March 11, 1947. O. H. KAMINKY 2,417,169

SNAP SWITCH

Filed Jan. 20, 1943

Fig. 2

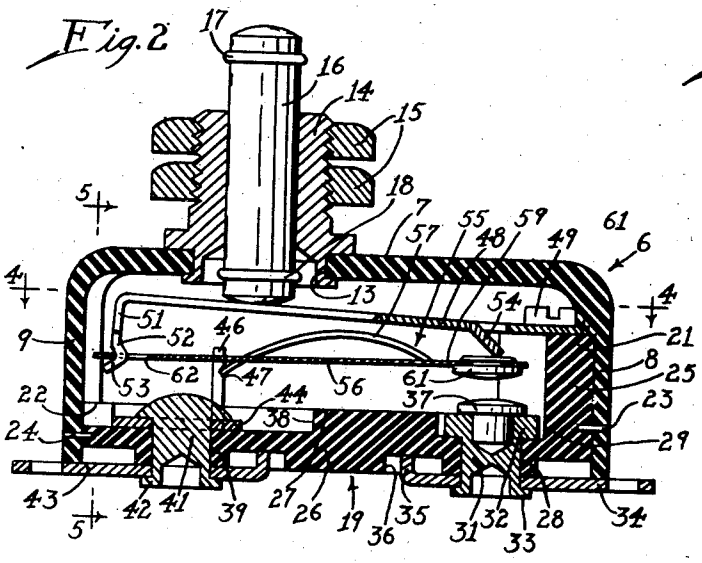


Fig. 1

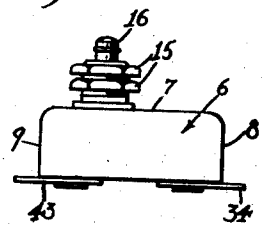


Fig. 3

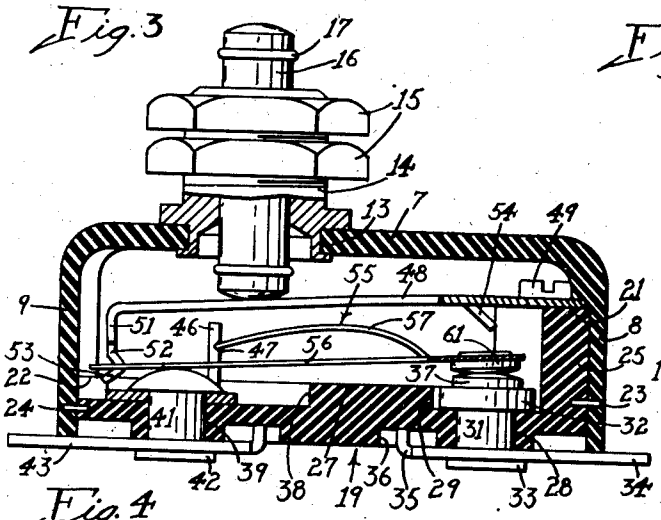


Fig. 5

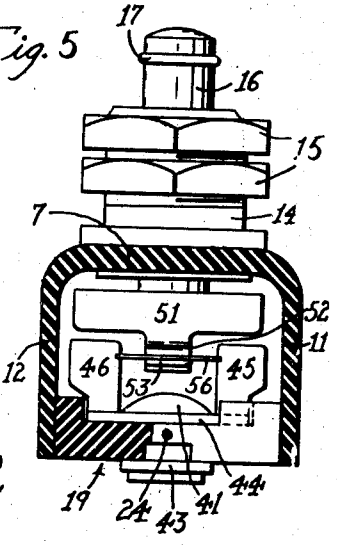
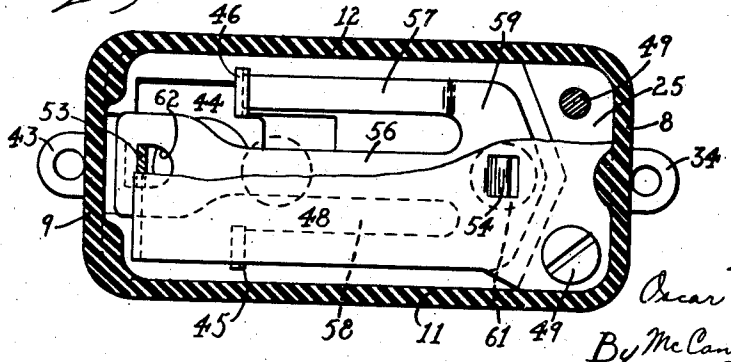


Fig. 4



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SNAP SWITCH

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Application January 20, 1943, Serial No. 472,935

7 Claims. (Cl. 200—67)

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This invention relates to snap switches and more particularly to improvements in snap switches of the general type shown and described in McGall Patent No. 1,960,020.

Among the more important objects of the invention is the provision of a switch of the character described which may be manufactured in substantially smaller size than those heretofore known in the art without reduction in the capacity of the switch or reduction in efficiency; in which the parts have improved clearance and electrical spacing; in which the parts are simple in shape so as to be cheaply manufactured without affecting the quality of the switch; in which the parts of the switch can be easily and accurately assembled at a minimum time and cost; and in which the parts are capable of interchangeable use with different spring switch supports to all of the modes of operation of the switch.

Other objects and advantages will appear from the following description and the accompanying drawing, in which—

Figure 1 is a full sized side elevation of the switch embodying my invention;

Fig. 2 is a longitudinal section taken vertically through the switch shown in Figure 1 with the parts in their normally open position;

Fig. 3 is a view similar to Fig. 2 showing the plunger depressed and the switch in closed position;

Fig. 4 is a sectional view on the line 4—4 of Fig. 2 with a part of the leaf spring broken away to show the switch spring, and

Fig. 5 is a sectional view on the line 5—5 of Fig. 2.

In the embodiment of the invention herein shown, the switch includes a housing designated generally by the numeral 6 for enclosing the upper side of the switch, the housing having an enclosing top 7, depending end walls 8 and 9 and side walls 11 and 12, and the lower edges of the walls being coplanar. Preferably this housing is formed of insulating material such as the synthetic resins or ceramic material. The top 7 has an opening 13 within which is positioned a guide tube 14 which in this instance is externally threaded for the reception of nuts 15 for panel mounting. The tube has a bore within which an actuating element or pin 16 is disposed, the pin being of such length as to project into the interior of the housing and beyond the end of the tube 14 in the manner shown. Disposed adjacent opposite ends of the plunger are stop rings 17 and 18 in the form of snap rings seated in annular grooves in the plunger in the conventional manner.

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A base designated generally by the numeral 19 is received within the housing and serves as a bottom member and closure therefor so as to completely enclose the switch mechanism, the base being formed of insulating material such as the conventional synthetic resins. The end walls 8 and 9 of the housing are provided with shoulders as indicated at 21 and 22 which serve as locating stops for the base, the base being retained in position by means of pins 23 and 24. The base 19 has an upstanding end piece 25 at one end and a main portion 26 providing a substantially flat upper face as shown at 27. Adjacent the upstanding end portion 25 the base has a bore 28 and a counterbore 29 adapted to receive an insert 31, an enlarged head 32 of the insert being received in the counterbore, the insert passing through the bore 28 and having its end rivetted over as shown at 33 against a prong or tab 34 adapted for electrical connection to the insert, the tab having an end 35 received in a recess 36 in the base to locate the tab against turning movement about the insert. A contact 37 is affixed to the insert 31 and projects thereabove as shown and forms the stationary contact of the switch mechanism.

The base is recessed as shown at 38 adjacent its opposite end and has an opening 39 for the passage of a rivet 41, which is rivetted over as shown at 42 against a prong or tab 43 similar to the tab 34. Disposed beneath the head of the rivet 41 is a plate or pivot bracket 44 of electrically conductive material seated in the recess 38 in locating engagement against the walls thereof and held down by the rivet 41. The anchor plate 44 has upwardly disposed ears 45 and 46 (Fig. 5) provided with coplanar notches 47 on the side thereof facing the end portion 25 which serve as pivotal mountings for a switch spring presently to be described.

A leaf spring 48 forming a further pivot bracket is attached at one end in face contact against the top of the end portion 25 by means of screws 49 and projects longitudinally of the housing in spaced relation to the top 7 and to the upper face 27 of the base to a point beyond the lower end of the plunger 16. The leaf spring is of spring material such, for example, as beryllium copper, and projects longitudinally of the housing in cantilever fashion, the free end thereof being formed downwardly as shown at 51, the extreme end thereof being of reduced cross-section as shown at 52 and having a curved bearing surface 53

functioning in the support of the switch spring. A portion of the leaf spring is struck out adjacent the upstanding end portion 25 as shown at 54 and acts as a stop for the switch spring.

Disposed between the leaf spring 48 and the base 19 is a switch spring designated generally by a numeral 55, which in this instance comprises a central tension member 56 and compression members 57 and 58 disposed on opposite sides of the tension member and in spaced relation thereto. One end of each of these members is interconnected by a bridge portion 59 (Fig. 4) and in this instance the bridge portion is integral with the tension and the compression members, the entire spring preferably being stamped from a single piece of spring metal such as beryllium copper or the like. Positioned on the bridge portion 59 is a mobile contact 61 disposed above the stationary contact 37 so as to register therewith upon movement of the switch between its limiting positions. The opposite end of the tension member is provided with an opening 62 adapted to receive the support portion 52 of the leaf spring. The opposite ends of the compression members 57 and 58 are seated in the notches 47 for pivotal movement with respect to the anchor or support members 46. The support members 45 and 46 and the support member 52 are so spaced that the distance therebetween is greater than the distance from the free ends of the compression members to the rear edge of the opening 62 so that when the spring is mounted in these supports the compression members 57 and 58 are bowed in compression as shown in Figs. 2 and 3, thus placing the central tension member 56 in tension. In the present embodiment of the invention, the normal or unactuated position of the parts is shown in Fig. 2, from which it will be seen that the pivot point between the support 52 and the rear edge of the opening 62 is such that the tension centerline of the tension member 56, that is, a line connecting the bridge portion 59 and the junction of the member with the support 52, is above the transverse pivotal axis of the compression members 57 and 58. When the switch is actuated by movement of the plunger inwardly, the leaf spring 48 is flexed, moving the support 52 downward, and when the tension centerline passes the transverse axis of the compression members, the parts will be moved with a snap movement to the position shown in Fig. 3 with the mobile contact 61 engaging the stationary contact 37. Upon release of the plunger 16 the leaf spring returns the point of support of the tension member, and as the tension centerline passes the transverse pivotal axis on which the compression members move, the parts will return to the position of Fig. 2 with a snap movement.

It will be seen that with the arrangement herein shown, the parts normally occupy the position shown in Fig. 2, unless movement is applied to the plunger to force it inward, and release of the plunger always leaves the switch in this position. However, by placing the anchor supports for the ends of the compression members 57 and 58 on the leaf spring 48 so as to be moved thereby and raising the transverse axis, and by carrying the support means 52 from the anchor plate 44, the switch can be converted to a normally closed switch in which the contacts are opened by depression of the plunger 16. This conversion involves simply a change in the form of the leaf spring 48 and the anchor plate 44 so as to reverse the points of support for the compression members and the tension member.

It will be understood that the operating characteristics of the switch can be varied by initially stressing or deforming either the tension member 56 or the compression members 57 and 58 in accordance with prior art practice.

I claim:

1. The combination in a snap switch of a housing having a top and depending side walls, a plunger disposed in said top adjacent one end thereof movable axially therethrough to actuate the switch, a base of insulating material disposed between said side walls and forming a closure for said housing, said housing and said base having interfitting means for predetermining the relative positions of said base and said top, a leaf spring within said housing attached at one end in cantilever fashion to said base adjacent the end of said housing opposite said plunger and extending longitudinally of the housing adjacent to and in spaced relation with said top and beneath said plunger to be depressed by inward movement of said plunger, a stationary contact on said base adjacent said opposite end of said housing, a contact carrying switch spring disposed between said leaf spring and said base, said switch spring comprising a tension member and a compression member connected together at one end and a movable contact at said end cooperable with said stationary contact, supporting means on said base for pivotally supporting the other end of one of said members, and supporting means on said leaf spring for pivotally supporting the other end of the other of said members, said supporting means being positioned to apply a compressive force to said compression member to tension said tension member and cause said movable contact to move with a snap movement upon predetermined lateral movement of said last mentioned supporting means in response to inward or outward movement of said plunger.

2. The combination in a snap switch of a base of insulating material having an upstanding end portion, a leaf spring attached at one end of the upper end of said end portion and extending over said base in cantilever fashion, a stationary contact on said base disposed between said base and said leaf spring adjacent said end portion supporting means on said base adjacent the opposite end thereof comprising an upstanding support element, supporting means depending from said leaf spring adjacent the unsupported end thereof, and a contact carrying switch spring disposed between said leaf spring and said base comprising a central tension member pivotally supported at one end on the last mentioned supporting means, compression members disposed on opposite sides of said tension member pivotally supported at one end on the first mentioned supporting means, means connecting the opposite ends of said tension and compression members above said stationary contact, and a mobile contact on said connecting means cooperable with said stationary contact, said supporting means being positioned with respect to each other to apply a compressive force to said compression members to tension said tension member and cause said mobile contact to move with a snap motion when said leaf spring is moved toward and away from said base beyond a predetermined plane.

3. The combination in a snap switch of a base of insulating material having an upstanding end portion, a leaf spring attached to one end to the upper side of said end portion and extending over

said base in cantilever fashion, a stationary contact on said base disposed between said base and said leaf spring adjacent said end portion, supporting means on said base adjacent the opposite end thereof comprising a portion adapted to seat in face contact with said base and upstanding support elements, said base having shape characteristics to receive said supporting means in interfitting relationship to prevent relative movement therebetween, supporting means depending from said leaf spring adjacent the unsupported end thereof, and a contact carrying switch spring disposed between said leaf spring and said base comprising a central tension member pivotally supported at one end on the last mentioned supporting means, compression members disposed on opposite sides of said tension member pivotally supported at one end on the first mentioned supporting means, means connecting the opposite ends of said tension and compression members above said stationary contact, and a mobile contact on said connecting means cooperable with said stationary contact, said supporting means being positioned with respect to each other to apply compressive force to said compression members to tension said tension member and cause said mobile contact to move with a snap motion when said leaf spring is moved toward or away from said base beyond a predetermined plane.

4. The combination in a snap switch of the precision type of a contact carrying switch spring comprising a tension member and a compression member connected together at one end, and a mobile contact thereon adjacent the connected ends, a stationary contact located adjacent said mobile contact for engagement thereby, a leaf spring attached at one end adjacent said contacts extending along one side of said switch spring in the same general direction and adapted to be moved toward and away from the switch spring, a plunger mounted toward the other end of said leaf spring for engagement therewith to flex the same, supporting means for pivotally supporting the other end of said compression member, and supporting means on the free end of said leaf spring for pivotally supporting the other end of said tension member, said supporting means being positioned to apply a compresive force to said compression members to tension said tension member and cause said mobile contact to move with a snap movement upon predetermined lateral movement of said last mentioned supporting means in response to movement of said plunger.

5. The combination in a snap switch of the precision type of a contact carrying switch spring comprising a tension member and a compression member connected together at one end, and a mobile contact thereon adjacent the connected ends, a stationary contact located adjacent said mobile contact for engagement thereby, a leaf spring attached at one end adjacent said contacts extending along one side of said switch spring in the same general direction and adapted to be moved toward and away from the switch spring, a plunger mounted toward the other end of said leaf spring for engagement therewith to flex the same, supporting means for pivotally supporting the other end of said compression member, supporting means on the free end of said leaf spring for pivotally supporting the other end of saird tension member, said supporting means being positioned to apply a compressive force to said compression members to tension said tension member and cause said mobile contact to move with a snap movement upon predetermined lateral movement of said last mentioned supporting means in response to movement of said plunger, and stop means on said leaf spring for predetermining the amplitude of said mobile contact.

6. The combination in a snap switch of the precision type of a contact carrying switch spring comprising a tension member and a compression member connected together at one end, and a mobile contact thereon adjacent the connected ends, a stationary contact located adjacent said mobile contact for engagement thereby, a leaf spring attached at one end adjacent said contacts extending along one side of said switch spring in the same general direction and adapted to be moved toward and away from the switch spring, a plunger mounted toward the other end of said leaf spring for engagement therewith to flex the same, supporting means for pivotally supporting the other end of said compression member, supporting means on the free end of said leaf spring for pivotally supporting the other end of said tension member, said supporting means being positioned to apply a compressive force to said compression members to tension said tension member and cause said mobile contact to move with a snap movement upon predetermined lateral movement of said last mentioned supporting means in response to movement of said plunger, a stop on said leaf spring bendable to adjust the amplitude of movement of said movable contact.

7. The combination in a snap switch of the precision type of a base, a contact carrying switch spring comprising a tension member and a compression member connected together at one end, and a mobile contact thereon adjacent the connected ends, a stationary contact carried on said base adjacent said mobile contact for engagement thereby in the operation of the switch, a leaf spring attached at one of its ends to said base adjacent said contacts and extending therealong in approximate parallel relation therewith adapted to be flexed toward and away from said base, said leaf spring having supporting means thereon comprising an end thereof bent downwardly toward said base a substantial distance, a plunger movement adjacent the free end of said leaf spring for engagement therewith to flex the same, supporting means disposed between the base and said leaf spring for pivotally supporting the other end of said compression member, the other end of said tension member being pivotally supported on the first mentioned supporting means, said supporting means being positioned to apply a compressive force to said compression member to tension the tension member and cause the mobile contact to move with a snap movement upon predetermined lateral flexing of said leaf spring in response to movement of said plunger.

OSCAR H. KAMINKY.

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The following references are of record in the file of this patent:

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Certificate of Correction

Patent No. 2,417,169. March 11, 1947.

OSCAR H. KAMINKY

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows: Column 4, line 74, claim 3, for "to one" read *at one*; column 5, line 49, claim 4, for "compresive" read *compressive*; line 72, claim 5, for "saird" read *said*; column 6, line 49, claim 7, for "movement" read *mounted*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of May, A. D. 1947.

[SEAL]

LESLIE FRAZER,
First Assistant Commissioner of Patents.