting motion to said movable contact element, stop means for limiting the movement of said actuating means, said stop means provided with integral fastening means projecting through said housing and clamping thereto.

16. A switch comprising an insulating housing, a fixed contact associated therewith, said contact having projecting terminal ends extending to the exterior of said housing, said housing having openings formed in a wall thereof for receiving said terminal ends, said openings having the inner portions thereof formed of circular section but having an outer portion of rectangular section conforming to the section of said terminal ends for providing close fitting terminal openings.

17. In a snap-action switch mechanism, a contact arm having a contact element therein for cooperation with a plurality of contacting members, an actuator, a common pivot member for the contact arm and actuator, the actuator having spaced bearing portions engaging the pivot member, a pitman and spring mechanism for imparting motion from said actuator to said contact arm, a pivot element provided with an enlarged flattened end extending from one bearing portion of said actuator, the pitman provided with an elongated slot at one end, whereby the pitman may be fitted over the said flattened end to be pivotally mounted on said pivot element.

NEWTON C. SCHELLENGER.