

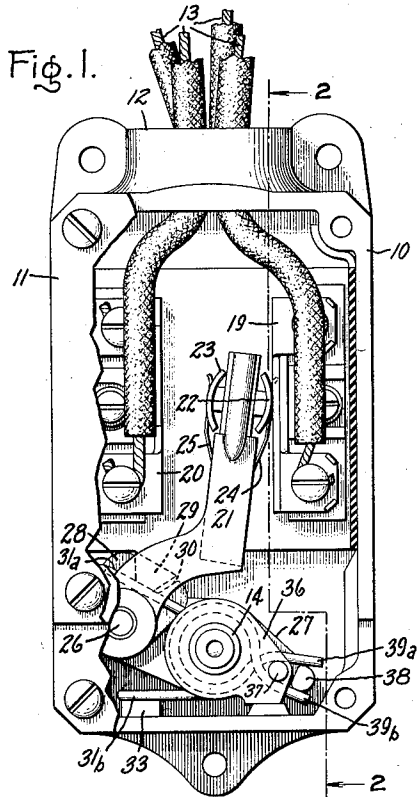
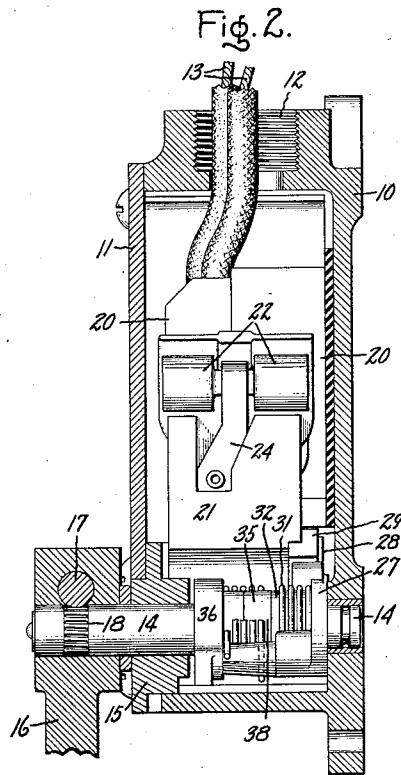
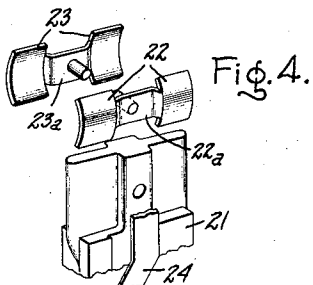
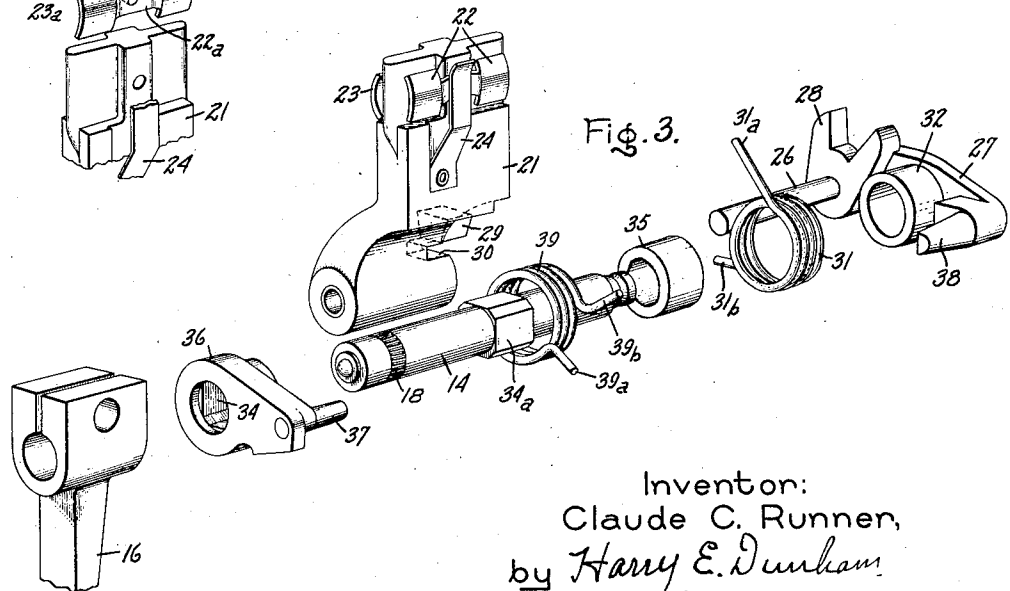
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ELECTRIC SWITCH

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ELECTRIC SWITCH

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5 Claims. (Cl. 200—164)

This invention relates to electric switches, more particularly to switches having an element operable to the circuit opening and circuit closing positions, and it has for an object the provision of a simple, reliable and improved switch of this character.

In carrying the invention into effect in one form thereof, a fixed switch element is mounted on a support and a cooperating movable switch element is pivotally mounted on a movable operating element. This movable operating element itself is rotatably mounted upon a pivot upon which an actuating element is also mounted. A resilient connection is provided between the actuating element and the operating element which allows spaced over-travel of the actuating element after engagement of the movable switch element with the stationary switch element, and a lost motion connection between the operating element and movable switch element provides wiping contact upon engagement of these elements.

For a further and more complete understanding of this invention, reference should now be had to the following specification and to the accompanying drawing of which Fig. 1 is an elevation partly broken away; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1 with certain parts broken away; Fig. 3 is an exploded view in perspective of the details of Figs. 1 and 2; and Fig. 4 is a detail.

Referring now to the drawing, an enclosing casing 10 is provided with a removable cover plate 11. The casing 10 is preferably in the form of a rectangular box of suitable material and the cover plate 11 is preferably made of a material such for example as aluminum. The casing 10 is provided with a conduit receiving opening 12 through which the controlled connections 13 enter the casing.

Preferably the cover plate 11 is mounted on the front side of the casing 10 so that the switch may be wired from the front side. Pivot means shown as a rotatably mounted shaft 14 extends through the front side of the casing. As shown, the pivot shaft 14 is journaled for rotation in the rear wall of the casing 10 and is also journaled in the member 15 arranged in the front side of the casing.

On the extension of the shaft, which projects through the front side of the casing, is mounted a switch operating lever arm 16. As shown, this lever arm has a micrometer adjustment. This micrometer adjustment comprises a machine screw 17 and cooperating teeth or threads 18

near the extremity of the shaft 14. The adjustment is accomplished by loosening the jam nut (not shown) and rotating the machine screw 17 by means of a screw driver until the position of the lever 16 has been adjusted to the desired position.

The switch is provided with a pair of normally closed contacts 19 and a pair of normally open contacts 20. These contacts are secured to the casing 10 by any suitable fastening means and thus, the casing serves as a support for the fixed elements of the switch.

The switch is also provided with a movable element illustrated as comprising a pivotally mounted lever arm 21 which is provided at its upper extremity with a pair of contacts 22 which cooperate with the fixed contact 19 and with a pair of contacts 23 which cooperate with the fixed contacts 20. As shown in Fig. 4, the upper portion of the lever 21 is suitably cut away to receive and accommodate the pairs of contacts 22 and 23. The contacts of each pair are held together by cross members 22a and 23a respectively. It will be observed that the contacts 22 and 23 are held in position as shown in Figs. 1 and 2 by means of spring clips 24 and 25 which engage the cross members 22a and 23a respectively. In order to insure good contact of the movable contacts 22 and 23 and the stationary contacts 19 and 20, the movable contacts are mounted in such a manner as to provide limited universal movement. In this connection, it will be observed that the contacts 22 and 23 are provided with pins and that the lever arm 21 is provided with holes for receiving these pins. The holes are enough larger than the pins to provide a slight wobble of the contacts and thus to insure good contact of the movable and stationary contacts in spite of any irregularities of the contact surfaces.

The lever arm 21 is pivotally mounted on the pivot means 26 which in turn is secured to an operating member 27. This operating member is also pivotally mounted for rotation on the shaft 14. One extremity of the operating member 27 is provided with a bifurcated member 28. That is to say, the member 28 is provided with a tapered notch in which is nested a tapered projection 29 of the operating lever 21. The top of the notch in the member 28 is purposely made wider than the dimension of the projecting member 29 at that point so as to provide lost movement. This feature is clearly seen in Fig. 1.

It will also be observed that the operating lever is provided with a notch 30 which receives

the extremity 31a of a spring 31. This spring surrounds the collar portion 32 of the operating member 27 and its opposite extremity 31b bears against a rest 33 secured to the bottom of the casing 10. Normally, this spring 31 biases the operating lever 21 to a position in which the movable contacts 22 are in engagement with the stationary contacts 19. In other words, the spring 31 biases the movable switch element to the normally closed position.

As shown in Fig. 3, the pivot shaft 14 is provided centrally with a non-circular or squared portion 34a. A collar member 35 is slipped over the right-hand extremity of the pivot shaft 14 and when assembled, one lateral face of this member bears against a lateral face of the collar 32 whereas the other lateral face bears against the base of the squared portion 34a.

An actuating member 36 is provided with a squared opening for engagement with the centrally squared portion 34 of the pivot shaft. As shown, the actuating member is provided with a pin 37 and likewise the operating member 27 is provided with a pin 38 which overlies the pin 37 when the switch is assembled. In order to provide safe over-travel of the actuating member 36, a resilient connecting means is provided between the actuating member 36 and the operating member 27. This resilient connecting means is shown in the form of a spring 39 encircling the collar 35. When the switch is assembled, the lower extremity 39a of the spring 39 is hooked over the pins 37 and 38, whilst the upper extremity 39b is hooked under the pins 37 and 38 as clearly shown in Fig. 1.

With the above understanding of the elements and their arrangement, the operation of the switch itself will readily be understood from the following description:

With the various elements in the position illustrated in Fig. 1, the movable contacts 22 are biased into engagement with and bridge the stationary contacts 19. Counter-clockwise movement of the operating lever 16 (viewed from the left in Fig. 2) effects a counter-clockwise rotation of the pivot shaft 14 and the actuating member 36 which is secured to rotate therewith. The pin 37 which is secured to the actuating member 36 rotates about the pivot shaft 14 as a center and thus pushes upwardly on the extremity 39a of the spring 39. This tends to place the spring under tension, but since the extremity 39b of the spring is free to move the pin 38 of operating member 27 is carried along with the pin 37, and thus the operating member 27 is given counter-clockwise rotation about the pivot shaft 14. As a result, the lever 21 which is pivotally mounted on the operating member 27 is also rotated in a counter-clockwise direction to interrupt the circuit through the stationary contacts 19. The counter-clockwise rotation of the lever 21 continues until the movable contacts 23 engage the stationary contacts 20. As the counter-clockwise movement of the lever 21 progresses, the spring 31 is placed under increasing tension. In addition, the tension of the spring tends to center the tapered projection 29 in the tapered notch of the member 28.

When the movable contacts 23 engage the stationary contacts 20, the extremity of the operating lever 21 no longer moves in the arc of a circle, i. e. it no longer moves normally to the stationary contacts. However, additional counter-clockwise rotation of the operating member 27 carries the pivot 26 in a counter-clockwise ro-

tation. The loose fit of the tapered projection 29 in the tapered notch of the member 28 permits the operating member 27 to continue its counter-clockwise rotation and allows the movable contact 23 to make a sliding engagement with the stationary contact 20, thus insuring a good wipe, which tends to keep the contacts clean.

It will be noted that the lost motion between the member 29 and the member 28 is limited, and consequently the amount of rotation of the operating member 27 after engagement of the movable contact 23 with the stationary contact is also limited. If the counter-clockwise rotation of the operating lever 16 should continue after the operating member 27 has reached its limit of counter-clockwise rotation, the pin 37 pushing upwardly against the extremity 39a of the spring 39 will merely wind up the spring and increase its tension without effecting further rotation of the operating member 27. This arrangement allows safe overtravel of the actuating member 36 without damaging any part of the mechanism.

When the switch operating lever 16 is rotated in the opposite direction, the contacts again slide and are rotated to the opposite side of the switch. Contact is again made and the predetermined slide is completed, thereby assuring clean contact surfaces of contacts 19 and 22.

Although in accordance with the provision of the patent statutes, this invention is described as embodied in concrete form, it will be understood that the elements shown and described are merely illustrative and the invention is not limited to the specific form disclosed since alterations and modifications will readily suggest themselves to persons skilled in the art without departing from the true spirit of this invention or the scope of the annexed claims.

What I claim as new and desire to secure by Letters Patent in the United States is:

1. A switch comprising a support, a fixed switch element mounted on said support, a cooperating movable switch element, mounting means for said movable element comprising a pivotally mounted operating member connected to said movable element, a pivot for said operating member, said operating member having a pin parallel to the axis of said pivot, an actuating element surrounding said pivot having a pin parallel to the pin of said operating member, and resilient means surrounding said pivot and engaging said pins of said actuating member and said operating member to provide safe over-travel of said actuating member after engagement of said movable element with said fixed element.

2. A switch comprising a support, a stationary switch element mounted on said support, a movable switch element cooperating therewith, a pivotally mounted operating member connected to said movable element, a pivot for said member rotatably mounted in said support, an actuating member secured to said pivot for rotation therewith and axially displaced from said operating member on said pivot, a pin on said operating member and a pin on said actuating member, said pins being substantially parallel to the axis of said pivot and over-lapping each other, and a resilient spring connection surrounding said pivot between said actuating member and said operating member and engaging said pins providing substantial overtravel of said actuating element after engagement of said movable element with said stationary element.

3. A switch comprising in combination a support, a stationary switch element, a movable switch element cooperating therewith, a pivotally mounted operating member for said movable element, said movable element being pivotally mounted on said operating member for rotation about an axis displaced from but substantially parallel to the axis of the pivot of said operating member, an actuating member secured to said pivot and axially displaced from said operating member, a pin on said operating member, a pin on said actuating member, said pins overlapping each other and arranged on the opposite side of said pivot from the axis of said movable switch element, a spring surrounding said pivot and engaging said pins, and a lost motion connection between said operating member and said movable element providing movement of said movable element into engagement with said stationary element in response to rotation of said operating member, and also providing sliding contact of said movable element on said stationary element after engagement.

4. A switch comprising a support, a stationary contact element mounted on said support, a cooperating movable contact, a lever for mounting said movable contact, a pivotally mounted operating member for said lever, said operating member also being provided with a pivotal mounting for said lever, a pivot for said operating member rotatably mounted in said support, said pivot being provided with a non-circular portion, an actuating member arranged to slide on said pivot and to engage said non-circular portion so as to rotate with said pivot, means for rotating said

pivot, a resilient spring encircling said pivot and connecting said actuating member and operating member to provide safe over-travel of said actuating member, a toothed lost motion connection between said operating member and lever providing sliding contact between said contact members upon engagement of said members, and a resilient spring connection between said lever and said support for controlling the amount of lost motion between said operating member and said lever.

5. A double throw switch comprising a support, a pair of stationary contacts mounted on said support in spaced apart relationship, a cooperating movable contact, a lever mounting said movable contact in the space between said stationary contacts, a pivotally mounted operating member provided with a pivot mounting said lever for rotation, a rotatably mounted pivot for said operating member, an actuating member mounted on said rotatable pivot for rotation therewith, a resilient spring connection between said actuating member and operating member providing over-travel of said actuating member after completion of limited movement of said movable contact, a tooth and notch connection between said operating member and lever providing lost motion between said operating member and lever thereby to produce wiping engagement between said movable and stationary contacts, and a spring connection between said support and lever for biasing said movable contact into engagement with said stationary contact.

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