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ELECTRICAL SWITCH DEVICE WITH DETACHABLE SWITCH BLADE CARRIERS AND A WIPPING COMMON CONTACT ELEMENT
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The present invention relates in general to electrical switches and more particularly to electrical switches which are actuated by an article or object moving along a path. An object of this invention is to provide an electrical switch having a common contact element for a plurality of individual contact elements in which the number of individual contact elements may be increased or decreased to suit any requirement.

Another object of this invention is to provide an electrical switch having a common contact element for a plurality of individual contact elements in which the individual contact elements are replaceable or removable.

Another object of this invention is to provide an electrical switch having a common contact for a plurality of individual contact elements in which all of the individual contact elements make a wiping contact with the common contact element.

Still another object of this invention is to provide a switch having a common contact for a plurality of individual contact elements in which the individual contact elements need not be in exact alignment with the common element for satisfactory operation.

The invention features a switch frame, a common contact element insulatingly mounted on the frame comprising a helical spring which is normally under tension, and one or more fingers or projections on the frame. One or more carriers, detachably fitted over the fingers or projections and held in place by cooperating detent elements, pivotally carry a switch blade, the thickness of the switch blade being less than the spacing between successive convolutions of the helical spring contact element.

These and other objects, advantages and features of this invention will become more apparent by reference to the accompanying drawings and the following detailed description in which a specific embodiment of the invention is set forth by way of illustration.

In the drawings:

FIG. 1 is an isometric view of a switch embodying the invention;
FIG. 2 is a partially exploded view of a switch embodying this invention;
FIG. 3 is a rear elevational view of the switch frame showing several switch blade assemblies as they are mounted on the frame;
FIG. 4 is a partial isometric view of the switch showing the actuation of one of the switch elements by an object moving along a path;
FIG. 5 is an isometric view of one of the switch blade elements and its carrier detached from the switch frame;
FIG. 6a shows a modified form of a spring strip;
FIG. 6 is a cross-sectional view taken on line 6—6 of FIG. 3;
FIG. 7 is a cross-sectional view taken on line 7—7 of FIG. 3 and shows one of the switch elements actuated;
FIG. 8 is a cross-sectional view taken on line 8—8 of FIG. 5;
and FIG. 9 is a cross-sectional view of the cooperating detent elements on the frame and carrier.

As shown in FIGS. 1 and 2 the switch comprises a rectangular casing or housing 10 having a back wall 11, bottom wall 12, top wall 13 and side walls 14 and 15, and a switch frame 17 secured in the housing 10 by screws passing through flanges 18 and 19. Body portion 20 of the frame 17 forms a partial front wall for the housing 10.

The body portion 20 of the frame 17 has formed thereon a pair of offset areas 21 and 22 and one or more fingers or projections 23. Insulated terminal jacks 24 and 26 are mounted by means of locking nuts 27 on the offset areas 21 and 22, respectively, so that the terminals 29 and 28 respectively project rearwardly of the frame 17. Extending between contacts 28 and 29 is a common contact element, which in the preferred embodiment is a helical spring 30. Helical spring 30 is normally under tension and has spaces 25 between adjacent convolutions of the spring.

One or more switch blade carriers 31 are slideably mounted on projections 23 and held in place through cooperating detent elements to be described later. Each switch blade carrier 31 pivotally supports a flat spring metal strip 32. The number of such carriers may vary as circumstances dictate.

The parts of the switch thus far described are all metallic so that there is electrical continuity between the housing 10, frame 20, fingers or projections 23, all of the carriers 31 and the spring metal strips 32. As noted earlier, spring contact element 30 is insulatingly mounted on the frame 17 and is under tension between contacts 28 and 29 of the jacks 26 and 24, respectively. Consequently an electrical circuit is completed when one of the switch blade elements 59 moves into contact with the contact element 30.

Each switch blade carrier 31 comprises side plates 38 and 39 (see FIGS. 5 and 8) joined together by a hollow channel 40. The distance between the side plates 38 and 39 is slightly greater than the thickness of the switch blade 32 to allow free movement thereof. Each side plate has formed therein an aperture 41 and 42, respectively, through which passes a pivot pin 43. Pivot pin 43 has a post 45 integral therewith and extending outwardly from side plate 39. Post 45 is slightly larger in diameter than pivot pin 43 and forms a shoulder (not shown) which abuts side plate 39. The end of the pivot pin extending through side plate 38 is upset as at 46 forming a rivet holding the side plates 38 and 39 in fixed position. Pivot pin 43 also passes through a hole 47 in the upper end of the spring metal strip 32 so that the strip may pivot about this point.

A switch biasing spring 48 is mounted on post 45. Short arm 51 of spring 48 has a hook portion 52 which passes through apertures in side plates 38 and 39. The long arm 53 of biasing spring 48 extends downwardly therefrom and is hooked about spring strip 32 below pivot pin 43.

Spring tab 56 depending from channel 40 is impressed with a dimple 57 which cooperates with a groove or indentation 58 on the inside surface of body portion 20 below below each projection 23. Dimple 57 forms with grooves 58 cooperating detent devices which hold the carriers 31 on the projections 23. In addition, these detent elements assure good electrical connection between the carriers and the frame.

The upper end 59 of spring strip 32 forms the switch blade element of the strip with the spring contact 30. This end may be silver plated to minimize corrosion. Contact 30 may be formed of a Phosphor bronze spring which is highly resilient and has good electrical conductivity.

Referring to FIGS. 4, 6 and 7, when an article or object is moving along a path denoted by the arrow X and strikes one or more of the spring strips the arm or arms 35 are pivoted about pivot pin 46 to move the tip 59 into engagement with the contact 30. Inserted as the convolutions of the helical spring 30 have a pitch slightly
larger than the thickness of switch blade 32, the blade will normally pass between the convolutions to form a wiping contact with at least one of the convolutions. However, should the blade be located so that the edge thereof strikes one of the turns of the convolutions on the outer periphery of the spring, the spring will move longitudinally in one direction or the other depending upon which side of that particular convolution the edge of the contact strikes so that the contact will normally pass between the convolutions and make wiping contact with either one or adjacent or both adjacent convolutions.

In order to present a broad surface for engagement of the spring strip by an object moving along the path X, spring strips 32 may be twisted intermediate its ends at 33 dividing the strip 32 into two sections, one of the sections forming the switch blade contact element 59 while the other section forms the actuating arm 35. This construction is shown in FIG. 5a.

The top side 13 of housing 10 has integral therewith a projecting flange 61 which overlies all of the switch elements so that falling debris will not enter in and interfere with the operation of the switch. For similar reasons the upper edges of carrier side plates 39 and 40 are tapered as at 62 and 63 so that falling debris will slide therefrom.

While we have described and illustrated a preferred embodiment of our invention, we wish it to be understood that we do not intend to be restricted solely thereto but that we do intend to cover all modifications thereof which would appear to one skilled in the art and which come within the spirit and scope of our invention.

We claim:

1. An electrical switch comprising a frame, a fixed resilient helical spring contact element, means for mounting said helical spring contact element on said frame in tension so as to have uniform spaces between successive convolutions thereof, a plurality of switch blade contact elements, means for independently mounting each of said switch blade contact elements on said frame for independent pivotal movement relative thereto between a first position and a second position defining different electrical conditions with respect to said helical spring contact element, spring means for biasing each of said switch blade contact elements to one of said positions, each of said switch blade contact elements having an arm integral therewith for moving said switch blade contact elements from said first position in opposition to said biasing spring means to said second position, and each of said switch blade contact elements having a thickness less than the spacing between successive convolutions of said helical spring contact element so that each of said switch blade contact elements make a wiping contact therewith.

2. An electrical switch comprising a frame, a carrier, a contact blade, means pivotally mounting said contact blade on said carrier, spring means for said carrier biasing said contact blade to one position on said carrier, means for mounting said carrier on said frame, a helical spring contact element forming with the contact blade an electrical switch, means insulatingly mounting said helical spring on said frame, and means for moving said contact blade against the action of said biasing spring means to change the electrical relationship of said contact blade and said helical spring contact element.

3. An electrical switch as defined in claim 2 further including cooperating detent elements on said frame and on said carrier for releasably securing said carrier on said frame.

4. An electrical switch as defined in claim 2 wherein said contact blade has a thickness which is less than the spacing between successive convolutions of said helical spring whereby said blade makes wiping contact with a convolution of said helical spring.

5. An electrical switch comprising a frame member, a carrier member, a switch blade contact element, means pivotally mounting said switch blade contact element on the carrier member, means for mounting said carrier member on said frame member comprising a finger on one of the members, and a channel on the other of said members slideably fitted over said finger, a helical spring forming with said switch blade contact element an electrical switch and means insulatingly mounting said helical spring between spaced points on said frame member.

6. An electrical switch as defined in claim 5 including cooperating detent elements on said carrier member and said frame member for releasably securing the carrier member on said frame member.

7. An electrical switch as defined in claim 5 further including a spring tab on one of said members engageable with the other of said members to frictionally hold said members in assembled relation.

8. An electrical switch as defined in claim 7 including a detent element formed on said spring tab on said one member, a complementary detent element formed on the other of said members, said detent elements being effective to frictionally secure said carrier member on said frame member.

9. An electrical switch comprising a frame member, a carrier member, a first contact element, means pivotally mounting said contact element on said carrier member, mounting means for mounting said carrier member on said frame member, said mounting means comprising a finger on one of the members and a channel on the other of said members slideably fitted over said finger, and a second contact element, means insulatingly mounting said second contact element on said frame member opposite a portion of said first contact element whereby pivotable movement of said first contact element about said means pivotally mounting same on said carrier member moves said first contact element into electrical contact with said second contact element.

10. An electrical switch as defined in claim 9 wherein there are a plurality of said mounting means on said frame member and a plurality of said carrier members, each carrier member and its associated contact elements forming electrical switches with said contact element on said frame member.

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