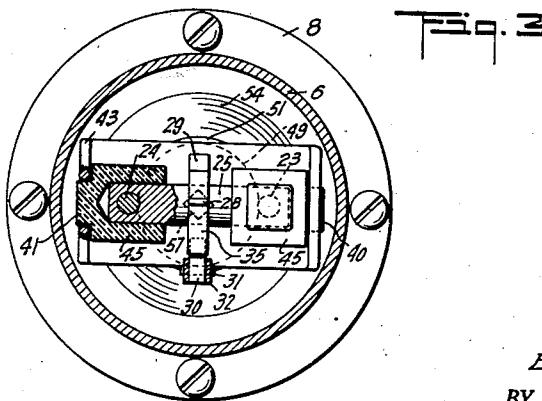
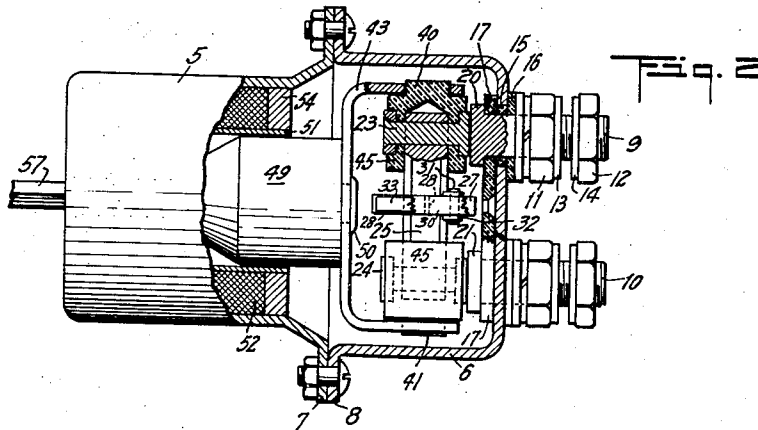
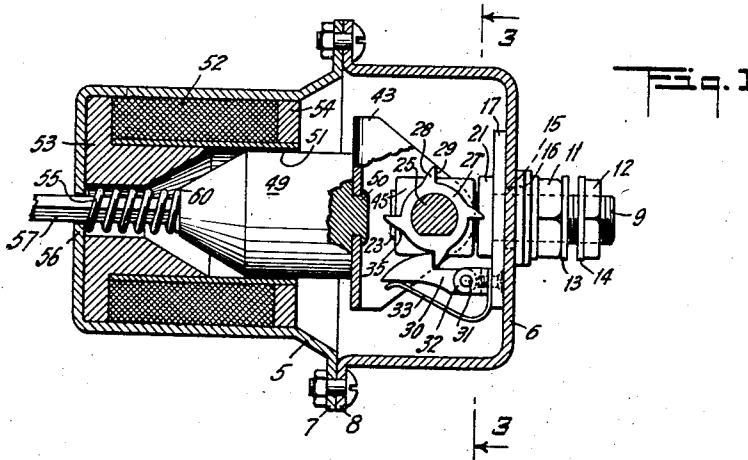


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CIRCUIT CONTROLLING DEVICE

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CIRCUIT CONTROLLING DEVICE

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This invention relates to circuit controlling devices, and particularly to switches of the snap action type.

An object of the invention is to provide a spring actuated switch in which successive releases of the spring stressing element will operate to produce successive opening and closing movements of the switch contacts, the direction of movement of said element being the same for both opening and closing functions.

A further object is to provide an electro-magnetically actuated switch mechanism in which successive energizations of the electro-magnetic elements will operate to produce alternate opening and closing movements of the switch.

Another object of the invention is to provide a switch mechanism of the electro-magnetic type in which the movable member of the electro-magnet is adapted for manual actuation in the event of failure of the source of energizing current or whenever, for any reason, manual actuation is preferred.

Another object of the invention is to provide a device of the foregoing character possessing marked advantages from the standpoint of simplicity, economy of space, and lightness of the parts in comparison with their efficiency and the work performed.

These and other objects and advantages of the invention will become apparent upon consideration of the following detailed description, and upon reference to the accompanying drawing illustrating the preferred embodiment of the invention. It is to be expressly understood however, that the drawing is for the purpose of illustration only, and is not intended as a definition of the limits of the invention, reference being had for such a definition to the appended claims.

In the drawing,

Fig. 1 is a longitudinal sectional view of a device embodying the invention;

Fig. 2 is an elevation partly in section taken at right angles to the section of Fig. 1; and

Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 1.

Referring to the drawing, the invention is shown embodied in a two-part casing consisting of two cup-shaped members 5 and 6 having abutting flanges 7 and 8 respectively, providing means for attachment of the device to any suitable support as, for example, the usual cockpit control board when the device is installed on an airplane. When so employed, the device is useful as a means for quickly disconnecting the battery

or other source of current from all power and lighting circuits on the craft in an emergency; but it will of course be obvious from the following description that the device is applicable to many other uses.

The portion 6 of the housing contains the novel contact mechanism adapted to alternately make and break an electric circuit having conductors, not shown, adapted to be attached to binding posts 9 and 10 which, as shown take the form of threaded bolts adapted to be engaged by nuts 11 and 12 to lock in place the conductor ends inserted between said nuts and the discs or washers 13 and 14 respectively, while the sleeves 15, disc 16 and the plate 17 constitute means for insulating terminals 9 and 10 from the end wall of the casing 6. The bolt heads 20 and 21 are preferably flat, serving as abutment members, and to provide firm contact with conducting pins 23 and 24 mounted in transverse bores in a conducting shaft 25, the latter being provided intermediate its ends with an enlarged portion 27 from which extend at regular intervals a suitable number of (herein shown as 4) teeth 28, having faces 29 adapted to be successively engaged by a latch member 30 pivoted as indicated at 31 to a U shaped support 32 secured to the plate 17; the latch being held in its locking relation to the shaft 25 by a suitable spring 33. The teeth 28 are also provided with inclined faces 35 adapted to ride along the curved surface of the outer end of the latch 30 as the shaft rotates in response to the pull exerted thereon in the manner to be described, this action continuing until, at the completion of the ninety-degrees of the turning movement, the succeeding tooth is engaged by the return snap of the latch 30. During this ninety-degree movement the pins 23 and 24 will of course be shifted out of contacting relation to the fixed contacts 20 and 21 and the latter will now be engaged by the insulating surface of the non-conducting sleeves or blocks to be further described; said blocks being provided with bearing ends 40 and 41, the latter being rotatably received in a yoke member 43 associated with the actuating means to be described.

The invention includes novel means associated with the shaft 25 and ratchet teeth 28 for causing return of the switch to its previous position, whether that be circuit making or circuit breaking position, in the event that the pull on the switch is not sufficiently positive, the same means also operating to complete the ninety-degree throw of the switch if the pull is sufficiently positive. As shown such means is constituted by a

pair of rectangular blocks 45, the corners of which successively engage the abutments 20 and 21 as the blocks turn with the shaft 25. With this construction it is apparent, particularly in Fig. 1, that in order to complete each successive ninety-degree movement it is necessary for one of the corners of the blocks 45 to slide across the full extent of the surface of the abutment and then come to rest in the position indicated in Figs. 1 and 2. It will be evident, therefore, that in the event that the outward pull on the moving elements of the switch is sufficient to complete a full ninety-degree movement of the shaft 25, the corner of the blocks which is engaged with the abutment will not have reached a central point thereon and accordingly cannot continue in its counter-clockwise rotation in the absence of a further outward pull. Consequently the block must of necessity return to its initial position (including the contact assembly) in response to the inwardly directed force produced by the means to be described.

The switch actuating means preferably includes a magnetizable plunger 49 suitably secured to the yoke 43, as indicated at 50, and slidable within a non-induction sleeve 51 on which the winding of the solenoid 52 is placed, the plunger being adapted to coact magnetically with a fixed core piece 53 and an annular plate 54 to complete the magnetic circuit operating to attract the plunger 49 to the core 53 in response to energization of the coil 52, it being assumed that the winding thereof is connected to suitable current conducting leads and terminals (not shown). The core 53 is centrally bored, as indicated, for the reception of a coiled compression spring 55, one end of which abuts the end wall 56 of the casing section 5 at the point where said end wall is apertured to permit passage therethrough of the reduced and elongated end 57 (which may be of rectangular cross-section) of the plunger 49; the end 57 being adapted to receive a link or cable, if such is necessary to render the device accessible to the operator whereby manual actuation of the switch may be effected. The opposite end of the spring 55 abuts a shoulder 60 formed on the plunger 49 at the junction of the rod portion 57 with the tapering portion 61; the tapering formation being employed to provide, in conjunction with the corresponding conical bore of the core 53, a more effective use of the magnetic lines of force produced on energization of the coil.

From the foregoing it will be apparent that upon either magnetic or mechanical actuation of the plunger 49, the latter will move to the left, as viewed in Figs. 1 and 2, thereby compressing the spring 55 and rocking the shaft 25 in a counter-clockwise direction; this action (assuming the parts to be in the position indicated in Fig. 1) causing the withdrawal of the pins from electrical contact with the terminals 9 and 10, and the counter-clockwise rotation being caused by the resistance of the latch 30 to the particular tooth 28 with which it is in engagement. After the rotation has proceeded slightly beyond forty-five degrees, the spring 55 becomes fully compressed and is effective upon release of the pull on rod 57 (in the event of mechanical actuation) or upon opening of the circuit to the coil 52, to complete the rotating movement of the rock shaft into an angular position in which the conducting pins 23 and 24 will be disposed at right angles to the terminals 9 and 10. The latter part of the movement will occur with a snap action due to

the rapid expansion of the spring 55; the corner of the blocks 45 having passed the central point on the abutments 20 and 21, will not be in a position to offer resistance to the return movement of the switch assembly.

In the event, however, that the operator fails to draw the rod 57 outwardly to its limit of movement or in the event that he opens the circuit to the coil 52 prior to the arrival of the plunger at the limit of its movement, the spring 55 will, upon such release, be effective to return the switch to its original position, since the corner of the blocks will not have reached the middle position and will therefore follow the line of least resistance back to the said original position. Thus the position of the corner of the blocks 45 with respect to the abutments 20 and 21 determines the direction of rotation which the rock shaft will take upon release of the plunger 49, the position of said corner being in turn dependent upon the positiveness and continuity of the pull exerted on the plunger. This feature of the invention is of considerable importance since it automatically restores the circuit to its original position in the event that the operator changes his mind in the act of operating the switch, as for example, when he perceives that a predicament which at first appeared to be highly dangerous has suddenly been corrected or compensated for and hence does not require an emergency turn of the switch.

A further important advantage will be seen to reside in the feature whereby successive actuations of the plunger in the same direction, followed by successive releases thereof, will operate to produce alternate making and breaking of the control switch. In this way the operator is relieved of the necessity of exerting the mental effort which is necessary in cases where the switch is susceptible of operation in more than one direction.

While the embodiment of the invention herein disclosed possesses considerable practical merit it is to be understood that the invention may be embodied in structures varying in shape, location and relative arrangement of the parts, and such variations are to be regarded as within the scope of the invention disclosed herein and defined in the appended claims.

What is claimed is:

1. In a device of the class described, in combination, a pair of stationary current conducting members, a rotatable bridging member within said casing, a ratchet tooth formed on said bridging member, a yoke adapted to receive the end of said bridging member, and means engageable with said ratchet teeth causing rotation of said bridging member within said yoke in response to movement of said yoke in a direction away from said stationary current conducting members, and means being distinct from said current conducting members.

2. In a device of the class described, in combination, a pair of stationary contacts, a rotatable bridging member within said casing, a plurality of teeth formed on said bridging member, a yoke adapted to receive the end of said bridging member, a detent engageable with said teeth causing rotation of said bridging member within said yoke in response to movement of said yoke in a direction away from said stationary contacts, and means associated with said bridging member for determining the direction of rotation thereof in response to movement of said yoke in the opposite direction, said last named means comprising a

rectilinear member distinct from said teeth and detent, and having edges engageable with said contacts during rotation of said bridging member.

5 3. In a device of the class described, in combination, a casing, a rotatable switch member within said casing, means for displacing said switch member laterally of its longitudinal axis, means comprising a plurality of ratchet teeth on
10 said switch member and a single detent secured to said casing and engageable with edge of said ratchet teeth successively to resist movement thereof in one direction, and means distinct from
15 member through an arc of predetermined length after said displacement has been produced.

4. In a device of the class described, in combination, a casing, a rotatable switch member within said casing, a plunger movable within said casing, resilient means for actuating said plunger in one direction only, means comprising
80 a plurality of ratchet teeth on said switch member and a detent secured to said casing and engageable with said ratchet teeth successively to resist movement thereof in one direction, and
85 means for snapping said switch member through an arc of predetermined length after said displacement has been produced.

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