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2,966,570

SLIDE SWITCH

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FIG. 1

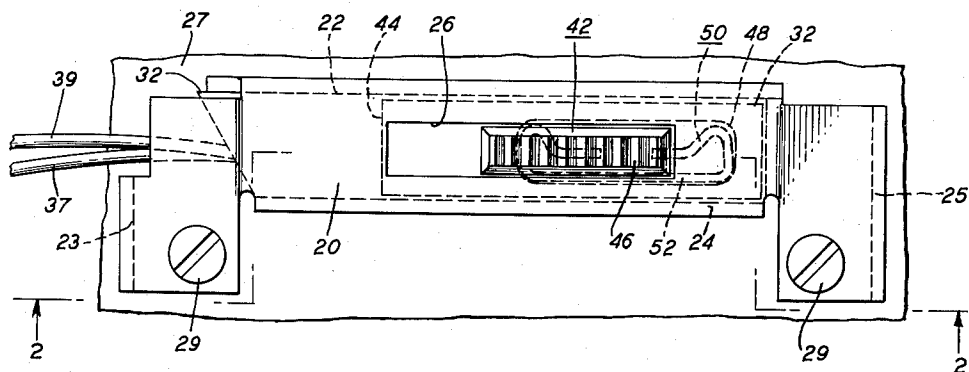


FIG. 2

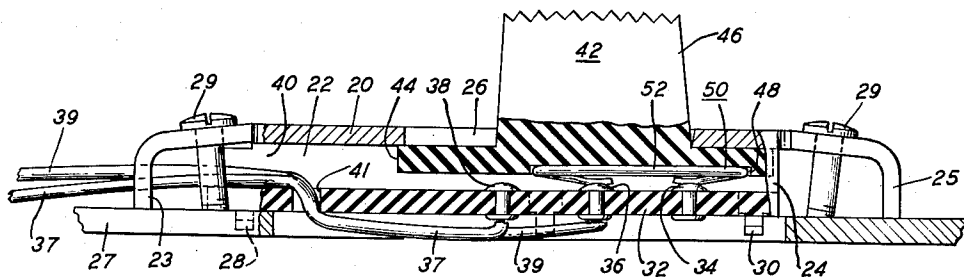
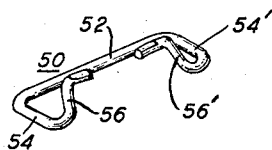


FIG. 3



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1

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SLIDE SWITCH

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6 Claims. (Cl. 200-164)

This invention relates to electric switches and, more particularly, to slide switches as shown, for example, in United States Patent No. 2,261,419 to O. A. Shann, issued November 4, 1941.

The design of miniature electronic assemblies requires that the subassemblies therein, such as keys, jacks, and switches, be of small physical size and yet have reliable and excellent operation. In slide switches, one of the many difficulties in accomplishing such a design standard is providing a strong structural arrangement which is physically small and suitable for automatic manufacture. Another difficulty is providing fixed and movable contacts which have adequate contact pressure therebetween for all variations in dimensions of the structural arrangement as a result of automatic manufacture.

An object of the present invention is an improved slide switch for miniature electronic devices.

Another object of the present invention is a slide switch of small physical size having a movable contact adapted for deflection larger than that associated with the elastic limit of the contacts.

A more specific object of the invention is a movable contact member of a slide switch suitable for automatic manufacture and which does not change shape during stock piling.

A feature of the present invention is a switch including a frame having a slotted mounting plate, an actuator including a button portion, a body portion having contacts attached thereto and an insulating plate having a plurality of contact members positioned therein, the plate being firmly held against the frame to form a guideway therebetween, the body portion of the actuator being in the guideway and the button portion extending through the slotted mounting plate.

Another feature of the present invention is a slide switch including fixed contacts and a movable contact, which employs plural types of stresses for deflection purposes in engaging the fixed contacts.

A more specific feature of the invention is a contact member for engaging the fixed contacts of a switch, the contact member being shaped into a base section, a cantilever section, and a torsion section, the cantilever section being biased against the fixed contacts in accordance with the deflection of the cantilever section and the twisting of the torsion section.

In an illustrative embodiment, the slide switch consists of a frame including a slotted mounting plate, an insulating plate having a plurality of contact members positioned therein and an actuator having a body portion and a button portion. The insulating plate is held firmly against the frame by suitable means to form a guideway therebetween. The body portion of said actuator is movable in the guideway and the button portion thereof extends through the slotted mounting plate. The body portion includes a recess therein to accommodate a contact member which is of wire spring stock and shaped into a base section and a cantilever section in series with a torsion section. The outer end of the cantilever section is adapted to engage the contacts in the insulating plate and is biased against the contact members in accordance with the deflection of the cantilever section and the twisting of the torsion section.

Other objects and features of the present invention will be more fully apprehended from the following de-

2

tailed specification taken in conjunction with the appended drawing in which:

Fig. 1 is a plan view of the slide switch of the present invention;

Fig. 2 is a cross-sectional view of Fig. 1 along the line 2-2'; and

Fig. 3 is a perspective view of a contact member included in the switch shown in Figs. 1 and 2.

Referring now to Fig. 1, a frame 20 includes side flanges 22, 23, 24 and 25 and a slotted opening 26. The frame is constructed of thin gauge sheet metal suitable for automatic manufacture by single stroke forming. The side flanges provide rigidity for the frame even though thin gauge metal is employed in the structure. For purposes of illustration only, the frame is shown secured to a base plate 27 by means of fasteners 29.

Along each flange, as shown in Fig. 2, a series of crimp tabs 28 and 30 provide a means of retaining an insulating plate 32 firmly against the frame. In being held firmly against the flange, a thin insulating plate may be employed in the switch without likelihood of excessive bending or warpage.

The insulating plate includes tubular rivets 34, 36 and 38 which serve as fixed contact elements of the switch. The rivets provide economy in the manufacture of the switch since they are made by automatic machinery and are easily installed in the plate. Connected to the rivets are skinned wires 37 and 39 which pass through an opening 41 in the insulating plate, the opening serving as a strain relieving means for the skinned wires. Several means are available for attaching the skinned wires to the rivets such as soldering or welding, and for purposes of the present application, each wire is shown as being soldered into the cup of a rivet.

The space between the insulating plate and the flange is designated as a guideway 40, and an actuator 42 of insulating material having a body portion 44 slides therein. A recess 43 in the body portion includes a contact member 50 which is secured thereto by cement or other adhesive. The actuator also includes a button portion 46 which extends through the slotted opening 26 of the frame. The button is serrated on the top surface thereof for ease in operation.

The contact member 50 shown in detail in Fig. 3 comprises a base section 52 having at each end thereof torsion sections 54 and 54' in series with cantilever sections 56 and 56'. The torsion sections lie in the plane of the base section but are bent normal to and in the same direction from the ends of the base section. Each cantilever section has the same configuration, but is a mirror image of the other. At the inner end, each cantilever section is bent normal to the torsion section. A short distance beyond the inner end, the cantilever sections are bent upward from the plane of the torsion section. At the outer end, the cantilever sections are flattened and bent into a plane parallel to that of the base section.

The contact member 50 is made from wire spring stock to facilitate fabrication by automatic machinery in bending and flattening the various sections. Preferably, the stock is made of beryllium copper. It has been found that tempering the members by suitable heat treatment produces a contact which resists distortion during stock piling or assembly intervals.

Although the contact member has been shown as being formed from wire spring stock, it should be understood that metal stock of other cross-section, for example, flat stock, may be employed to obtain contacts of identical configuration to that disclosed herein.

Returning to Fig. 2, the operation of the switch will be described in more detail. In the position shown, the cantilever sections engage the fixed contacts 34 and 36.

3

The contact member is stressed in the torsion section by a twisting action and deflected in the cantilever section by a bending action. When the actuator is shifted from the position shown to that where the cantilever sections begin to engage contacts 36 and 38, the design of the contact member 50 is such that the cantilever section will be deflected until the stress therein reaches a point less than the elastic limit of the section. Thereafter, as the cantilever section comes into full engagement with the fixed contacts, twisting of the torsion sections will commence to permit further deflection of the cantilever section for proper engagement with the fixed contact. The additional deflection of the cantilever sections will not cause the stress therein to exceed the elastic limits of the section. It is important that the twisting action of the torsion sections come into operation before the cantilever sections are stressed beyond the elastic limit, otherwise the contacts will not develop the necessary contact pressure for normal dimensional variations of the switch element.

For proper cooperation between the torsion and cantilever sections, applicant has found that for wire stock of .0142 gauge and .030 inch between the bottom of the recess 48 and the top of the fixed contacts 34, 36 and 38 the lengths of the cantilever section and the torsion section should have a ratio of about 1.5 to 1. For cantilever-torsion length ratios of such a value, deflections of the cantilever sections will be obtained which will permit substantially uniform contact pressures over a wide range of cumulative manufacturing tolerances in the spacing between the actuator 42 and the insulating plate 32.

The space between the cantilever sections enables a pushbutton contact or detent to be added to the switch. Contacts can be placed in a plurality of recesses which, of course, make the slide wider. As consequence, a slide switch of small volume and durable construction can be manufactured to provide various combinations of switching action for miniature electronic assemblies.

It can be appreciated that the above-described slide switch is merely illustrative of the principles of the present invention. Numerous other arrangements and modifications thereof may be devised by those skilled in the art without departing from the spirit and the scope of the present invention.

What is claimed is:

1. A slide switch comprising a frame including a slotted mounting plate, an insulating plate having a plurality of fixed contact members positioned therein, tabs attached to said frame for holding said insulating plate against said frame to form a guideway between the insulating and mounting plates, an actuator including a body portion and a button portion, said button portion extending through said slot in the mounting plate, said body portion movable in said guideway and including a recess in the side thereof opposite the fixed contact members, and at least one contact member within said recess, said contact member being shaped into a base section and a cantilever section in series with a torsion section, the outer end of the cantilever section adapted to be deflected to engage the fixed contacts of the insulating plate, said outer end being biased against a fixed contact member in accordance with the deflection of the cantilever section and the rotation of the torsion section.

2. A slide switch comprising a frame including a slotted mounting plate, an insulating plate having a plurality of tubular rivets embedded therein as fixed contact members, at least two fixed contact members being connected to circuit wires, said insulating plate including strain relieving means for said circuit wires, means for holding said insulating plate against said frame to form a guideway between said insulating and mounting plates, an actuator including a body portion and a button portion, said button portion extending through said slot in the mounting plate, said body portion movable in said guideway and including a recess in the side thereof op-

4

posite the fixed contact members, and at least one contact member within said recess, said contact member being of wire spring stock and shaped into a base section and a cantilever section in series with a torsion section, the outer end of the cantilever section adapted to be deflected to engage the fixed contacts, said outer end being biased against a fixed contact member in accordance with the deflection of the cantilever section and the rotation of the torsion section.

3. A slide switch comprising a frame including a slotted mounting plate, an insulating plate having a plurality of tubular rivets embedded therein as fixed contact members, at least two fixed contact members being connected to circuit wires, said insulating plate including strain relieving means for said circuit wires, means for holding said insulating plate against said frame to form a guideway between said insulating and mounting plates, an actuator including a body portion and a button portion, said button portion extending through said slot in the mounting plate, said body portion movable in said guideway and including a recess in the side thereof opposite the fixed contact members, and at least one contact member within said recess, said contact member being of wire spring stock and shaped into a base section and a cantilever section in series with a torsion section, the outer end of the cantilever section adapted to be deflected to engage the fixed contacts, said outer end being biased against a contact member in accordance with the deflection of the cantilever section and the rotation of the torsion section, the lengths of the torsion and cantilever sections being selected to cause rotation of the torsion section before the elastic limit of the cantilever section is reached.

4. A slide switch comprising a frame including side flanges, tabs and a slotted mounting plate, an insulating plate having a plurality of tubular rivets embedded therein as fixed contacts, at least two fixed contact members being connected to circuit wires, said insulating plate including strain relieving means for said circuit wires, said tabs holding said insulating plate against said frame to form a guideway between said insulating and mounting plates, an actuator including a body portion and a button portion, said button portion extending through said slot in the mounting plate, said body portion movable in said guideway and including a recess in the side thereof opposite the fixed contact members, and at least one contact member within said recess, said contact member being of wire spring stock and shaped into a base section and a cantilever section in series with a torsion section, the outer end of the cantilever section adapted to be deflected to engage the fixed contacts, said outer end being biased against a contact member in accordance with the deflection of the cantilever section and the rotation of the torsion section, the lengths of the torsion and cantilever sections being selected to cause rotation of the torsion section before the elastic limit of the cantilever section is reached.

5. A slide switch comprising a pair of fixed contacts, and a sliding member slidably mounted adjacent said fixed contacts, said sliding member embodying electrically conductive bridging means positioned so as to bridge said fixed contacts when the sliding member is in a first position but not to bridge the fixed contacts when the sliding member is in a second position, said bridging means being shaped into a base section and a cantilever section in series with a torsion section.

6. A slide switch comprising at least one fixed contact and a sliding member slidably mounted adjacent said at least one fixed contact, said sliding member embodying a contact member, said contact member being shaped into a base section and a cantilever section in series with a torsion section.

References Cited in the file of this patent

UNITED STATES PATENTS

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