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SWITCH

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Fig.1.

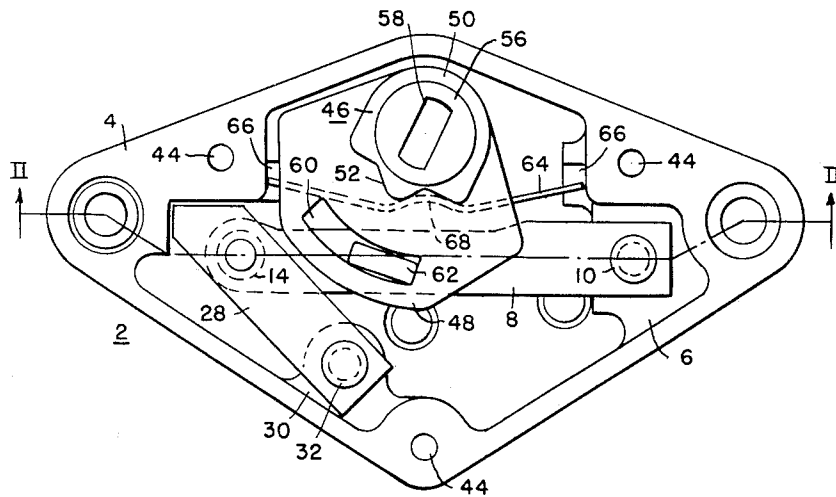
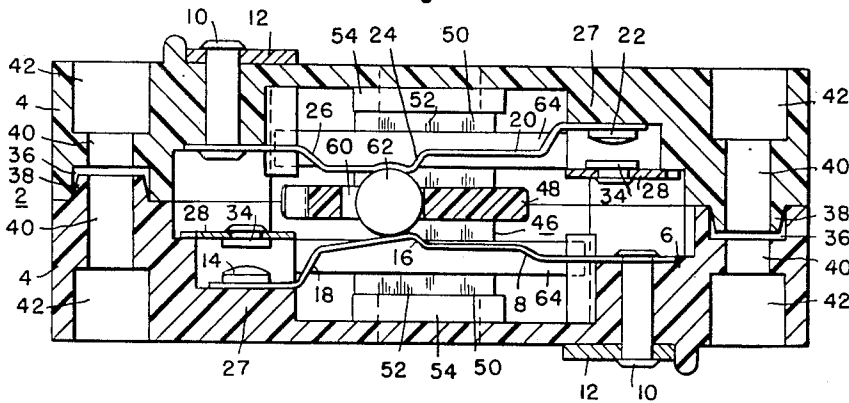


Fig.2.



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SWITCH

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This invention relates generally to electric switches, and more particularly to operating mechanism for such switches.

For certain applications, it is desirable in the operation of electric switches that the switch operating member or handle have a certain freedom of movement independent of operation of the switch contacts, and that the contacts be actuated at a predetermined point in the travel of the operating member spaced from the starting point, for at least one operation of the switch. While switches capable of operation in this manner have been built in the past, they have been relatively expensive due to the complexity of toggle and other intricate operating mechanisms which have been employed.

The primary object of this invention, therefore, is to provide a switch having a novel form of operating mechanism of the type described, which is of simplified form and economical to manufacture.

More specifically, it is an object of this invention to provide a switch having a novel form of cam actuating mechanism embodying a predetermined lost motion between the operating member and the mechanism for actuating the switch contacts.

Still another object of this invention is to provide a switch device including novel mechanism having predetermined lost motion between the operating member and the mechanism for actuating a plurality of switches.

Another object of this invention is to provide a switch having a novel actuating mechanism which incorporates a predetermined lost motion between the switch operating member and the mechanism which must be taken up before actuation of the contacts occurs during each switch operation.

These and other objects of this invention will become apparent upon consideration of the following detailed description of a preferred embodiment thereof, when taken in connection with the attached drawing in which:

Figure 1 is a plan view of a switch constructed in accordance with this invention with one-half of the switch casing removed, and

Fig. 2 is a longitudinal view of a switch constructed in accordance with this invention, with the switch being completely assembled, and this view taken substantially on the line II—II as shown in Fig. 1.

While the switch 2, which is specifically disclosed herein as representing one embodiment of this invention, has a certain specific form, as will hereinafter appear, it should be recognized at the outset that this invention may be embodied in many other forms of switches, and in switches which do not employ all the details of the construction of the preferred embodiment disclosed herein.

Referring to the drawing, the switch 2 specifically shown there comprises a casing of insulating material, preferably a molded insulating material, comprising two identical half casing sections 4 each of which is hollow and provided with an open side. When the switch casing is assembled, the two casing sections 4 are adapted to be secured together with their open sides facing each other.

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Each casing section 4 has an interior ledge 6 at one end thereof on which is secured one end of a movable contact 8, for example, by a rivet 10 which passes through the movable contact 8 and the ledge 6 to the exterior of its casing section, and also serves to secure a terminal strip 12 to the exterior of the casing. The movable contact 8 should be made of a resilient conducting material, for example, a copper alloy such as bronze. The terminal strip 12 at the exterior of each casing section should be made of a good conducting material such as copper or brass, and it may have a terminal screw (not shown) threaded therein for the securement of a line conductor thereto. The free end of movable contact 8 is provided with a contact button 14 secured thereto as by riveting, soldering or the like, with the button being made of, or surfaced with, a good electrical conducting material, such, for example, as silver. An intermediate part of switch blade 8 for the lower casing section, as viewed in Fig. 2, is provided with a bent cam portion 16, and with an offset portion 18 intermediate the cam portion 16 and the contact button 14.

The movable contact 20 for the upper casing section, as viewed in Fig. 2, is similar to the movable contact 8 described above and is formed of the same material. The movable contact 20 has a contact button 22 at its free end which may be identical with the contact button 14 for the movable contact 8, and it has a bent cam portion 24 like the cam portion 16 for movable contact 8 except that it is located closer to the rivet 10. Movable contact 20 also has an offset portion 26, but it is of less extent than the offset portion 18 for the movable contact 8, and is located intermediate the rivet 10 and the cam portion 24.

Each of the movable contacts is adapted to cooperate with a fixed contact member 28 secured in each casing section. Each fixed contact 28 is in the form of a strip of conducting material, such as brass, and is preferably relatively stiff, although it may have some resiliency. Each fixed contact 28 is secured on a ledge 30 in each casing section, by means of a rivet 32 extending through the fixed contact 28 and the ledge 30 to the exterior of the casing section, where it may also secure a terminal strip (not shown) similar to the terminal strip 12, in place on the exterior of the casing. Each fixed contact 28 carries a fixed contact button 34 at its free end which may be identical with the contact buttons 14 and 22 on the movable contacts, or instead of being soldered to the fixed contact 28 it may be riveted thereto, as shown in Fig. 2.

The marginal flange of each casing section 4 has at one end a recess 36, and at the other end a projection 38 adapted to interfit with the corresponding recess 36 and projection 38 on the other casing section 4 when they are assembled together. Each casing section 4 has a bore 40 the outer end of which is countersunk as at 42 and which passes through the projection 38 or recess 36, as the case may be. When the casing sections 4 are assembled together, the bores 40 are in alignment to receive mounting bolts for securing the switch to a support. The casing sections 4 also have aligned bores 44 to receive rivets or eyelets (not shown) for securing the two casing sections 4 together.

A rotatable switch operating member 46 is adapted to span the space within the casing and to be rotatably mounted at each end in the respective casing sections 4. Preferably the switch operating member 46 is of insulating material, such as a molded insulating material. The switch operating member 46 has a centrally located operating flange 48 of generally segmental form, and at opposite sides of the operating flange 48' it is of non-circular form, being provided with D-shaped portions 50 intermediate the operating flange 48 and the inner walls of the casing sections, respectively. The D-shaped por-

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tions 50 have on the straight side thereof an indexing projection 52, for a purpose to be described. The base of each casing section 4 is provided with an integral boss 54 which is apertured for receiving the reduced area pintle portions 56 at opposite ends of the switch operating member 46, to rotatably mount the same in the casing. Each end of the switch operating member 46 is accessible at the exterior of its respective casing 4, and is provided with a transverse operating slot 58 for receiving a flat operating member.

The operating flange 48 for the switches is provided with an elongated circular-shaped opening 60 for freely receiving a cam roller 62 located between the movable switch contacts 8 and 20. At each side of the switch operating flange 48 a leaf index spring 64 is located, with its opposite ends seated in notches 66 provided in the respective casing sections 4, and being provided with an intermediate bent portion 68 for cooperation with the index projection 52 on the operating member 46 to hold the latter in a releasable fashion at its two extremes of movement defining the two operative switch positions, namely, the open and closed circuit positions.

As shown on the drawing the switch 2 is depicted with the movable switch contacts 8 and 20 at their open circuit positions, where the cam roller 62 is located at such a position as to be in engagement with the switch contacts 8 and 20 so as to maintain them separated from the fixed contacts 28, and in engagement with stops 27 integral with the casing. The movable switch contacts 8 and 20 have a bias towards the stationary contacts 28, so that they are held at the position shown in Fig. 2 of the drawing, separated from the fixed contact buttons 34 against their closing bias, with the movable contacts 8 and 20 being in stressed condition. It will also be noted that at the open circuit position, the cam roller 62 is located at one end of the opening 60 in the operating flange 48. Now assuming that it is desired to close the switches, this may be accomplished by rotating the switch operating member 46 in a counterclockwise direction as viewed in Fig. 1, but during the first part of this movement it will be observed that the switch operating member 46 moves independent of the cam roller 62, while taking up the lost motion in the opening 60, and the cam roller 62 will not be moved until it is engaged by the left-hand end of opening 60. Continued rotation of the switch operating member 46 then carries the cam roller 62 with it past the cam portions 24 and 16 of the movable contacts while slightly further separating them, whereupon the movable contacts 8 and 20 are free to engage the fixed contacts 28 under their influence of their own bias. It will be noted that as soon as cam roller 62 passes cam projections 16 and 24 on the movable contacts, the operating member 46 will be moved an additional amount in the same direction by the action of index springs 64 on index projection 52 and cause the operating member 46 to move to the other extreme of its movement. Then when it is desired to open the switches and the operating member 46 is moved in the reverse direction, it will be necessary to take up the aforesaid additional movement of the operating member before the cam roller 62 will be moved to engage the cam portions 16 and 24 of the movable contacts and separate them, thus opening the circuit and returning the switch contacts to the position shown in Fig. 2.

It is thus apparent that in both closing and opening the circuit there is a predetermined amount of lost motion between the operating member 46 and the closing of the switches. It will further be observed that the index springs 64 act to releasably maintain the operating member 46 at its full open and closed circuit positions, so that the lost motion referred to above is always required in operating the switch.

Having described a preferred embodiment of this invention in accordance with the patent statutes, it should be understood as pointed out at the outset that this invention

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is not limited to the precise form of switch disclosed herein but may be embodied in other types of switches. Accordingly, it is desired that the invention be not limited to the illustrative embodiment specifically disclosed herein, but that it be given a broader scope as permitted by the prior art.

We claim as our invention:

1. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member solely at each of said extreme positions, movable contact actuating means having lost motion relative to said operating member during its movement in opposite directions from its extreme positions, so that when the operating member is moved from one extreme position toward the other, it moves a predetermined amount before it causes said contact actuating means to actuate the movable switch contact to one of its positions, and upon movement of said operating member from its other extreme position toward said one extreme position it moves a predetermined amount before it causes said contact actuating means to actuate the movable switch contact to its other position.

2. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member at each of said extreme positions, movable contact actuating means located in the path of movement of a part of said operating member and being movable thereby to actuate said contacts at a predetermined point in the path of movement of said actuating means, but said predetermined point being spaced from said operating member when said operating member is releasably held by the indexing means at one of its extreme positions, so that when the operating member is moved in one direction from said one extreme position toward the other, it moves a predetermined amount before said part thereof causes said contact actuating means to actuate the movable switch contact to one of its positions, and said operating member having another part spaced from the first-mentioned part in said one direction for engaging and moving said contact actuating means to actuate the movable switch contact only after predetermined movement of said operating member in the reverse direction from its other extreme position toward said one extreme position.

3. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, an operating member movable between two extreme positions, indexing means for releasably maintain said operating member at each of said extreme positions, a movable cam member located intermediate spaced stop members on said operating member with considerable clearance to form a lost motion connection therebetween, said movable contact having a part located in the path of movement of said cam member which is located so that when said operating member is moved from either extreme position to the other, it moves a predetermined amount before one of said stop members engages and moves said cam member into engagement with said movable contact to actuate the latter to one or the other of its aforesaid positions dependent upon the direction of movement.

4. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member at each of said extreme positions, said operating member having an elongated opening therein extending in the direction of movement of the operating member, a contact actuating member mounted in said opening for lost motion movement longitudinally of said opening, so that when said operating member is moved from one extreme position to the other,

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it moves a predetermined amount while taking up said lost motion before moving said contact actuating member to operate said movable contact to one of its aforesaid positions.

5. A switch construction comprising, two pairs of separable contacts each of which has one movable contact located in spaced opposed relation to the movable contact of the other pair of separable contacts, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member at each of said extreme positions, said operating member having a portion movable in the space between said movable contacts, said portion of said operating member having an elongated opening therein extending in the direction of movement of the operating member a contact actuating member mounted in said opening for lost motion movement longitudinally of said opening so that when said operating member is moved from one extreme position to the other it moves a predetermined amount while taking up said lost motion before moving said contact actuating member to operate said movable contacts to one of their operative positions.

6. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member at each of said extreme positions, said operating member having an elongated opening therein extending in the direction of movement of the operating member, a contact actuating roller mounted in said opening for lost motion movement longitudinally of said opening, so that when said operating member is moved from one extreme position to the other, it moves a predetermined amount while taking up said lost motion before moving said contact actuating roller into engagement with said movable contact to cause movement of the latter to one of its aforesaid positions.

7. A switch construction comprising, two pairs of separable contacts each of which has one movable contact located in spaced opposed relation to the movable contact of the other pair of separable contacts, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member at each of said extreme positions, said operating member having a portion movable in the space between said movable contacts, said portion of said operating member having an elongated opening therein extending in the direction of movement of the operating member, a contact actuating roller mounted in said opening for lost motion movement longitudinally of said opening so that when said operating member is moved from one extreme position to the other, it moves a predetermined amount while taking up said lost motion before moving said roller between said movable contacts, and opposed cam portions on said movable contacts located to be engaged by said roller when the latter is moved to actuate said contacts to one of their operative positions.

8. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, a rotatable operating member movable between two extreme positions, indexing means for releasably maintaining said operating member at each of said extreme positions, said operating member having an elongated opening therein in the form of a portion of a circle, a contact actuating member mounted in said opening for lost motion movement longitudinally of said opening, so that when said operating member is moved from one extreme position to the other, it moves a predetermined amount while taking up said lost motion before moving said contact actuating member to operate said movable contact to one of its aforesaid positions.

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9. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member at each of said extreme positions, said operating member having parts which are spaced in the direction of movement of said operating member, contact actuating means located between said parts of the operating member with considerable clearance to form a lost motion connection therebetween, so that when said operating member is moved in opposite directions from its extreme positions it moves a predetermined amount before one of its parts engages and moves said contact actuating means to operate said contacts to open and closed circuit positions, respectively.

10. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member solely at each of said extreme positions, movable contact actuating means movable between two positions at which said contacts are maintained at their open and closed positions, respectively, said actuating means having lost motion relative to said operating member during its movement in opposite directions from its extreme positions an amount which is greater than the amount of motion of said actuating means between its two positions so that when the operating member is moved from one extreme position toward the other, it moves a predetermined amount before it causes said contact actuating means to actuate the movable switch contact to one of its positions, and upon movement of said operating member from its other extreme position toward said one extreme position it moves a predetermined amount before it causes said contact actuating means to actuate the movable switch contact to its other position.

11. A switch comprising, contacts at least one of which is movable to open and closed circuit positions relative to the other, an operating member movable between two extreme positions, indexing means for releasably maintaining said operating member solely at each of said extreme positions, a movable contact actuating member, one of said members having an elongated slot therein for receiving at least a portion of the other member so that said actuating member has lost motion relative to said operating member during movement of the latter in opposite directions from its extreme positions, so that when the operating member is moved from one extreme position toward the other it moves a predetermined amount before it causes said contact actuating member to actuate the movable switch contact to one of its positions, and upon movement of said operating member from its other extreme position toward said one extreme position it moves a predetermined amount before it causes said contact actuating member to actuate the movable switch contact to its other position.

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