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SNAP ACTION ELECTRIC SWITCH

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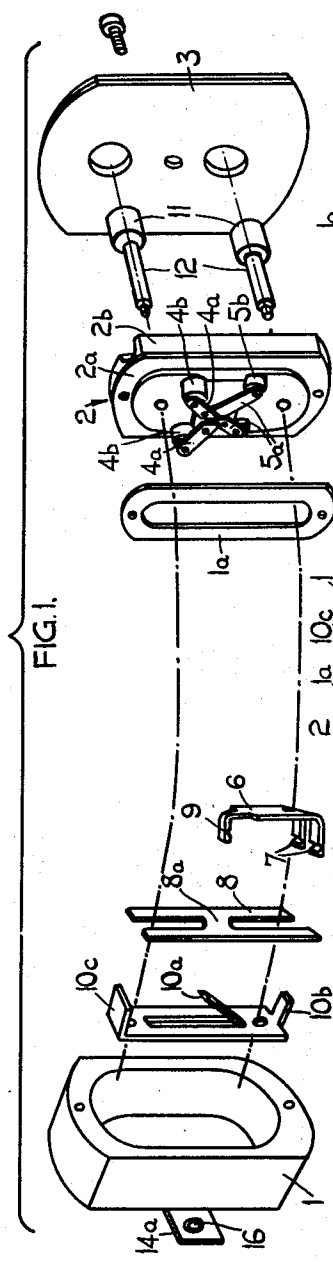

FIG. 1.

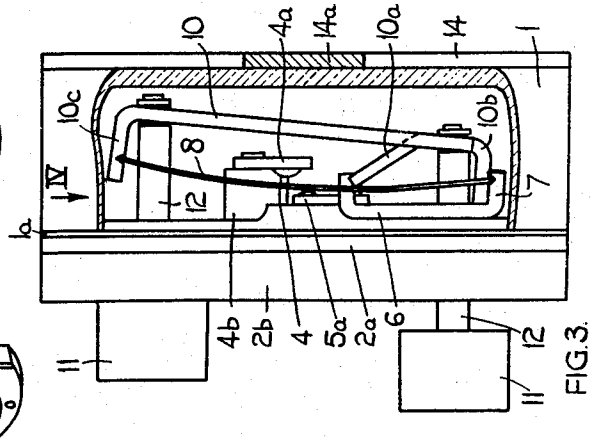

FIG. 3.

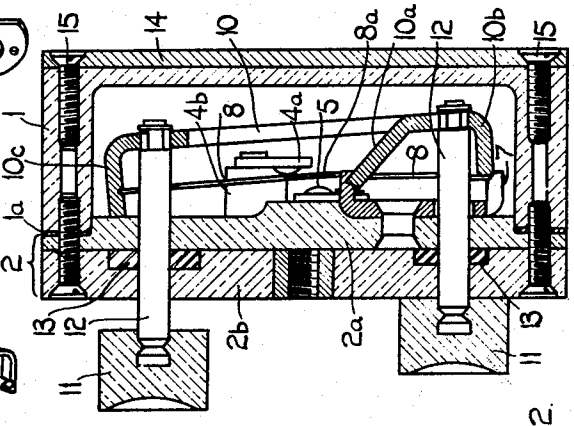

FIG. 2.

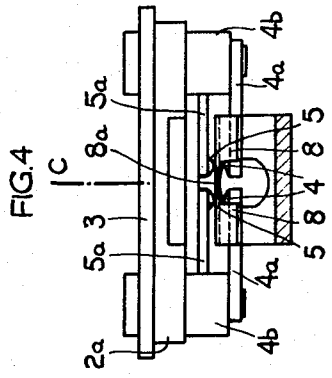

FIG. 4

INVENTOR
ROBERT SAMUEL LEES-ANDREWS

BY KARL W. FLOCKS
HIS ATTORNEY

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## SNAP ACTION ELECTRIC SWITCH

Robert Samuel Lees-Andrews, Cheltenham, England, assignor to Bisset Industries Limited, Cheltenham, England, a company of Great Britain

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6 Claims. (Cl. 200—67)

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This invention relates to snap action electric switches of the kind (hereinafter referred to as the kind described) in which a resilient strip or blade co-operates with a fixed contact or contacts to make or break an electric circuit and is pre-stressed to take up one or other of two limit positions on either side of a dead-centre position in which it is in unstable equilibrium.

It is an object of this invention to provide a switch of the kind described which is simple in construction and reliable in operation.

The present invention provides a snap action switch which when operated into the closed position will remain in this position until positively operated into the open position.

The nature of the invention will be more clearly understood from the following description, given by way of example, of one embodiment constructed in accordance therewith and illustrated in the accompanying drawings, in which—

Fig. 1 is an exploded perspective view of a change-over switch,

Fig. 2 is a longitudinal section of the switch shown in Fig. 1, with the moving parts in one operated position,

Fig. 3 is a side elevation with part of the housing broken away and with the moving parts in the other operated position, and

Fig. 4 is an end elevation seen in the direction of the arrow IV of Fig. 3, some parts being removed.

The switch illustrated is of the push button type and consists of a hollow rectangular oil-tight box or body part 1 forming a housing for the moving parts of the switch. The body part 1 is closed in an oil-tight manner by an insulating carrier plate 2 rigidly secured thereto as by cementing or by screws with the interposition of an oil-seal washer or gasket 1*a*, and an escutcheon plate 3 is secured to the front of the carrier plate 2 to give a finished and suitably decorative appearance. Alternatively, the escutcheon plate may be replaced by a switch cover having button shrouds to conform to the appropriate regulations when the switch is to be used for industrial purposes.

The cover may be made of an aluminium alloy, and the box or body part 1 may then be a die-cast case with a conduit entry boss. The carrier plate 2 is divided into two parts 2*a*, 2*b* to accommodate oil seals 13 around the switch-operating rods, as will be described more fully below. On the carrier plate 2 are mounted two pairs of contacts 4, 5, the pair of contacts 4 being mounted in a plane spaced slightly behind that of the pair of contacts 5. The two pairs of contacts are arranged on either side of the transverse centre-line C (Fig. 4) and are connected by rigid strips 4*a*, 5*a*, respectively, to the terminal pillars 4*b*, 5*b*. At one end of the carrier plate 2 is mounted a U-shaped anchor member 6, the limbs of the U being of the same height. The two limbs of the U are cut away for part of their width, the lower limb—as seen in Figs. 1 and 2—being cut away at its centre to present a pair of abutments 7 which are grooved transversely on their upper faces near the free ends to receive the lower end of an H-shaped resilient blade 8 of "silver-faced" beryllium copper. The upper limb 9 of the U-shaped anchor member 6 is cut away along each side to enable it to project with clearance between the sides of the H-shaped resilient blade, and is transversely grooved on its under surface near the outer end thereof to constitute a fixed fulcrum part. This fulcrum part 9 is engageable by a forward projection 10*a* on an operating member or lever 10 of approximately the same overall dimensions as the resilient blade 8. This forward projection 9 has a knife-edge formation at its extremity which seats in the groove in the fixed fulcrum part 9, the combination acting as a substantially frictionless fulcrum for the operating lever 10.

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The lower end of the operating lever 10 has an inturned lug 10*b* which passes between the two halves of the lower blade abutment 7. The upper end of the lever 10 has an inturned abutment lug 10*c*, the under surface of which is grooved near its free end to receive the upper ends of the resilient blade 8. The arrangement and dimensions of these parts are such that, when the blade is mounted in the grooves in its upper end lower abutments 10*c*, 7, respectively, it must flex slightly under endwise pressure to enable the fulcrum projection 10*a* of the operating lever 10 to enter the complementary groove in the fixed fulcrum part 9. The stress thus set up in the resilient blade 8 holds the fulcrum in engagement, and at the same time operates to bias the blade to a flexed contour on one or other side of a dead-centre position in which it is in unstable equilibrium. The fixed contacts 4, 5 on either side of this dead centre position define the limit positions of this flexure.

The cross-piece 8*a* of the resilient blade 8 is arranged to bridge the pairs of fixed contacts 4 or 5 and so to close the respective external circuit. To operate the switch, the operating

lever 10 is tilted, rocking it about its fulcrum 9, 10a and initially pressing the blade against the "made" contacts (4 in Fig. 1), so as to tend to straighten it, until it passes through its dead-centre position and snaps over to come to rest, in its other limit position, to bridge the other pair of contacts 5.

For moving the operating lever 10, two insulating push-buttons 11 are mounted on stems 12 which pass through the carrier plate 2 and the escutcheon plate 3, the part 2b being recessed on its undersurface around the holes for the stems 12 to receive packing washers 13. The housing 1 is filled to the required level with transformer oil, thereby increasing the current breaking capacity of the switch, or conversely reducing the overall size of the switch for a given circuit. The buttons 11 may be distinctively coloured or engraved to indicate the setting of the switch. The housing is secured in position by means of a cruciform fixing frame 14 screwed thereto at 15, the arms 14a having fixing holes 16 drilled therein. The frame 14 may be crimped during installation of the switch in order to allow the sealing face of the escutcheon plate to be located parallel with the plane of the outer surface of the wall or other support on which the switch is being installed.

In a modified construction, the resilient blade 8 may constitute one contact, to co-operate with a single fixed contact or contacts connected to the other part or parts of the external circuit.

A plurality of switch units may be mounted side by side on a common carrier plate and in a common body or housing, each unit having its own set of fixed contacts such as 4, 5 and resilient blade such as 8. A common escutcheon plate may be used, and may be engraved so as to identify the several circuits.

The design described above, which is not limitative of the invention as to details of construction, is simple to manufacture and assemble since all the working parts may be stamped out by a simple press-tool or like operations. The body 1, carrier plate 2 and escutcheon plate 3 may be plastic mouldings or they may be metal castings or forgings, or may be fabricated from sheet metal. Furthermore, the fulcrum arrangement 9, 10a is sturdy, and by reason of the knife-edge feature of construction at all points where relative motion occurs, friction is reduced to a minimum, thus adding to the sensitivity and reliability of operation of the switch, even under adverse climatic conditions. Instead of being mounted in or on a carrier plate 2, the fixed parts of the switch may be mounted on a rigid frame work constituting the carrier part which may be enclosed by any desired form of sheeting, or may be incorporated into a larger assembly of components.

If desired, all the parts, with the exception of the fixed contacts and the resilient blade, may be of moulded plastic materials, although even the blade may be of a plastic or other tough and flexible insulating material if desired. In the latter case, the cross-piece of the H-shaped blade 8 may be of metal. In this case also, the resilient blade 8 may have more than one cross-piece such as 8a, each cross-piece co-operating with respective fixed contacts for controlling simultaneously a plurality of circuits. By this means insulating and corrosion difficulties can be reduced to a minimum.

The switch is capable of many applications, particularly to the control of low-power domestic or industrial circuits.



What I claim is:

1. A snap action electric switch comprising a carrier plate, a fixed abutment extending from said carrier plate, a rigid, movable switch operating member having an abutment at one of its ends spaced from said fixed abutment, a resilient blade carried at its ends in said abutments and having a length greater than the distance between the fixed abutment and the abutment on the switch operating member, said resilient blade being movable with the switch operating member about said fixed abutment as a pivot, a second fixed abutment extending from the carrier plate intermediate said first fixed abutment and said abutment on said switch operating member, said switch operating member and said second fixed abutment being provided with separate rigid inter-engaging pivot formations so that the ends of said rigid switch operating member including said abutment thereon move along an arcuate path of shorter radius than that which would be described by said resilient blade if unrestrained, spaced stop members on each side of said resilient blade, at least one of said stop members constituting a fixed contact of the switch, and means for moving the switch operating member and corespondingly moving said resilient blade from one extreme position in which the resilient blade engages one stop and is curved convexly toward the carrier plate to another extreme position in which the resilient blade engages the other of said stops and is curved concavely toward the carrier plate.

2. A snap action electric switch comprising a carrier plate, a fixed abutment mounted on the carrier plate towards one end thereof, a rigid switch operating member, separate rigid inter-engaging pivot formations on the switch operating member and the carrier plate, that on the latter being at a point nearer the other end of the carrier plate than the fixed abutment, an abutment on the switch operating member distant from the fixed abutment, a first stop mounted on the carrier plate between the fixed abutment and the abutment on the switch operating member, a second stop mounted on the carrier plate at a point between the fixed abutment and the abutment on the switch operating member and spaced from the first stop, at least one of said stops consistuting a fixed contact of the switch, a resilient blade carried at its ends in the fixed abutment and the abutment on the switch operating member and extending through the gap between the two stops and of a length greater than the distance between the fixed abutment and the abutment on the switch-operating member at all positions, and extending from the abutment on the switch operating member beyond the pivot point of the switch operating member to the fixed abutment, and means for moving the switch operating member from one extreme position in which the resilient blade engages one stop and is curved convexly towards the carrier plate to another extreme position in which the resilient blade engages the other stop and is curved concavely towards the carrier plate.

3. A snap action electric switch as set forth in claim 2 wherein the rigid pivot formation on the carrier plate and the fixed abutment are formed facing each other on opposite limbs of a U-shaped member secured to the carrier plate.

4. A snap action electric switch as set forth in claim 3 wherein the rigid switch operating member is pivoted at a point between the fixed

abutment and the median point of the resilient blade.

5. A snap action electric switch according to claim 2 wherein the means for moving the switch operating member includes two plungers projecting through the carrier plate and operatively engaged with the switch operating member on each side of the inter-engaging pivot formations and wherein the resilient blade is of H shape with the plungers extending therethrough.

6. A snap action electric switch comprising a carrier plate, a fixed abutment mounted on the carrier plate towards one end thereof, a rigid switch operating member, an abutment on the switch operating member distant from the fixed abutment, a first stop mounted on the carrier plate between the fixed abutment and the abutment on the switch operating member, a second stop mounted on the carrier plate at a point between the fixed abutment and the abutment on the switch operating member and spaced from the first stop, at least one of said stops constituting a fixed contact of the switch, a resilient blade carried at its ends in the fixed abutment and the abutment on the switch operating member and extending through the gap between the two stops and of a length greater than the distance between the fixed abutment and the abutment on



the switch operating member at all positions, separate rigid inter-engaging pivot formations on the switch operating member and the carrier plate, the point of engagement being between the fixed abutment and the median point of the resilient blade, which extends from the abutment on the switch operating member beyond the pivot point of the switch operating member to the fixed abutment, and means for moving the switch operating member from one extreme position in which the resilient blade engages one stop and is curved convexly towards the carrier plate to another extreme position in which the resilient blade engages the other stop and is curved concavely towards the carrier plate.

ROBERT SAMUEL LEES-ANDREWS.

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