

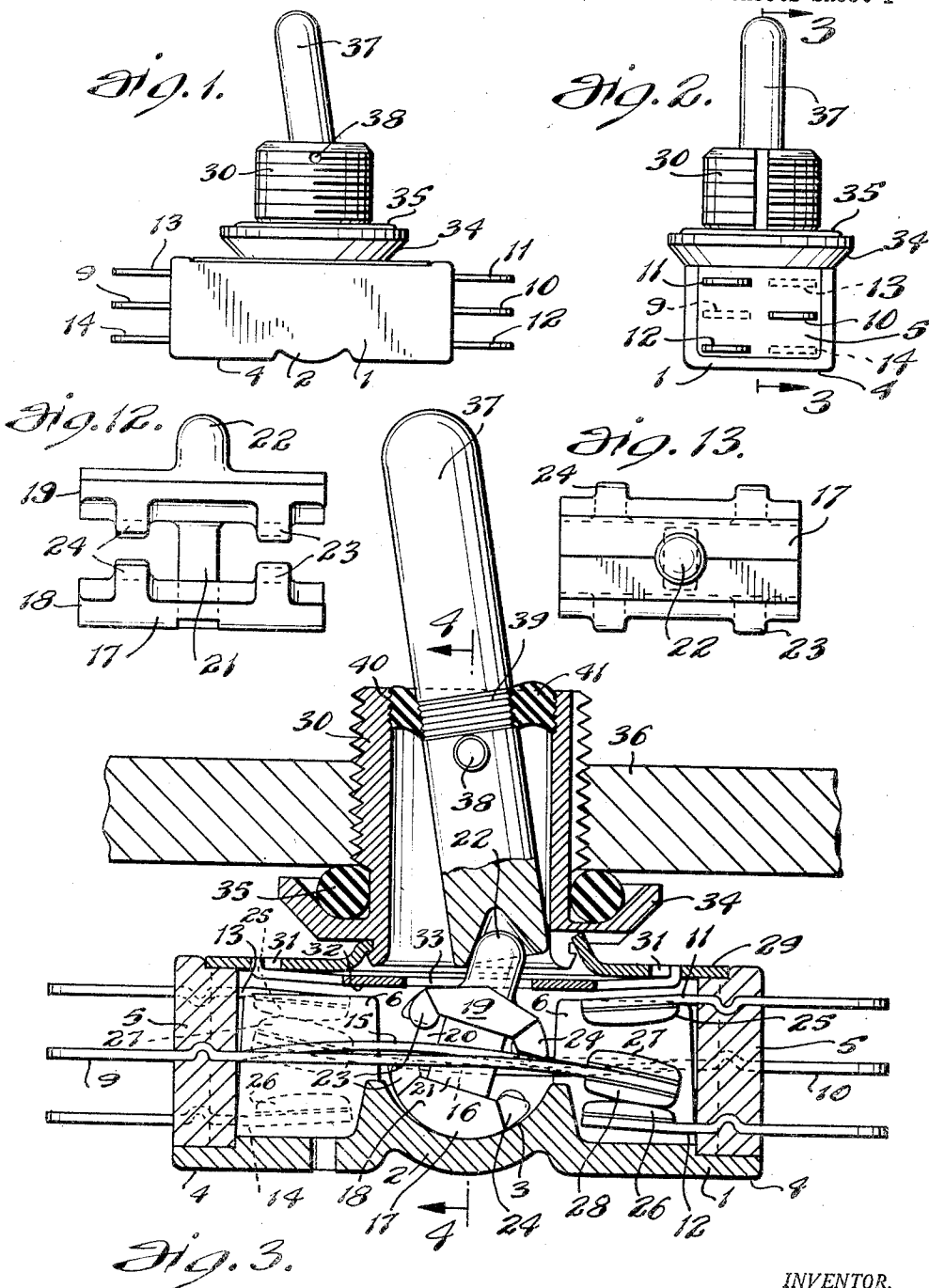
Sept. 1, 1953

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SNAP SWITCH

2,650,964

Filed Jan. 28, 1952

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

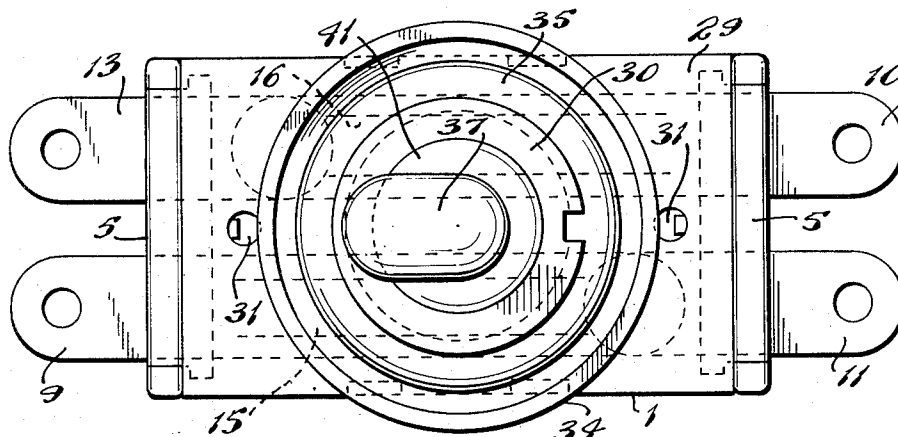


Fig. 5.

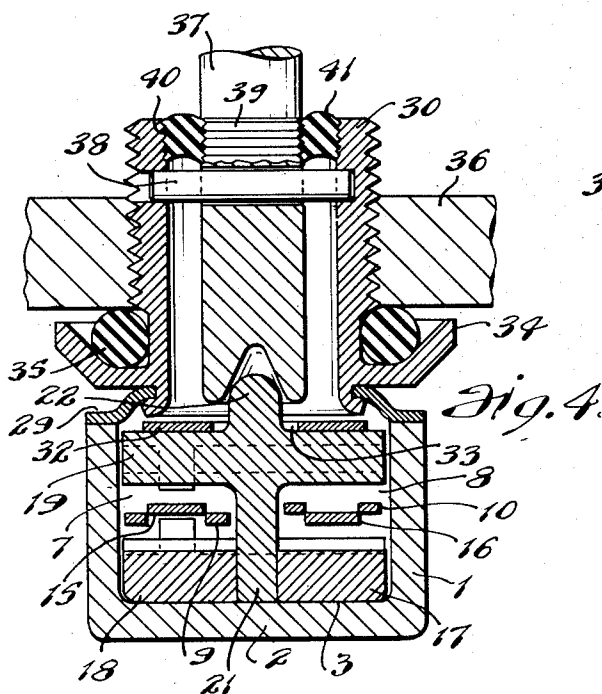


Fig. 4.

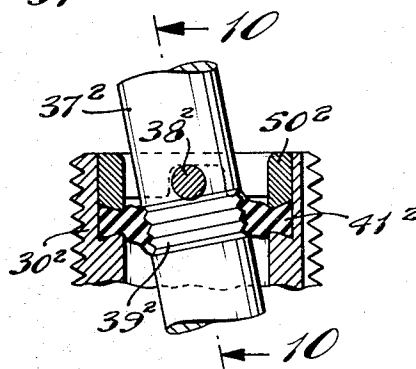


Fig. 9.

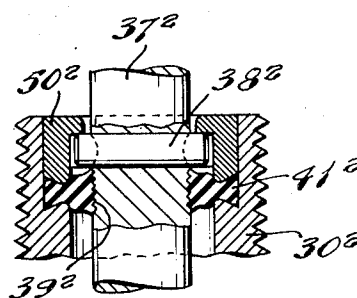


Fig. 10.

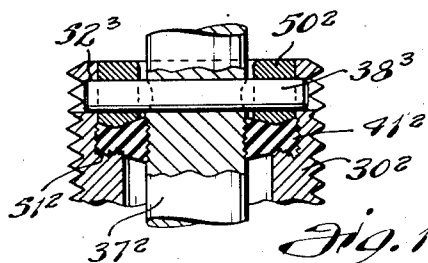


Fig. 11.

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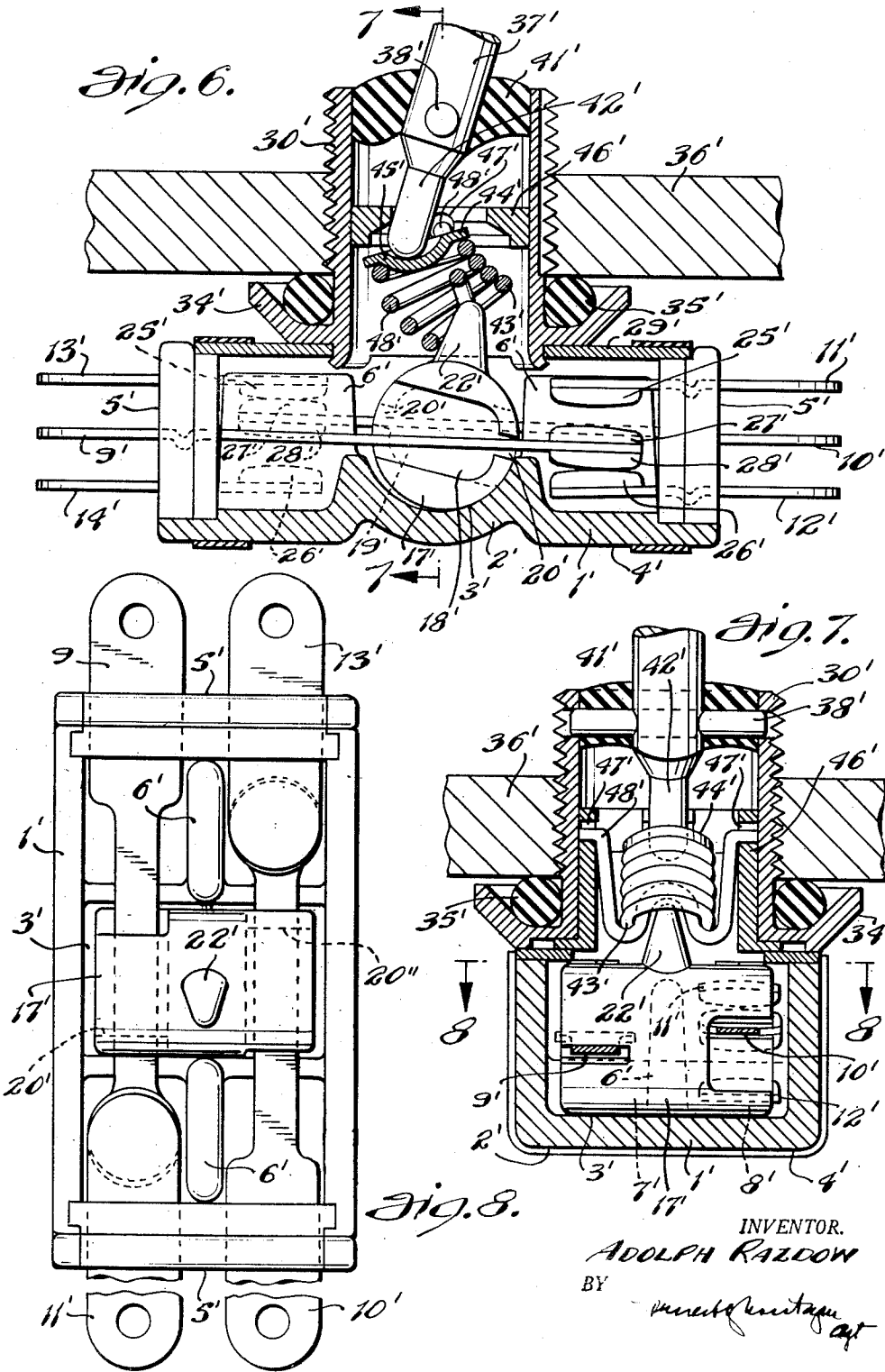
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,650,964

SNAP SWITCH

Adolph Razdow, New York, N. Y.

Application January 28, 1952, Serial No. 268,614

10 Claims. (Cl. 200—67)

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This invention relates to snap switches in general and, more particularly, to double-acting snap switches and the like and snap-acting spring members embodied in such switches.

Double-acting snap switches are known in which the change of one spring position to the other is obtained by lifting up the spring which gradually decreases the contact pressure. Decrease of contact pressure means, however, increase of arcing and fast deterioration of the contact material. Furthermore, the contacts in the known snap switches are usually riveted to the spring material which arrangement brings about fumes which attack the springs and corrode the surface of the springs and their contacts. An increase in the electrical resistance follows and the temperature of the contact increases because of little arcs which are generated between contacts and the springs. A further characteristic feature of known snap switches resides in the fact that the electrical outside connection is usually obtained by lugs which are riveted to the current-conducted springs. This kind of connection creates difficulties after a comparatively short period of time due to the corrosion between the lugs and the rivets and between the rivets and the springs.

It is, therefore, one of the objects of the present invention to provide an improved form of tool-handle snap switch.

It is another object of the present invention to provide a snap switch of the aforementioned character having parts of rugged and durable construction, and which is not likely to get out of order.

It is still another object to provide such a switch with stationary and movable contact elements of improved form.

It is yet another object of the present invention to provide a single or double-pole, single or double-throw snap switch or combination thereof which is substantially of sealproof construction.

It is still a further object of the present invention to provide a switch of the aforementioned character which minimizes the number of different parts required to produce the switch.

It is yet another object of the present invention to provide a snap switch, the springs of which produce a high contact pressure between the springs and the corresponding stationary contacts.

It is also a further object of the present invention to provide a snap switch in which the

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contact pressure is further increased during the time of changing the spring position until the center portion of the spring moves through the center portion thereof and forces the spring to snap over to the other position of the moving spring.

It is also another object of the present invention to provide a snap switch in which the contacts are welded or soldered to the spring thereby obtaining a corrosive-free contact.

It is also a further object of the present invention to provide a snap switch the stationary contacts of which are welded or soldered to heavier springs.

It is yet a further object of the present invention to provide a snap switch in which the size and/or shape of the springs is chosen in such manner as to obtain a small movement, thereby producing a minute wiping action between the stationary and the moving contacts.

It is also an object of the present invention to provide a snap switch, which avoids any indirect contact which is brought about by providing long springs which protrude from the insulating case of the switch and serve as lugs on which the electrical connecting wire may be screwed, soldered, or welded.

It is yet another object of the present invention to provide a snap switch, the insulating case of which contains a small floating bridge adapted to slide within small cut-outs disposed inside of the casing, and the bridge being moved by a hand-actuated lever.

It is an object of the present invention to provide a snap switch containing a bushing structure for a hand-actuated lever which brings about a complete seal for the switch.

It is also an object of the present invention to provide a snap switch including a hand-actuated lever which may be sealed up by a magnetic fluid seal.

With these and other objects in view which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

Figure 1 is an elevational view of a double-acting snap switch;

Fig. 2 is an end view thereof;

Fig. 3 is a vertical axial section through the switch at an enlarged scale for the purpose of better demonstration;

Fig. 4 is a section substantially along the lines 4—4 of Fig. 3;

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Fig. 5 is a top plan view thereof, the panel board being removed;

Fig. 6 is a vertical axial section of another embodiment of the snap switch;

Fig. 7 is a section substantially along the lines 7—7 of Fig. 6;

Fig. 8 is a section along the lines 8—8 of Fig. 7;

Fig. 9 is a fragmentary section of one variation of a second embodiment of the sealing means for the hand-actuated lever;

Fig. 10 is a section along the lines 10—10 of Fig. 9;

Fig. 11 is a fragmentary section showing a second variation of the second embodiment, as shown in Fig. 9, of the sealing means for the hand-actuated lever; and

Figs. 12 and 13 are elevational and plan views, respectively, of the bridge member shown in Figs. 3 and 4.

Referring now to the drawings and particularly to Figs. 3 to 5, the switch comprises a longitudinal casing 1 of preferably rectangular cross-section, which casing opens to the top and at both ends, and which is of insulating material. As shown in Fig. 4, the bottom 2 of the casing 1 forms in its center a partly cylindrical base 3, and the end portions 4 of the bottom 2 are set off and are of lesser thickness than the main portion of the bottom 2. Vertical blocks 5 are provided to close up both ends of the casing 1 and find their seat in the set-off portions of the bottom 2. Each of the side portions of the casing 1 is divided by longitudinally extending and vertically disposed ribs 6, the latter terminating adjacent the center portion of the casing 1 having the cylindrical base 3. Thus the ribs 6 divide the casing 1 into two separate chambers 7 and 8, each of said chambers being adapted to receive a contact spring 9 and 10, respectively, and each of the springs 9 and 10 has coordinated thereto two stationary spring contacts 11, 12 and 13, 14, respectively. The said contact springs as well as the stationary springs are mounted in the end blocks 5 of the casing 1. The spring 9 extends from one block 5 through the entire casing towards the other block 5, and its end is disposed between the stationary springs 11 and 12. In similar manner, the contact spring 10 extends from the other block 5 through the other chamber of the casing 1 towards the first-mentioned block 5, and its end is disposed between the stationary springs 13 and 14.

Thus it appears that the contact springs 9 and 10 as well as the stationary springs 11, 12, 13 and 14, extend through the blocks 5 outside of the casing 1 and form lugs or terminals to which a connecting wire (not shown) may be screwed, welded, or soldered.

As particularly shown in Fig. 5, the springs 9 and 10 are formed as flat springs and preferably made of resilient sheet metal. An appreciable portion of the springs 9 and 10 are slotted along parallel lines and the center portions 15 and 16, respectively, are in curved position outside the plane of the springs 9 and 10, against which an operating bridge member, to be described later, exerts pressure when each of the springs 9 and 10 is to be changed from one contact position into the other.

The bridge member 17 which operates the springs 9 and 10 to assume the respective contact positions, floats in the center portion of the casing 1 and comprises substantially a cylindrical body which is divided into two separate elements 18

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and 19 which are formed by a recess 20 extending cross-wise through the bridge member 17 and merely being connected by a rib 21. The cylindrical outer face, which is of slightly lesser diameter than that of the base 3 of the casing 1, rests on the latter and permits of the assumption of different inclined positions. A pin-like extension 22 is provided on top of the bridge member 17, which extension is adapted to perform a rotating movement thereof.

The elements 18 and 19 are equipped with ear extensions 23 and 24 which are adapted to exert pressure against the center portions 15 and 16, respectively, of the springs 9 and 10 when the latter are moved from one contact position to the other. For this purpose the ear extensions 23 and 24 are equipped with special contact recesses so that the contact faces of the recess abut first against the center portions 15 and 16, respectively, of the springs 9 and 10, respectively, while the outer portions of the ear extensions 23 and 24 abut the outer faces of the springs 9 and 10, respectively, upon pushing their center portion 15 and 16, respectively, towards and through the outer portion of the springs 9 and 10, respectively. By this arrangement, the contact pressure between the contact spring and the stationary spring is at first further increased during the time of changing of the position of the contact spring until the center portion 15 and 16, respectively, of the springs 9 and 10, respectively, moves through the slots provided in the said springs and forces the springs 9 and 10, respectively, to snap over to the other position where it remains until a change of positions is desired.

Special contacts 25 and 26 are provided on the stationary springs 11 and 12 and also correspondingly on the stationary springs 13 and 14, while the inner end of each of the springs 9 and 10 is equipped with double contacts 27 and 28. It is a particular feature of the present invention to weld or solder the contacts to the springs 9 and 10 in order to obtain a corrosive-free contact. It has been found that the use of induction heating or resistance heating is of advantage to avoid overheating of the spring material. It is also a feature of the present invention to provide springs which require a small movement only in order to move from one to the other contact position and to require a minute wiping action between the stationary and moving contacts. This cleansing action decreases appreciably the contact resistance and improves the efficiency of the switch.

The open top of the casing 1 is closed by a cover 29 which has a center opening to receive an externally threaded hollow metal bushing 30. Any conventional means may be used to connect the metal bushing with the cover 29. The latter is equipped with oppositely disposed openings 31 which receive the bent-over ends of a flat spring member 32 which is adapted to abut against the top face of the bridge member 17. The spring 32 has a recess 33 through which the pin extension 22 protrudes.

The bushing 30 is preferably keyed and also has preferably at its inner end a flange 34 which is adapted to receive a sealing ring 35 pressed against the panel board 36 on which the switch is mounted by screwing the bushing 30 therein.

The hand lever 37 extends through the hollow bushing 30 and is supported therein by a pivot pin 38 properly mounted in the wall of the bushing 30. As shown in Fig. 4, the wall of the bushing 30 has on one side a recess and on its opposite

side a complete boring, thus permitting an easy insertion of the pivot pin 38 into the bushing 30.

Three different sealing means may be provided, in accordance with the present invention, to seal the hand lever 37 in the bushing 30 without interfering with the operation of the lever. One embodiment, shown in Figs. 3 and 4, shows serrations 39 on the outer face of the lever 37 and corresponding serrations 40 on the inner face of the bushing 30. A diaphragm 41 of rubber or any other suitable material is secured to the outer face of the hand lever 37 and the inner face of the bushing 30 by providing a bond between the metal and the rubber and by exerting a high pressure during the curing of the rubber. Instead of providing serrations, it is also possible to arrange merely a rough surface and/or grooves on the respective metal faces or any face suitable for the purpose. It has been found that certain silicon rubbers withstand very low temperatures up to -80° F. and also very high temperatures up to +450° F. without changing the elastic properties of the material. Instead of using the diaphragm seal, it is also possible to use a magnetic fluid seal, as disclosed in my Patent No. 2,557,140. It is of advantage to vulcanize the diaphragm to the bushing and the hand lever before the cover 29 is fastened to the casing 1 of insulating material. Where higher gas or fluid pressure prevails, more than one diaphragm may be used.

Referring now to Figs. 6, 7 and 8, which show a second embodiment of the switch, the latter comprises again a casing 1' of preferably rectangular cross-section and opening to the top and to the ends. The bottom 2' of the casing 1' is formed again in its center portion to a partly cylindrical base 3'. The side portions and the end portions 4' of the bottom 2' are set off and are of lesser thickness than the main portion of the bottom 2'. Vertical blocks 5' are provided to close up both ends of the casing 1' and find again their seat in the set-off portions of the bottom 2'. Each of the side portions of the casing 1' is divided by longitudinally extending and vertically disposed ribs 6', the latter terminating adjacent the center portion of the casing 1', having the cylindrical base 3'. Accordingly the ribs 6' divide the casing 1' into two separate chambers 7' and 8', each of said chambers being adapted to receive a contact spring 9' and 10', respectively, and each of the springs 9' and 10' has coordinated thereto two stationary spring contacts 11', 12', and 13', 14', respectively. The contact springs and also the stationary springs are mounted in the end blocks 5' of the casing 1'. The spring 9' extends from one block 5' through the entire casing 1' along the chamber 8' towards the other block 5', and its end is disposed between the stationary springs 11' and 12'. In similar manner, the contact spring 10' extends from the other block 5' along the other chamber 7' of the casing 1' towards the first-mentioned block 5', and its end is disposed between the stationary springs 13' and 14'.

Thus the contact springs 9' and 10', as well as the stationary springs 11', 12', 13' and 14', extend through the blocks 5' outside of the casing 1' and form lugs or terminals to which a connecting wire (not shown) may be screwed, welded or soldered. It appears that the casing structure of the second embodiment is substantially identical with that of the first embodiment.

The springs 9' and 10' are formed as flat springs and preferably made of resilient sheet metal. In this embodiment, however, the center portions of

the springs 9' and 10' are not slotted and partly removed out of the plane of the springs, since the function of these center portions of the flat springs 9' and 10' is assumed by an additional coil spring to be described later.

A bridge member 17', which operates the springs 9' and 10' to assume the respective contact positions, floats in the center portion of the casing 1' and comprises again substantially a cylindrical body which is equipped with recesses 18' and 19', respectively, the recesses being narrowed to a mere passage 20' at opposite ends thereof. These recesses are designed to permit of extension of the contact springs 9' and 10' through the bridge member 17' and at the same time to provide abutments against these contact springs to shift the latter into the respective contact positions. The cylindrical outer face of the bridge member 17' is of slightly lesser diameter than that of the base 3' of the casing 1' and due to its floating position is permitted to assume different inclined positions. A pin-like extension 22' is provided on top of the bridge member 17', which extension is adapted to bring about the rotating movement of the bridge member 17'.

Special contacts 25' and 26' are provided on the stationary springs 11' and 12' and also correspondingly on the stationary springs 13' and 14', while the inner end of each of the springs 9' and 10' is equipped with double contacts 27' and 28'. The mentioned contacts are preferably welded or soldered to the respective springs in order to obtain a corrosive-free contact.

The open top of the casing 1' is closed by a cover 29' and is preferably soldered to the casing 1'. The cover 29' has a central opening to receive an externally threaded hollow metal bushing 30', the latter being connected to the cover 29' by any conventional means.

The bushing 30' is preferably keyed and also has at its inner edge a flange 34' adapted to receive a sealing ring 35' which is pressed against the panel board 36' on which the switch is mounted by screwing the bushing 30' therein.

A hand lever 37' extends through the hollow bushing 30' and is supported therein by a pivot pin 38' properly mounted in the wall of the bushing 30'. The lever 30' terminates at its lower end in an extension 42' of reduced diameter. The pin extension 22' enters the lower end of a coiled compression spring 43', and telescoped into the upper end of the compression spring 43' is an approximately inverted cup-shaped sheet metal member 44', the closed upper end 45' of which is dish or depressed to provide a suitable abutment for the rounded lower extension 42' of the hand lever 37'. A second cup-shaped member 46' is fitted into the bushing 30', which member 46' is equipped with two diametrically oppositely disposed openings 47' to receive the ends of a yoke 48', the center portion of which enters the lower end of the coiled compression spring 43'. The yoke 48' is adapted to maintain the compression spring 43' in its position above the pin extension 22' of the bridge member 17'. By this arrangement, the contact pressure between the contact springs and the stationary springs is at first further increased during the time of changing of the position of the contact springs until the springs 9' and 10', respectively, snap over to the other position where they remain until a change of positions is desired.

It has been pointed out above that three different sealing means may be provided, in accordance with the present invention, to seal the hand lever

in the bushing without interfering with the operation of the lever. One embodiment has been shown in Figs. 3 and 4 where a diaphragm 41 of rubber or any other suitable material is secured to the outer face of the hand lever 37 and the inner face of the bushing 30 by providing a bond between metal and the rubber. The same sealing means may be provided in the embodiment shown in Figs. 6 and 7.

Figs. 6 and 7, however, show a second means for sealing the hand lever in the bushing by providing a diaphragm 41' which is bonded to the inner face of the bushing 30', and which diaphragm 41' has an opening 49' to receive the pivot pin 38'. This arrangement is preferred over that shown in Figs. 3 and 4, because the arrangement in Figs. 3 and 4 opens an avenue into the bushing through the opening of the pivot pin 38 into the bushing 30. It is clear that the arrangement shown in Figs. 6 and 7 eliminates this avenue and provides a perfect sealing for the bushing 30' and thereby also of the switch casing 1'.

Figs. 9 to 11 show two different embodiments of a third means for sealing the lever in the bushing and this means comprises substantially the arrangement of a diaphragm 41² in the bushing 30², which diaphragm is here, however, disposed below the pivot pin 38². The structure shown in Figs. 9 and 10 specifically shows a set-off for the inner diameter at the upper end of the bushing 30² and the diaphragm 41² rests on the shoulder formed by the set-off in the bushing 30². A special ring 50² is inserted into the bushing on top of the diaphragm, pressing against the latter and maintained there in its sealing position. The ring 50² forms at the same time the bearing for the pivot pin 38².

Fig. 11 shows merely a variation of the structure shown in Figs. 9 and 10. While the sealing ring 50² maintained the diaphragm 41² in its sealing position, the structure shown in Fig. 11 provides in addition a bonding of the diaphragm 41² to the shoulder faces 51² of the bushing 30², and in addition the sealing ring 50² is provided to support the maintenance of the diaphragm 42² in its sealing position. The pivot pin 38³ extends in this structure not only through the sealing ring 50² but also through proper borings 52³ of the bushing 30².

The two basic embodiments of the snap switch, shown in Figs. 3 to 5 and Figs. 6 to 8, respectively, operate and are constructed in a simple manner and both embodiments not only provide a very high contact pressure between the contact springs and the stationary springs, but also bring about increase of contact in the first stage of the changing of positions of the contact springs, which change is achieved by a simple operation of the hand lever.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. In an electric switch, in combination, an insulating longitudinal casing open at its top and at its ends, said casing having a curved bottom disposed in its central portion and extending crosswise to the longitudinal axis of the said casing, a switch actuating bridge member having a stem extension floating in the said casing and supported by the curved bottom of the said casing

for oscillatory rotary movement, a top cover having a central opening and closing the top of the said casing, the said stem extension of the said bridge member extending through the said opening of the top cover, an end block disposed at each side of the said casing to close the side ends thereof, a first spring blade carried by and extending through one of the said end blocks and disposed in the casing from one end thereof to adjacent its other end, two additional spring blades carried by and extending spaced apart from each other one above the other through the other of the said end blocks into the said casing and terminating adjacent the said other end block, the inner end of the said first spring blade being disposed between the inner ends of the said spring blades constituting electrical contacts, the said switch actuating bridge member having a slot extending in longitudinal direction of the said casing and the said first spring blade passing loosely through the said slot, the outer ends of the said spring blades constituting terminal lugs, a bushing secured to and extending upwardly from the said top cover, an operating lever pivotally supported by the said bushing and adapted to actuate the said bridge member and to oscillate the latter into two respective contact positions, means for operatively sealing the said lever in the said bushing.

2. The electric switch, as set forth in claim 1, in which the said bridge member has extensions adapted to engage the said first spring blade and to bring about the snap action for the said first spring blade upon changing from one to the other contact position.

3. The electric switch, as set forth in claim 1, in which a longitudinally disposed center portion of the said first spring blade is positioned outside the plane of the blade and the said center portion of the first spring blade being pressed through the latter into an opposite position upon exerting a rotary movement upon the bridge member by means of the said operating lever.

4. The electric switch, as set forth in claim 1, in which the inner end of the operating lever has a recess adapted to receive the extension of the said bridge member in order to perform a proper oscillatory rotary movement of the bridge member upon shifting the outer end of the operating lever into the respective positions.

5. The electric switch, as set forth in claim 1, which includes a metal yoke member pivotally supported within said bushing and depending towards said casing, a coiled compression spring interposed between the lower end of said lever and said yoke, the said stem extension of the bridge member entering an inner formation of the said yoke, a substantially cylindrical guide member telescoped downwardly over the said coiled compression spring and extending throughout the major portion of the length of the latter, a concave upper plate resting on top of the said coiled compression spring and providing an abutment for the lower end of the said operating lever, the said coil compression spring maintaining the said bridge member and thereby the electrical contact of the said first spring blade under steady pressure in one or the other of its contact positions and upon turning the operating lever bringing about a snap action for the said first spring blade.

6. The electric switch, as set forth in claim 1, in which the said sealing means for the operating lever in the said bushing comprise a diaphragm

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sealed to the inner walls of the said bushing and to the outer wall of the said operating lever.

7. The electric switch, as set forth in claim 6, in which the said diaphragm is disposed above the pivot of the said operating lever.

8. The electric switch, as set forth in claim 6, in which the said diaphragm is disposed below the said pivot for the said operating lever.

9. The electric switch, as set forth in claim 6, in which the said pivot is disposed inside of the said diaphragm sealing the said operating lever.

10. The electric switch, as set forth in claim 6, in which the outer end of the said bushing has a shoulder forming a larger inner diameter than

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that of the remaining inner diameter of the said bushing, a diaphragm resting on the said shoulder of the bushing and a sealing ring inserted at the outer end of the said bushing and maintaining the said diaphragm in operative position in the said bushing, thereby sealing the said operating lever.

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References Cited in the file of this patent

FOREIGN PATENTS

Number	Country	Date
985,619	France	July 20, 1951