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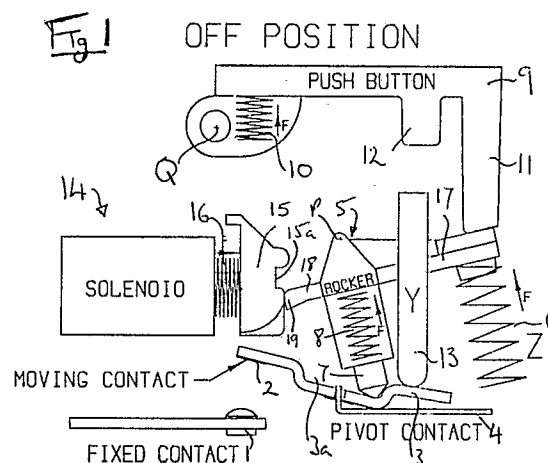
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54 **Switch mechanism.**

57 An electrical switch mechanism comprising: a fixed contact; a movable contact on a lever carrier, movable between an inoperative position and an operative position where the contacts engage, through an intermediate position; a pivotable rocker carrying first bias means for urging the lever carrier, the rocker being pivotable from a first rest position where the first bias means can urge the lever carrier into the inoperative position and a second position where the bias means can urge the lever carrier into the intermediate position; an actuator comprising a push button which, when actuated, pivots the rocker between the first position and the second position, and a latch which retains the rocker in the second position upon release of the push button, the arrangement being such that when the push button is subsequently released, the first bias means urges the lever carrier into the operative position.



Description

Switch Mechanism

This invention relates to switch mechanisms and particularly, but not exclusively to a so called trip-free switch mechanism, i.e. a switch mechanism which cannot be reclosed while a fault exists.

A switch mechanism is known in which a contact carrier is moved between an inoperative and an operative position by an actuator, and the actuator then completes a circuit to the contact. This involves having two moving contacts, one on a pivotal carrier and one on a sliding carrier which is returned to its initial position from an intermediate position to make contact with the pivotal carrier, which is meanwhile moved to the operative position by the actuator. This construction is both complex and cumbersome and requires the bonding of electrical connections to two moving contacts. This presents difficulties and increases the costs of the trip-free mechanism.

Accordingly the present invention seeks to provide a switch mechanism of simplified construction.

According to the invention there is provided an electrical switch mechanism comprising a lever carrier movable between an inoperative position and an operative position where a contact on the lever carrier can come into contact with a fixed contact, and an actuator for acting on the lever carrier, characterised in that when actuated the actuator moves the carrier to an intermediate position, but the carrier is not moved into the operative position where the moving contact engages with the fixed contact until the actuator has been released.

According to another aspect the invention provides an electrical switch mechanism comprising: a fixed contact; a movable contact on a lever carrier, movable between an inoperative position and an operative position where the contacts engage, through an intermediate position; a pivotable rocker carrying first bias means for urging the lever carrier, the rocker being pivotable from a first rest position where the first bias means can urge the lever carrier into the inoperative position and a second position where the bias means can urge the lever carrier into the intermediate position; an actuator comprising a push button which, when actuated, pivots the rocker between the first position and the second position, and a latch which retains the rocker in the second position upon release of the push button, the arrangement being such that when the push button is subsequently released, the first bias means urges the lever carrier into the operative position.

A preferred embodiment of the invention will now be described, by way of example and with reference to the accompanying drawings, wherein:

Figure 1 is a schematic elevational view of a switch mechanism of the preferred embodiment in an off position;

Figure 2 is a similar view to Figure 1, but with the switch mechanism in a trip-free or intermediate position; and

Figure 3 is a similar view to Figure 1, where the switch is in an on position.

Referring first to Figure 1, the switch mechanism

generally comprises a fixed contact 1, a moving contact 2 at one end of a carrier in the form of a lever 3 mounted on a pivotal contact 4, a pivotally mounted rocker 5 biased in an anti-clockwise direction by a spring 6 and having a slidable plunger 7 biased by a spring 8 into engagement with the carrier lever 3, an actuator in the form of a pivotally mounted push-button 9 biased in an anti-clockwise direction by a spring 10, a plunger 13 resting on the lever 3, and a solenoid operated latch 14.

The fixed contact 1 and the pivotally mounted carrier lever 3 are disposed so that the moving contact 2 can engage with the fixed contact 1 when the carrier lever pivots about the pivot contact 4, through which pivot contact electrical connection is made to the moving contact. The fixed contact 1 and an electrical connection to the pivot contact 4 can be connected to an electrical circuit as required. The pivotally mounted carrier lever 3 is generally elongate, having at one end the moving contact 2 and in a central portion a recess 3a. The plunger 13 rests on the opposite end of the lever carrier 3 to the moving contact 2.

The rocker 5 is pivoted at P and an arm 17 of the rocker is engaged by the spring 6 to bias the rocker 5 in an anti-clockwise direction, while an opposite arm 18 of the rocker 5 has a free end 19 which can engage with the solenoid latch 14, as will be described hereinafter. The rocker carries a slidable plunger 7 which is biased by a spring 8. The spring 8 acts in a line passing through the pivot point P and so does not act to pivot the rocker 5. The spring 8 biases the rocker plunger 7 into engagement with the lever carrier 3 in the central recess 3a of the lever carrier 3. As will become apparent, the range of movement of the rocker plunger 7 along the lever carrier 3 is limited by the recess 3a.

The push button 9 is pivoted at Q and biased in an anti-clockwise direction by a spring 10. The push button 9 has two depending finger portions 11, 12. The first finger portion 11, the more distant of the two from the pivot point Q on the push button 9, and the layer of the two fingers is positioned to engage with the arm of the rocker 5 which is biased by the spring 6. The push button 9 is disposed so that in operation, as will be described hereinafter, the inner shorter finger 12 can engage with the plunger 13.

The solenoid operated latch 14 has a nose 15 with a recess 15a for receiving the free end of the arm of the rocker 5. The latch nose 15 is biased by a spring 16 towards the free end 19 of the arm 18 of the rocker 5. The solenoid operated latch 14 is arranged when operated to retract the latch nose 15. To operate of the solenoid latch 14, it is of course necessary for the solenoid to be connected to a fault detecting circuit. This is well known in the art and will not be described further.

Operation of the switch mechanism will now be described with reference in sequence to Figures 1, 2 and 3. First, starting with Figure 1, in the off position

shown in the Figure 1 the rocker 5 is biased in an anti-clockwise direction by the spring 6 so that the arm 17 of the rocker 5 engages with the outer finger 11 of the push button 9. The other arm of the rocker 5 with the free end 19 is at this time not engaged with the solenoid latch 14. Provided no fault condition is present the solenoid will be inoperative and the latch nose 15 will be biased by the spring 16 into engagement with the free end 19 of the arm of the rocker 5. The rocker plunger 7 will be, as shown in Figure 1, at the right hand most end of the recess 3a in the lever carrier 3, biasing the lever carrier in a clockwise direction, thereby keeping the moving contact 2 spaced apart from the fixed contact 1. The plunger 13 will rest freely on the opposite end of the lever carrier 3 to the moving contact 2. This is the normal off condition on the switching mechanism.

If the push button is now actuated, for example by being pressed by a user, and depressed at X as shown in Figure 2, the push button 9 will pivot about the point Q against the force of the spring 10 and also of the spring 6 so that the rocker 5 will be pivoted in a clockwise direction about the point P. As the rocker 5 is pivoted clockwise two significant events occur first the free end 19 of the rocker arm 18 move towards and eventually engages in the recess 15a of the latch nose 15 of the solenoid 14, thereby becoming latched therein, and second the plunger 7 is moved along the recess 3a of the lever carrier 3 past the pivot point 4, compressing the spring 8 as it does so. The pivoting movement of the push button, with associated pivoting movement of the rocker 5 continue until the inner finger 12 of the push button 9 engages with the plunger 13. The force (X) on the actuator (push button) 9 at this point tends to bias the lever carrier 13 to move in the clockwise direction but it is prevented from doing so beyond a certain point by the free end 19 of the arm 18 of the rocker 5 being engaged in the solenoid latch nose 15. This is the condition illustrated in Figure 2. It has been noted that in this intermediate, trip-free position, the moving and fixed contacts are spaced apart, and that during the operation to move to this position there is no contact made between them.

Only when the actuator is released, e.g. by a user releasing the push button, is the final contact made between the moving and fixed contacts. When the push button 9 is released the clockwise biasing force on the lever carrier 3, previously being transmitted through plunger 13, is removed and the rocker plunger 7, biased by the spring 8, pivots the lever carrier anti-clockwise so that the moving contact 2 comes into engagement with the contact 1. The push button 9 is pivoted about the point Q by the spring 10 and at the same time the rocker 5 is similarly influenced by the spring 6 but is prevented from pivoting anti-clockwise about the point P because of the engagement of the free end 19 of the arm 5 in the solenoid latch nose 15.

The switch mechanism is maintained in the "ON" position shown in Figure 3 by the retention of the free end 19 of the rocker arm 18 by the solenoid latch nose 15.

If at any time while the switch mechanism is in the

"ON" position a fault condition is detected by the fault detecting circuit the solenoid 14 is activated to retract the solenoid latch nose 15 to release the free end 19 of the rocker arm 5. If this occurs, the spring 6 will urge the rocker 5 anti-clockwise about the pivot point P moving the rocker plunger 7 along the recess 3a in the lever carrier 3 until it passes the pivot contact point 4 and then the force of the spring 8 will urge the plunger 7 to bias the lever carrier 3 in a clockwise direction moving the moving contact 2 away from the fixed contact 1. This movement will continue until the condition shown in the Figure 1 is reached with the pivoting lever carrier 3 reaching a stop position in which it is biased by the spring 8 of the rocker plunger 7 and the arm of the rocker 5 being biased by the spring 6 into engagement with the outer finger 11 of the push button 9. Thereafter the switch mechanism will only be operable into the on position when the fault condition has been removed and the solenoid 14 deactivated, returning the solenoid nose 15 to its bias position ready to receive the free end 19 of the arm 18 of the rocker 5.

If the switch is operated while an undetected fault condition exists the contacts can make, but at that movement the fault condition will be detected and the solenoid activated, thus the rocker arm will be un-latched, the lever carrier released and the contact broken before any damage occurs.

Variations of the above described arrangement will become apparent, for example, it would be possible to have the solenoid arranged to be normally on and biased to an off condition by a spring so that only while the solenoid was activated would it be possible to operate the switch. Similarly, variations in the arrangement of the various springs in the switch mechanism are possible to assume the same functions as the springs illustrated.

Claims

1. An electrical switch mechanism comprising a lever carrier movable between an inoperative position and an operative position where a contact on the lever carrier can come into contact with a fixed contact, and an actuator for acting on the lever carrier, characterised in that when actuated the actuator moves the carrier to an intermediate position, but the carrier is not moved into the operative position where the moving contact engages with the fixed contact until the actuator has been released.

2. An electrical switch mechanism comprising: a fixed contact; a movable contact on a lever carrier, movable between an inoperative position and an operative position where the contacts engage, through an intermediate position; a pivotable rocker carrying first bias means for urging the lever carrier, the rocker being pivotable from a first rest position where the first bias means can urge the lever carrier into the inoperative position and a second position where the bias means can urge the lever carrier into the intermediate position; an actuator

comprising a push button which, when actuated, pivots the rocker between the first position and the second position, and a latch which retains the rocker in the second position upon release of the push button, the arrangement being such that when the push button is subsequently released, the first bias means urges the lever carrier into the operative position.

3. An electrical switch mechanism according to claim 2 in which the first bias means comprises a spring-loaded plunger, and the lever carrier is pivotally mounted, the plunger engaging the lever carrier on one side of its pivot point in the first position, and on the other side of its pivot in the second position, so as to urge it into the inoperative or operative positions respectively.

4. An electrical switch mechanism according

to claim 2 or claim 3 in which the latch comprises a solenoid operated detent means which is arranged to retract in the event of a fault condition, so that the rocker is released to return to the first position in which the contacts are disengaged.

5. An electrical switch mechanism according to any of claims 2 to 4 in which the push button comprises a pivotable arm having a pair of fingers, one of which makes initial contact with the rocker to urge it towards the intermediate position whilst the other acts to retain the lever carrier in the inoperative position, whereby the lever carrier cannot move towards the operative position until the first bias means has reached its second position and the push button is then released.

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