

[54] ELECTRICAL SWITCH

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FOREIGN PATENTS OR APPLICATIONS

978,491 12/1964 Great Britain.....200/68
1,088,616 10/1967 Great Britain.....200/68

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[51] Int. Cl.H01h 13/28

[58] Field of Search200/67 G, 68, 67, 67 C

[56] References Cited

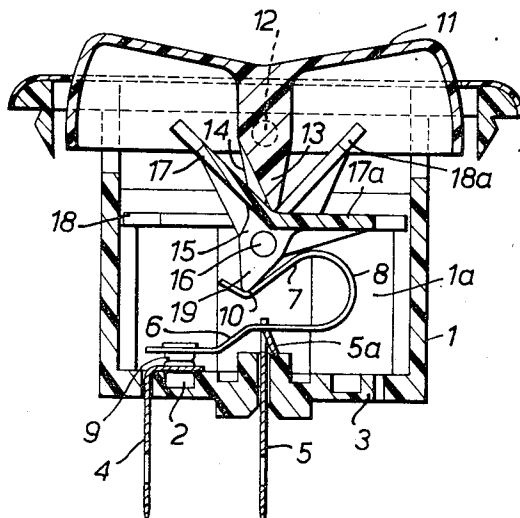
UNITED STATES PATENTS

3,184,561 5/1965 Heath200/68 X

[57] ABSTRACT

An electrical switch includes a first pivotally mounted actuating member, the rocking movement of which is transmitted to a second pivotally mounted actuating member whose rocking movement effects the operation of a leaf spring over its dead center position to open and close the switch contacts. The said first actuating member has a depending lug which engages with and rides over sloping ramps forming part of the said second actuating member.

3 Claims, 7 Drawing Figures



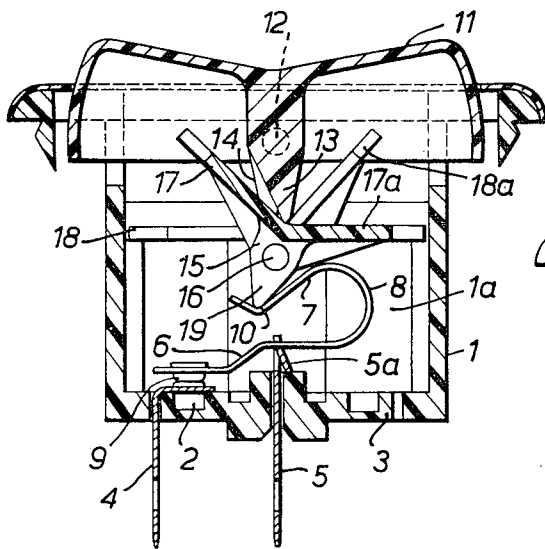


FIG. 1.

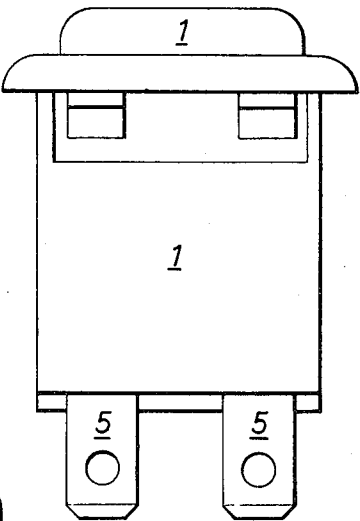


FIG. 2.

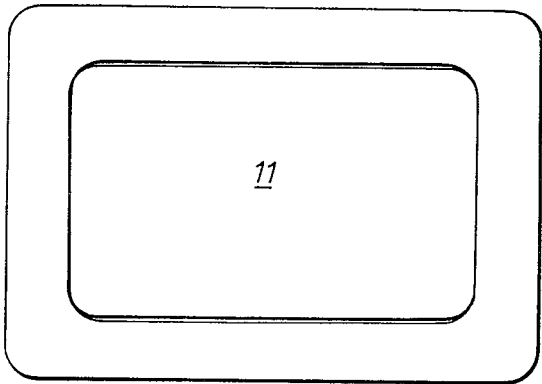


FIG. 3.

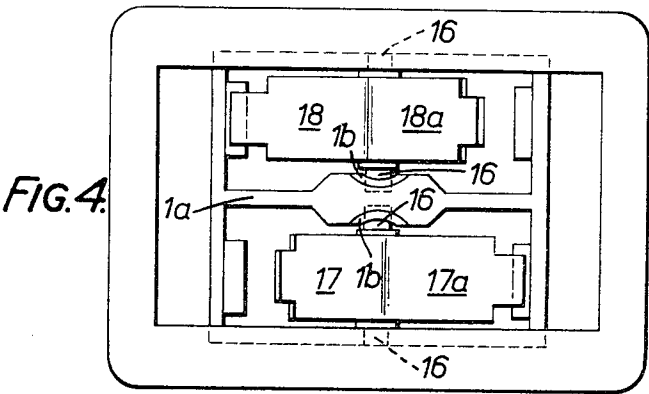


FIG. 4.

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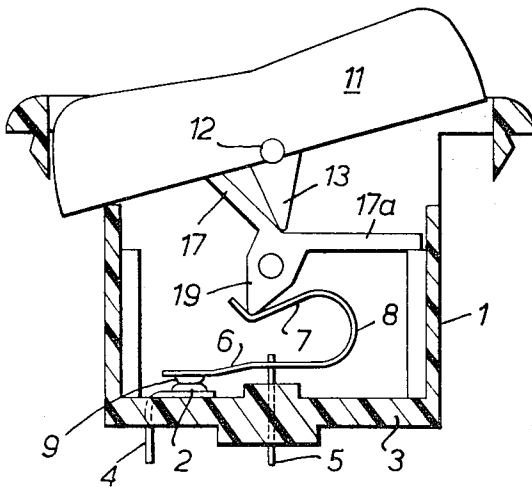


FIG. 5.

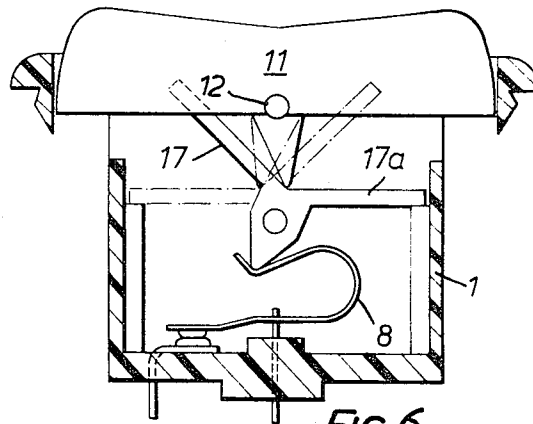


FIG. 6.

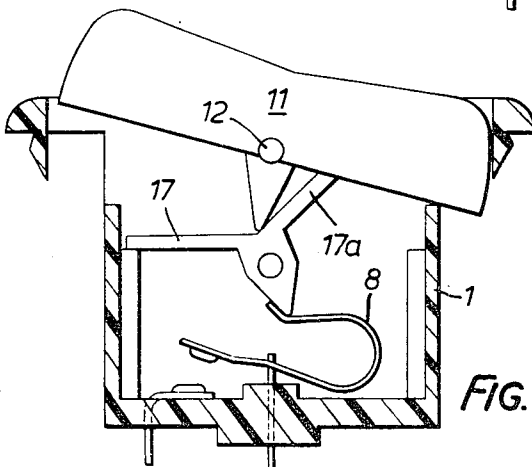


FIG. 7.

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ELECTRICAL SWITCH

This invention relates to an electrical switch of the kind which is operated by rocking or pivotal movement of an actuating member.

According to the present invention, the switch comprises a housing formed of insulating material having at least one fixed and one movable contact and a snap-over leaf spring for moving the movable contact into and out of engagement with the co-operating fixed contact, a switch actuating member being pivotally mounted in the housing and provided with a lug engaging an intermediate actuating member comprising a base pivotally mounted in the housing, one face of the intermediate member having a projection engaging the leaf spring and the opposite face having ramp-like surfaces extending in angular relation to one another to define an obtuse angle, the apex of which is approximately at the pivotal center of the base, the arrangement being such that the rocking or pivotal movement imparted to the first mentioned actuating member will cause the lug thereon to ride over one or other of the ramp surfaces so as to pivot the intermediate actuating member whereby the projection thereon will move the leaf spring over one or other sides of its dead center so as to snap the intermediate actuating member into a position to cause the spring to effect the movement of the movable contact relative to the fixed contact to open or close the switch.

The movable contact may be mounted on the leaf spring.

In one embodiment the switch includes two fixed contacts and two movable contacts co-operating therewith, a separate leaf spring and a separate intermediate actuating member being provided for each pair of fixed and movable contacts, the ramp surfaces of the respective intermediate actuating members and their operation by the lugs on the first mentioned actuating member being such that the latter is capable of moving into three positions in one of which both movable contacts engage both fixed contacts, in the second position both movable contacts are in spaced relation to their associated contacts and in the third position one movable contact engages its fixed contact and the other is spaced from its fixed contact.

To enable the invention to be fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a sectional side view of a switch according to one embodiment of the invention;

FIG. 2 is an end elevational view of the switch;

FIG. 3 is a plan view thereof;

FIG. 4 is a plan view of the switch with the actuating member removed; and

FIGS. 5, 6 and 7 are sectional side views illustrating the three operative positions of the switch.

As shown, the switch comprises a housing 1 formed of insulating material such as resilient or semi-resilient synthetic plastics having a pair of fixed contacts 2 on the inner face of the bottom wall 3 and connected to a terminal 4 which extends through a slot in the bottom wall to the exterior of the housing to enable a lead wire to be attached. A further pair of terminals 5 extend through slots in the bottom wall 3 and each includes a portion 5a projecting inwardly of the housing substantially at right angles thereto. The terminals 5 also have portions extending outwardly of the housing to enable a lead to be attached thereto.

The housing is divided into two compartments by a partition 1a and a said fixed contact 2 and terminal posts 4 and 5 are positioned in each compartment.

A snap-over leaf spring is also assembled in each compartment and includes an arm 6 pivoted at an intermediate point in its length to the projecting portion 5a of the terminals 5. The spring also includes an arm 7 overlying the arm 6 in spaced relation thereto and connected with the arm 6 by a resilient bight 8. The free end of the arm 6 carries a movable contact 9 for co-operative engagement with the fixed contact 2 and the free end of the arm 7 is reversely bent to form a V-shaped recess or groove 10.

The housing 1 is open at its upper end as viewed in FIG. 1 and a switch actuating member 11 is pivotally mounted in this open end by means of lateral pins 12 rotatably engaging in apertures in the opposed side walls of the housing. The underside of the member 11 is provided with two triangular shaped lugs 13, 14, which are angularly disposed to one another.

Two intermediate actuating members are mounted in the housing, one in each compartment and each comprises a base 15 pivotally mounted by lateral pins 16 respectively engaging in an aperture in an adjacent side wall of the housing and a recess 1b in the partition 1a. The shape and dimensions of the apertures and recesses are such as to permit the pins 16 a limited amount of movement in a vertical direction as viewed in FIG. 1.

The base of the respective intermediate members is provided with a pair of ramp-like surfaces 17, 17a and 18, 18a, the surfaces of each pair being disposed in angular relation so as to define an obtuse angle the apex of which is approximately at the central pivot point of the base. The ramps face the lugs 13, 14, which in operation of the switch are adapted to ride over one or other of the ramps. The underside of the base 15 of the intermediate actuating members is formed with a triangular shaped projection 19 engaging in the recesses 10 of the respective leaf springs.

It will be noted that the central longitudinal axis of the lugs 13, 14, of the actuating member 11 is offset slightly with respect to a plane extending at right angles to the longitudinal axis of the member 11 and passing through the pivotal axis thereof.

The arms of the leaf spring are normally under tension such that the arms 7 will be urged into engagement with the triangular projection 19 of the intermediate actuating member and by virtue of the shape and dimensions of the apertures and recesses in which the pins 16 are received, the ramps of the intermediate actuating members will always be urged towards the lugs 13, 14, so as to make contact therewith and take up any play.

By reason of the offset disposition of the lugs 13, 14, they will engage the ramps of the respective intermediate members at different locations and by virtue of the limited vertical movement of the pins 16, each lug can be moved along the ramps past the center or apex of the angles defined by the pairs of ramps. This permits the switch to be operated into three positions. Firstly, to move both movable contacts to engage both fixed contacts, secondly to position both movable contacts in spaced relation to the fixed contacts and thirdly, to position one movable contact in engagement with a co-operating fixed contact while the other movable contact is in spaced relation to its associated fixed contact.

In operation, when the actuating member 11 is pivoted, the lugs 13, 14, will ride over the ramps of the respective intermediate actuating members causing the latter to pivot. Only a limited pivotal movement needs to be imparted to the intermediate members until the snap-over leaf springs pass the dead center when they serve to complete the movement of the intermediate actuating members and effect a rapid movement of the arms 6 of the leaf springs to engage or move away from the fixed contacts.

The operation of the switch in the form illustrated in the drawings is best understood from a consideration of FIGS. 5 to 7. In FIG. 5, the actuating member 11 has been pivoted into a position wherein the lugs 13, 14, engage the ramps 17a, 18a of the respective intermediate actuating members such that both have been pivoted in a clockwise direction and the projections 19 exert pressure on the arms 7 of the leaf springs which pressure is transmitted through the bight 8 to the arms 6 to urge both movable contacts 9 into engagement with the fixed contacts 2. In moving to this position the lug 13 would have effected the pivotal movement of its co-operating intermediate actuating member before the lug 14 effects the pivotal movement of the other intermediate actuating member. To permit the continued pivotal movement of the member 11 for the lug 14 to actuate its intermediate actuating member, it will be

noted that the lug 13 has travelled a short distance along the ramp 17a from the apex of the angle defined by the ramp surfaces. This movement is possible by reason of the limited vertical movement permitted by the pivot pins 16. When the parts are in this position, the two leaf springs and the two intermediate actuating members are in line and therefore only one of each of these parts is visible in the drawing.

FIG. 6 illustrates the position of the parts when the switch is in its other extreme position, the actuating member 11 having been pivoted in an opposite direction to that referred to in connection with FIG. 5 so that both intermediate actuating members have been pivoted in an anti-clockwise direction and the pressure exerted by the projections 19, 19a on the respective leaf springs is released and, as shown, the arms 6 of the leaf springs have risen to permit the movable contacts to separate from the fixed contacts. As the switch moves into the position illustrated in FIG. 7, the lug 14 would have pivoted its associated intermediate actuating member before the lug 13 pivots its member, and it will be noted that the lug 14 is moved slightly towards the left away from the apex of the angle.

As in the case of FIG. 5, the two intermediate actuating members and the associated leaf springs and contacts will be in line in this position of the switch and therefore only one of each of these parts is visible.

In the third position of the switch illustrated in FIG. 6, the switch is in a position corresponding to that illustrated in FIG. 1, and the lug 13 of the actuating member 11 has pivoted the intermediate actuating member shown in full lines in a clockwise direction, such that the projection 19 exerts pressure on the leaf spring to cause the arms 6 to urge the movable contact into engagement with its co-operating fixed contact. The lug 14 has not, however, reached the apex of the angle or dead center of the intermediate actuating member (shown in chain lines) and the pressure exerted on its associated leaf spring by the projection 19 is such that the arms 6 are permitted to rise to separate the movable contact from its co-

operating fixed contact. Accordingly, in the position illustrated in FIG. 6, one pair of movable and fixed contacts are in engagement and the other pair is separated from one another.

I claim:

5 1. An electrical switch comprising a housing formed of insulating material, at least two fixed contacts and two movable contacts and snap-over ramp springs for moving the movable contacts, a first switch actuating member pivotally mounted in the housing and provided with a first lug and a second lug, angularly disposed to one another, a second switch actuating member comprising a base pivotally mounted in the housing, one face of said second actuating member having projections engaging the ramp springs and the opposite face provided with a pair of ramp like surfaces, the surface of each pair extending in angular relation to one another to define at least two obtuse angles, the apexes of which are approximately at the pivotal center of the base, each lug engages a ramp-like surface, the arrangement being such that rocking or pivotal movement imparted to said first actuating member will cause the first lug to ride over the first ramp like surface and the second lug to ride over the second ramp like surface so as to pivot said second actuating member whereby the projection on the latter will move the ramp spring over one or other sides of its dead center so as to snap said second actuating member into a position to cause said spring to offset the movement of the movable contact relative to the fixed contact to open or close the switch.

2. A switch according to claim 1, wherein the means pivotally supporting the said first arm of said leaf spring comprises an inwardly extending portion of a terminal post which includes a portion extending outwardly of the housing.

3. A switch according to claim 1, wherein the said second arm is formed with a recess into which the free end of the said projection on said second actuating member extends.

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