ABSTRACT: This invention relates to electrical switches. The switch includes a body supporting first and second fixed contacts and a slider which is mounted for sliding movement in the body. The slider carries a third contact, and is moveable from a first position wherein the third contact is clear of the first and second contacts to a second position wherein the third contact engages the first contact. The slider is further moveable from the second position to a third position wherein the third contact engages the second contact. There is provided resilient means urging the slider towards its first position, and a first pair of coacting parts, on the body and slider respectively, which are operable to releasably retain the slider in the second position. There are further provided a second pair of coacting parts being operable to releasably retain the slider in the third position.
FIG. 5.
SLIDER SWITCH WITH IMPROVED DETENT MEANS

This invention relates to electrical switches for road vehicles.

A switch according to the invention includes a body supporting first and second fixed contacts, a slider mounted for sliding movement in the body and carrying a third contact, said slider being movable from a first position wherein said third contact is clear of the first and second contacts, to a second position wherein said third contact engages said first contact, and being removable from said second position to a third position wherein said third contact engages said second contact, resilient means urging said slider towards its first position, a first pair of coacting parts on the body and the slider respectively operable to releasably retain the slider in said second position, and a second pair of coacting parts on the body and on the slider respectively operable to releasably retain the slider in said third position.

One example of the invention is illustrated in the accompanying drawings, wherein

FIG. 1 is a sectional view of a switch,
FIG. 2 is a plan view of part of the detent means of the switch shown in FIG. 1,
FIG. 3 is a side elevational view of a further part of the detent means of the switch shown in FIG. 1,
FIG. 4 is a sectional view of a switch, according to another example of the invention, and
FIG. 5 is an exploded perspective view of the switch shown in FIG. 4, with parts thereof omitted for clarity.

Referring to the drawings, the switch includes a molded synthetic resin body 11 an open side of which is closed by an insulating contact board 12 which is engaged as a snap fit with the body 11. The contact board 12 and the body 11 defines a passage 13 within which is slidably mounted a molded slider 14 which carries a conductive bridging piece 15 engageable with fixed contacts 16, 17, 18 carried by the contact board 12, the bridging piece 15 being urged towards the board 11 by a spring 19.

At one end of the slider 14 projects from the body 11, and has secured thereto an operating member 21 which is slidably received in a molded nacelle 22 which is engaged as a snap fit with the body 11 and contact board 12, and through which the switch can be mounted on a supporting panel. A helical compression spring 23 extends between the operating member 21 and a rear face of the nacelle 22, and urges the operating member 21 to the left as shown in the drawings, so as to move the slider 14 to a first, rest position at the extreme left-hand end of the body 11.

The contacts 17, 18 of the switch are spaced apart along the longitudinal axis of the contact board 12, and each contact extends through the board and defines a terminal pin on the exterior of the switch. In the first, rest position of the slider 14 only the contact 17 is engaged by the bridging piece 15.

A pair of resilient, phosphor bronze spring blades (one of which is shown at 24) are secured to opposite faces of the slider 14. The spring blades are secured at one end to the slider 14, and project at their other ends beyond the right-hand end of the slider 14 towards the right-hand end of the body 11. At its free end, each of the spring blades has secured thereto a rigid pin 25, 26 respectively (FIG. 2), the pins 25, 26 extending towards the wall of the body 11 remote from the contact board 12. The pins 25, 26 can be moved laterally relative to the body 11 in a plane parallel to the plane of the contact board 12. The inner surface of the wall of the body 11 remote from the contact board 12 is provided with a pair of integral cam forms 27, 28 which lie in the paths of movement of the pins 25, 26 respectively. The pin 26 together with the cam form 28 constitutes a first detent means defining a third position of the slider 14 relative to the body 11, and the pin 25 together with the cam form 27 constitutes a further detent means defining a third position of the slider 14 relative to the body 11.

The cam form 26 includes a raised, generally triangular portion 29 with its apex presented towards the pin 26, and one of its long sides 31 extending across the path of movement of the pin 26, as the slider 14 is moved against the action of the spring 23, so that during such movement the pin 26 engages the side 31. The base side of the portion 29 is formed with a recess 32, and the cam form 28 further includes a rib 33 which extends generally at 90° to the side 31 of the portion 29 across the path which would be described by the pin 26 if the cam form 28 were not present. One end of the rib 33 is aligned with the base side of the portion 29, but by virtue of the recess 32 there is a space between the end of the rib 33 and the portion 29 through which the pin 26 can pass.

The cam form 27 is in the path of movement of the pin 25, as the slider 14 is moved against the action of the spring 23. The cam form 27 is also in the form of a generally triangular raised portion having its apex presented towards the pin 25, and having a recess 34 in its base side. The cam form 27 is spaced axially long the wall of the housing 11, from the portion 29 of the cam form 28 so that the pin 26 will coact with the portion 29 of the cam form 28 to define the second position of the slider before the pin 25 coacts with the cam form 27 to define the third position of the slider 14.

The operation of the switch is as follows, in the first position of the switch the slider 14 engages a stop 11a on the casing 11 to hold the slider 14 in its first position against the action of the spring 23. In the first position of the slider 11 the contact 15 is engaged with the contact 16, and since the contact 15 is a bridging contact then no circuit is completed. In order to move the switch to its second position, the operating member 21 is pushed against the action of the spring 23 to move the slider 14 to the right as shown in FIG. 1. As the slider 14 is moved the pin 26 engages the side 31 of the portion 29 of the cam form 28 and is deflected as permitted by flexure of its supporting blade, and rides along the side 31 of the portion 29. When the pin 26 reaches the end of the side 31 remote from the apex of the portion 29 the blade supporting the pin 26 has been flexed through a considerable angle, so that as the pin 26 moves beyond the end of the side 31 the pin is moved laterally by the blade under the action of the blade in returning to its unstrained position. However, since the rib 33 is aligned with the base side of the portion 29, then the lateral movement of the pin 26 is arrested by engagement of the pin 26 with the rib 33. The operating member 21 is thereby released, and the slider 14 starts to return towards its first position under the action of the spring 23, and in so doing the pin 26 is moved into the recess 32 in the portion 29 of the cam 28 thereby arresting the slider 14, in its second position. In the second position of the slider 14 the bridging contact 15 is engaged with the contact 16 and the contact 17, and thereby completes an electrical circuit therebetweenthe.

In order to move the switch to its third position from its second position, the operating member 21 is further depressed against the action of the spring 23, and in so doing the pin 26 is moved out of the recess 32, and into engagement with the right-hand (as shown in FIG. 2) side of the rib 33, thereafter, during further movement of the slider 14 the pin 26 rides along the right-hand surface of the rib 33. During such further movement the pin 25 engages the cam form 27 and is deflected by the side of the cam form 27, as permitted by flexure of the blade 24, until the pin 25 reaches the end of the side of the cam form 27 remote from the apex of the cam form 27. The side of the recess 34 in the cam form 27 remote from the side of the cam form 27 along which the pin 25 rides is of greater length than the side of the recess 34 adjacent said side of the cam form 27, and so when the pin 25 reaches the end of said side of the cam form 27 the resilience of the blade moves the pin 25 into engagement with the longer side of the recess 34. Release of the operating member 21 then permits the slider 14 to be moved towards its second position by the spring 23 wherein the pin 25 engages the recess 34 to return the slider 14 in its third position. In the third position of the slider 14, the bridging contact 15 engages the contact 18 in addition to the contacts 16 and 17 and thereby completes electrical circuits between the contacts 16 and 17 and between the contacts 16 and 18. It will be appreciated that a circuit is also
completed between the contact 17 and the contact 18, but in most applications the contact 16 will be a supply terminal and the contacts 17 and 18 will be output terminals, and so the interconnection of the contacts 17, 18 will not matter. The recess 34 in the cam form 27 is so positioned that when the pin 25 is engaged therewith, the blade 24 supporting the pin 25 is still pressed.

In order to return the switch to its rest position, the operating member 21 is further depressed against the action of the spring 23 to permit the pin 25 to ride out of the recess 34, beyond the end of the long side of the recess 34, whereupon the resilience of the blade 24 moves the pin 25 out of line with the recess 34. The rib 33, as previously stated, extends across the path which would be described by the pin 26 in the absence of the cam form 28, and so during the movement of the slider 14 to disengage the pin 25 from the recess 34, the blade supporting the pin 26 is again flexed. The length of the rib 33 is such that the movement of the slider 14 required to disengage the pin 25 from the recess 34 is sufficient to move the pin 26 beyond the end of the rib 33, so that the blade supporting the pin 26 moves back to its unstressed position. Upon release of the operating member 21 after said further movement from the third position, the spring 23 moves the slider 14 to the left (as shown in FIG. 1). During the movement of the slider to the left under the action of the spring 23, the pin 25 rides along the side of the cam form 27 and the pin 26 rides along the left-hand side of the rib 33. The blade 24 supporting the pin 26 is again flexed during this movement but takes no further part in the action of the switch. However, the blade supporting the pin 26 is flexed as the pin 26 rides along the left-hand side of the rib 33, and when the pin 26 reaches the end of the rib 33 adjacent the portion 29 of the cam form 28 the pin 26 is moved by its supporting blade, towards the unstressed position of the blade, and engages in the recess 32, and thereby arrests movement of the slider 14 in the second position of the slider 14. The recess 32 in the cam form 28 is so positioned that when the pin 26 is engaged therewith the blade supporting the pin 26 is still flexed away from its unstressed position.

In order to return the switch to its first position from its second position, the operating member 21 is depressed against the spring 23, through sufficient distance to disengage the pin 26 from the recess 32, whereupon the pin 26 is moved by its blade out of line with the recess 32. The operating member 21 is then released, so that the spring 23 moves the slider 14 once again to the left as shown in FIG. 1. Such movement of the slider 14 to the left causes the pin 26 to engage the side of the portion 29 opposite the side 31, whereupon the pin 26 rides along said surface and is again moved in a direction to flex its supporting spring. When the pin 26 reaches the apex of the portion 29, the supporting blade returns the pin 26 to the unstressed position, wherein the pin 26 is once again in such a position that depression of the operating member 21 will engage the pin 26 with the surface 31 of the portion 29, in readiness for a further operation. The slider 14 is moved to the left under the action of the spring 23 until the slider 14 engages the stop 11a which holds the slider in its first position. During the return movement of the switch from its third to its second position the pin 25 also returns to the unstressed position in readiness for a further operation.

Should it be required to move the switch directly from its first position to its third position, the operating member 21 is depressed without pausing to allow the pin 26 to engage in the recess 32 in the portion 29 of the cam form 28. Thus instead of the pin 26 subsequently riding up the right-hand side of the rib 33, the pin 26 rides up the left-hand side of the rib 33 until its blade is once again unstressed whereupon during return movement the pin 26 once again engages the left-hand side of the rib 33 and the operation is as described above.

Thus the switch can be moved either from its first position to its second position and then from its second position to its third position, or can be moved directly from its first position to its third position. However it is not possible for the switch to be moved directly from its third position to its first position since the second position of the switch is achieved automatically during the return movement of the switch.

The end of the rib 33 adjacent the portion 29 of the cam form 28 is aligned with the apex of the cam form 27, and in order to indicate to the operator, the point at which the slider 14 will be held in its second position the cam form 27 is provided adjacent its apex with a surface 27a. The surface 27a is inclined at an angle of approximately 80° to the longitudinal axis of the slider 14. Thus when the pin 26 engages the end of the rib 33 the pin 25 engages the surface 27a of the cam form 27. Further movement of the slider 14 against the action of the spring 23 will cause the pin 25 to follow the surface 27a and owing to the inclination of the cam form 27a considerable deflection of the pin 25 will occur in response to small movements of the slider 14. Thus since deflection of the pin 25 takes place against the resilience of the blade 24 then there will be resistance to such further movement of the slider. The sudden increase in resistance to movement gives the operator an indication that the slider 14 is in such a position that if the slider is released then the slider will move in the second position. In a practical embodiment of the switch, the switch is provided to control the side lamps and the headlamps of a road vehicle, the contact 16 is connected to the DC supply, the contact 17 is connected in the side lamp circuit of the vehicle, and the contact 18 is connected in the headlamp circuit of the vehicle. Thus it is possible for the driver to switch on his side lamps, and then switch on his headlamps by two separate movements of the operating member 21, or it is possible for the driver of the vehicle to switch on both his side lamps and his headlamps virtually simultaneously by a single movement of the operating member 21. However, it is not possible for the driver of the vehicle to switch off his headlamps and his side lamps in one operation. Thus it requires a definite conscious action on the part of the driver to switch off both his lights, and it is not possible for him to inadvertently switch off the side lamps as well as the headlamps when it was his intention only to switch off the headlamps.

In another example of the invention as illustrated by FIG. 4, further indication that the slider is in the second position is provided by a ball 41 which is urged into engagement with the top wall of the body 11 by the spring 42 provided in the slider 14 and the body 11 is formed with a downwardly projecting rib 43, the rib being so positioned that the ball 41butts against the end of the rib 43 when the switch is in the second position, so that further depression of the operating member 21 causes movement of the ball 41 against the resistance of the spring 19, with consequent resistance to movement of the operating member 21 beyond the second position.

Having thus described my invention what I claim as new and desirable to secure by Letters Patent is:

1. An electrical switch including: a body; first and second fixed contacts supported on the body; a slider; means mounting the slider for sliding movement in the body; and a third contact carried by the slider, the slider being movable from a first position wherein the third contact is clear of the first and second contacts to a second position wherein the third contact engages said first contact, and being movable from said second position to a third position wherein said third contact engages said second contact; resilient means urging the slider towards its first position: a first detent arrangement on the body, and the slider operable to releasably retain the slider in said second position; a second detent arrangement on the body, and the slider respectively operable to releasably retain the slider in said third position; said detent arrangement being independent of one another; wherein each detent arrangement includes a rigid pin carried by a spring blade and a cam engageable by the pin, the cam form being spaced apart axially and laterally and engagement of the pin of the first part in coating parts in a recess in its respective cam form releasably retaining said slider in said second position while engagement
of the pin of the second pair of coacting parts in a recess in its respective cam form serves to releasably retain the slider in its third position.

2. A switch as claimed in claim 1 wherein means is provided to resist movement of the switch from said second position to said third position.

3. A switch as claimed in claim 2 wherein said means comprises a face of the cam form of the second pair of coacting parts engageable by the respective pin, said face being angled steeply to the longitudinal axis of the slider, so that movement of said slider towards said third position of the switch causes deflection of said pin against the resilience of its respective spring blade.

4. A switch as claimed in claim 2, wherein said means comprises a ball which is urged into engagement with a top wall of the body of the switch by a spring accommodated in the slider, and a downwardly projecting rib formed on the body of the switch and so positioned that the ball abuts against the end of said rib when said switch is in its second position, movement of said slider towards the third position from the second position causing movement of said ball against the resilience of said spring.