

March 25, 1947.

R. T. CORNELIUS

2,418,068

SWITCH

Filed Oct. 28, 1943

2 Sheets-Sheet 1

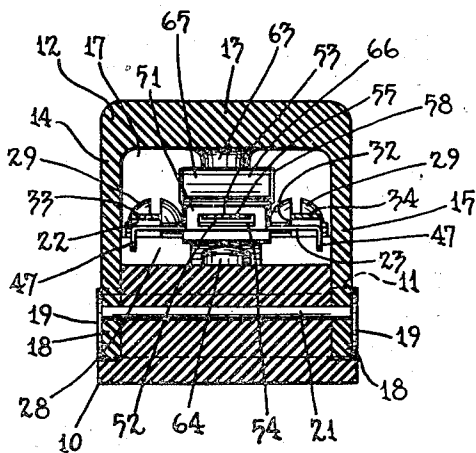
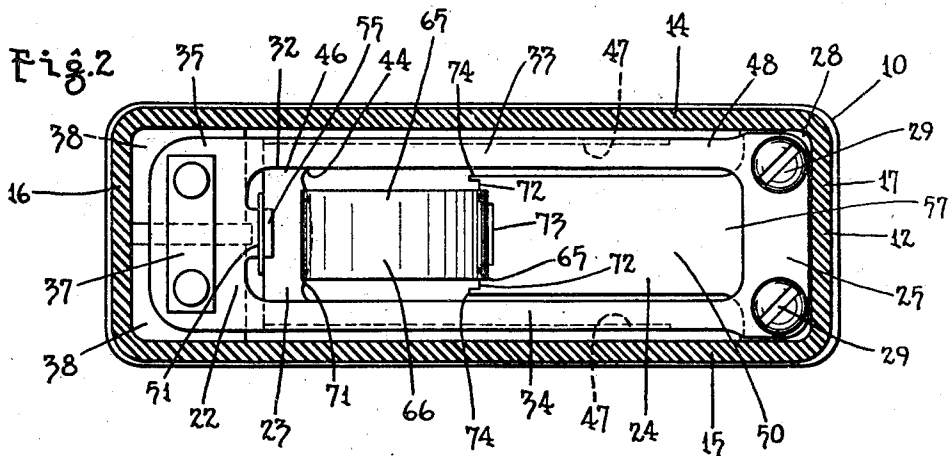
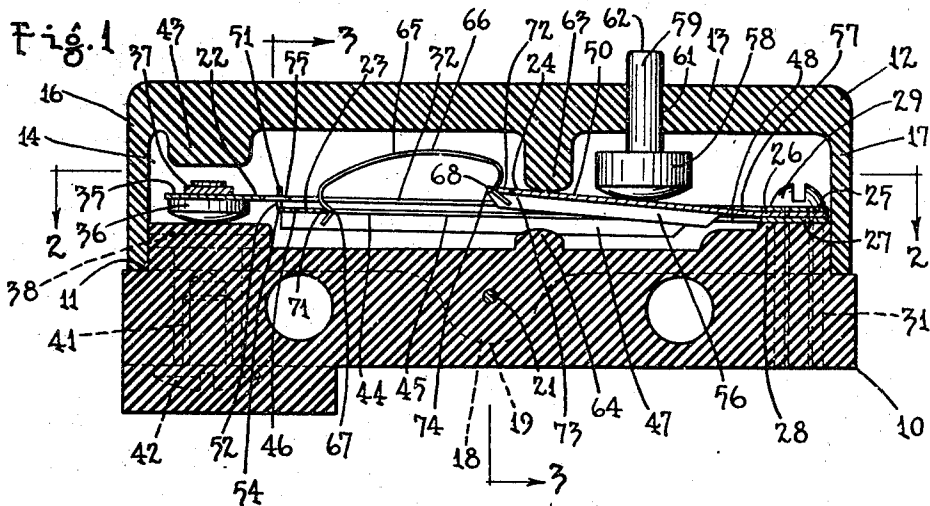


Fig. 3

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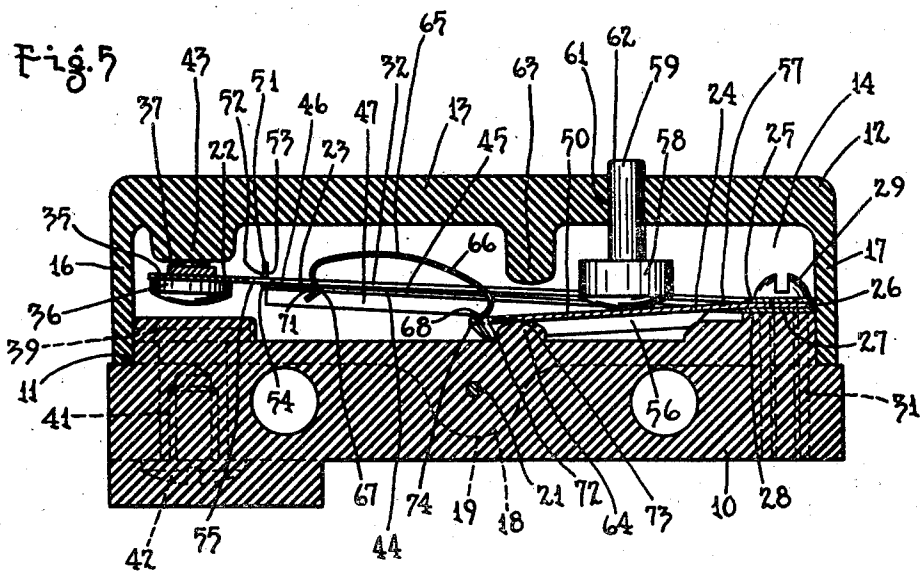
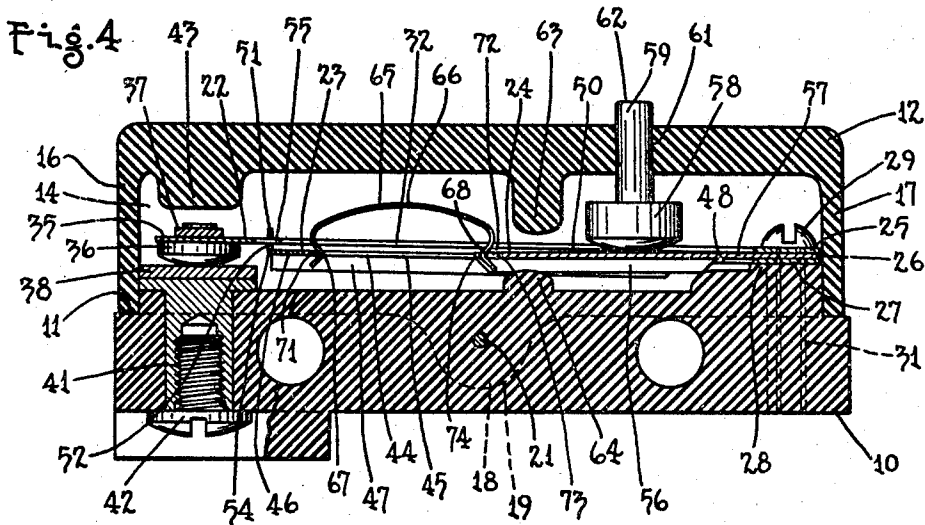
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,418,068

SWITCH

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5 Claims. (Cl. 200—67)

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My invention relates to electric switches, and particularly to heavy duty snap action switches in which the switch member is moved from either closing or opening position through an over-center device.

An object of the invention resides in providing a small, compact and light switch capable of carrying an appreciable current.

An object of the invention resides in providing a switch which will operate positively and without arcing, upon extremely slow movement of the actuating member of the switch.

Another object of the invention resides in providing a switch which will maintain full contact pressure until actual opening of the switch occurs.

A still further object of the invention resides in providing a switch having an operating member and a switch member, and in providing means for causing said operating member to move in opposite directions with a snap action and in further providing a lost motion connection between said switch member and operating member.

A still further object of the invention resides in providing an ear on one of the members and having an opening therein and in forming a tongue on the other member adapted to be received in the opening and alternately engaging said abutments.

Another object of the invention resides in providing an actuating member for actuating the operating member and in providing an over-center connection between said actuating member and operating member.

An object of the invention resides in providing a connection between said operating member and said switch member which is inactive while the over-center device is on dead center.

Another object of the invention resides in the construction and arrangement of the various members of the switch.

Other objects of the invention reside in the novel combination and arrangement of parts and in the details of construction hereinafter illustrated and/or described.

In the drawings:

Fig. 1 is a longitudinal elevational sectional view of a switch illustrating an embodiment of my invention and showing the switch in closed position.

Fig. 2 is a plan sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a cross-sectional view of the switch taken on line 3—3 of Fig. 1.

Fig. 4 is a view similar to Fig. 1 taken through

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one of the contacts of the invention and showing the over-center device on dead center.

Fig. 5 is a view similar to Fig. 1 showing the switch in open position.

In the use of the over-center type of electric switch, considerable difficulty has been encountered when the over-center device reaches dead center. With such devices, the switch member is connected to one of the members directly operated by the over-center device and when the over-center device reaches dead center, pressure upon the contacts is reduced and arcing occurs. This is particularly true where the actuating means has a slow motion, such as a thermostat and in which heavy current is being carried. Such switches, while the over-center device is on dead center, are frequently operated prematurely by vibration or slight jar. The present invention overcomes this difficulty by providing a construction in which the switch member is not actuated until the over-center device is well past dead center.

My invention includes a base 10 constructed of insulating material and on which certain of the parts are mounted. This base is rabbeted along the edges thereof, as indicated at 11, to receive a cover 12 for the mechanism of the switch. The cover 12 has a top 13, side walls 14 and 15 and end walls 16 and 17, said side and end walls fitting in the rabbet 11. The two side walls 14 and 15 have ears 18 depending therefrom which are received in sockets 19 of the base 10 below the rabbet 11. A pin 21 passes through said ears and the base and holds the cover 12 attached to the base.

The switch mechanism of the invention includes a switch member or arm 22, an operating member or arm 23 and an actuating member or arm 24 which all extend longitudinally of the base 10. These members are all constructed of resilient or spring material and have overlying parts 25, 26 and 27 which are all clamped together on a pad 28 formed on the base 10. For this purpose, two screws 29 are employed which pass through the parts 25, 26 and 27 of the members 22, 23 and 24 and which are screwed into threaded bushings 31 cast into the base 10. These members are constructed and operate in the following manner.

The switch member 22 has a longitudinally extending opening 32 in it which extends up to the part 25 and within a short distance of the other end of the member to provide two longitudinally extending bars 33 and 34 connected at one end by means of the part 25 and at the other end by

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means of a similar connecting part 35. The part 35 has attached to it two movable contacts 36 which are connected together by means of a current-carrying yoke 37. The two contacts 36 are adapted to engage fixed contacts 38 which are imbedded in the base 10 and insulated from one another. These contacts have threaded holes 41 adapted to receive binding screws 42 by means of which conductors may be connected to the said contacts. The switch member 22 operates between the contacts 36 and a fixed stop 43 formed on the inner surface of the top 13 of cover 12. The flexure in the switch member 22 is such that when in its free position, the contacts 36 are urged against the contacts 38 with sufficient pressure to prevent arcing.

The operating member 23 is similarly constructed with reference to the switch member 22 and has an opening 44 therein which forms the said member with two longitudinally extending bars 45 connected at their outer ends by a connecting part 46 and at their inner ends by the part 27, previously referred to. Extending downwardly from the bars 45 at their outer edges are flanges 47 which extend from the part 46 to within a short distance of the part 26. These flanges prevent bending of the bars throughout the major portion throughout the length thereof and limit the bending of said bars to a locality indicated at 48 in close proximity to the part 26. The member 23 is situated entirely below the member 22 and is at all times so disposed.

The member 23 falls short of the outer end of the opening 32 in the member 22 and has an ear 51 extending outwardly therefrom and through said opening. This ear has an aperture 52 in it which provides two abutments 53 and 54 formed with facing surfaces spaced from one another. A tongue 55 formed on the part 35 of member 22 extends into this aperture. The opposite sides of this tongue provide oppositely facing surfaces adapted to be alternately engaged by the surfaces of the abutments 53 and 54. Member 22 is operated by member 23 by means of these surfaces. The spacing of the abutments 53 and 54 is sufficiently great to produce a lost motion between the co-acting parts, so that member 23 may have considerable movement before the member 22 is operated thereby.

The actuating member 24 consists of a spring blade 50, considerably shorter than the member 23 and operating entirely within the two openings 32 and 44 of the members 22 and 23, respectively. The member 24 is constructed with flanges 56 similar to the flanges 47 which extend from the end of said member and to within a short distance of the part 26 of said member. These flanges stiffen the said member and localize the flexure to a locality indicated at 57 in proximity to the part 26. The blade 50 is normally flexed, so that the same has a tendency to move upwardly and bring the switch member 22 into closing position, as will be hereinafter more fully described.

The member 24 is actuated by means of an actuating button 58 which is disposed on a stem 59 slidably mounted in a hole 61 drilled in the top 13 of cover 12. When the protruding end 62 of this stem is depressed, the button 58 engages the blade 50 and moves the member 24 downwardly. The blade 50 operates between two stops 63 and 64 formed on the cover 12 and base 10, respectively.

It will be noted that the outer end of the blade 50 is spaced from the inner edge of the connect-

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ing part 45 of the member 23. Operating between these portions of the members 23 and 24 is an over-center device 65 which consists of a C-shaped spring 66 having sockets 67 and 68 formed at its ends. These sockets engage fulcrums 71 and 72 formed on the connecting part 46 of the member 23 at its inwardly facing edges and formed on the blade 50 of the member 24 at its outwardly facing edge. The fulcrum 71 is arcuate, as best shown in Fig. 2, to provide a single-point contact intermediate the lateral edges of the spring 66. The fulcrum 72 is recessed as designated at 73 intermediate the edges thereof, whereby two-point contact is provided at the lateral edges of the spring 66. Lugs 74, extending outwardly beyond the fulcrum 72, hold the spring 66 in proper position. The spring 66 is appreciably tensioned, so that when the member 24 moves past dead center in one direction or the other, the said spring causes reverse movement of the member 24 with which it is associated.

The operation of the invention is as follows: In normal position, the member 24 is in its upward position with the blade 50 in engagement with the stop 63. This throws the fulcrum above dead center, causing the member 23 to be urged downwardly. Member 22, through its own resiliency, is urged downwardly, bringing the contacts 36 firmly against the contact 38. In such position, the engaging surface of the abutment 53 bears against the upper surface of the tongue 55. The switch is then closed. When the button 58 is depressed through engagement with the end 62 of the stem 59, member 24 is lowered. When the blade 50 reaches a coplanar relationship with reference to the bars 45 of the member 23, downward pressure is no longer exerted by the said member on the member 22. However, the said member has enough resiliency of its own to maintain sufficient pressure on the contact to prevent arcing. The parts of the over-center device are now at dead center. As the blade 50 continues to move downwardly, the member 24 passes dead center and the spring 66 exerts a pressure on the member 23 tending to move the same upwardly. The member 23 now gradually commences to move upwardly as the member 24 continues to move downwardly. If the actuation of the button 58 is very slow, the movement of the member 23 is likewise slow and at the beginning of its upward movement, it has little or no upwardly exerted force. During this period of the movement of the member 23, the ear 51 moves relative to the tongue 55 without engaging the same. During such movement, the abutment 53 recedes from the upper surface of the tongue 55 and the abutment 54 approaches the lower surface of said tongue. During such movement, member 22 is free from member 23. When the over-center device is well past dead center and the member 23 is capable of exerting appreciable force on the member 22, abutment 54 engages tongue 55 and moves the member 22 upwardly with a snap action. When the pressure on the button 58 is released, the resiliency of the member 24 moves the same upwardly and causes reverse movement of the parts. Again lost motion occurs between the movements of the member 23 past dead center, so that the member 22 is not moved toward switch-closing position until after the over-center device is well past dead center.

The advantages of my invention are manifest. With my invention, the switch member is not operated until the operating member has suffi-

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cient force to positively and quickly move the same. Thus, arcing at the contacts is prevented. My switch may be constructed in an inexpensive manner and is capable of handling an appreciable amount of current. The switch is extremely sensitive and can be made to operate with a small movement of the actuating member. My improved switch is particularly adapted to be used with slowly moving actuating devices, such as thermostats and the like, and will operate both in opening and closing with a positive snap action. My improved switch will not be affected by vibrations when the over-center device is substantially at dead center, so that premature operation of the switch is prevented.

Changes in the specific form of my invention, as herein described, may be made within the scope of what is claimed without departing from the spirit of my invention.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a switch, a movable switch arm consisting of spaced bars and connecting parts at the ends thereof, an operating member constructed with spaced bars and connecting parts at the ends thereof, and an actuating member constructed in the form of a blade, said members being all secured together in proximity to one another at one end of each member and being free to move at the other end, said blade being movable in the space between the bars of both said switch member and operating member, contact means at the free end of the switch member, a spring operating between the free ends of the operating member and the actuating member and serving as an over-center device for procuring snap action of the operating member upon movement of the actuating member and a lost motion connection between said switch member and said operating member at the free ends thereof.

2. In a switch, a movable switch arm consisting of spaced bars and connecting parts at the ends thereof, an operating member constructed with spaced bars and connecting parts at the ends thereof, an actuating member constructed in the form of a blade, said members being all secured together in proximity to one another at one end of each member and being free to move at the other end, said blade being movable in the space between the bars of both said switch member and operating member, contact means at the free end of the switch member, a spring operating between the free ends of the operating member and the actuating member and serving as an over-center device for procuring snap action of the operating member upon movement of the actuating member, a pair of spaced abutments on said switch member having surfaces and a pair of spaced surfaces on said operating member, one pair of surfaces facing in opposite directions, the other pair of surfaces facing one another and being spaced apart a distance greater than the other surfaces to receive the same therebetween.

3. In a switch, an elongated switch member, an elongated operating member and an elongated

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actuating member all juxtaposed relative to one another and extending generally in the same direction, said members being each mounted for swinging movement about one end thereof, a snap action device acting between the free ends of the actuating member and the operating member, and a lost motion device acting between the free ends of the operating member and the switch member.

4. In a switch, an elongated switch member, an elongated operating member and an elongated actuating member all juxtaposed relative to one another and extending generally in the same direction, said members being constructed of resilient material and being in the form of leaf springs, a base, means for attaching each of said members at one end to said base to support said members for swinging movement, a snap action device acting between the free ends of the actuating member and the operating member, and a lost motion device acting between the free ends of the operating member and the switch member.

5. In a switch, a movable switch member consisting of spaced bars and connecting parts at the ends thereof, an operating member constructed with spaced bars and connecting parts at the ends thereof, and an actuating member to which motion is applied from without the switch and constructed in the form of a blade, said members being all secured together in proximity to one another at one end of each member and being free to move at the other end, said actuating member being movable in the space between the bars of both said switch member and operating member, contact means at the free end of the switch member, a spring operating between the free ends of the operating member and the actuating member and serving as an over-center device for procuring snap action of the actuating member upon movement of the operating member, said operating member and said switch member having juxtaposed parts, an ear projecting outwardly from one of said parts and extending in the direction of movement thereof and having an aperture therein provided with spaced edges forming abutments, a tongue on the other of said parts extending in the direction thereof and received within said aperture, said tongue being alternately engaged by said abutment to form a lost-motion connection between said switch member and the operating member at the free ends thereof.

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