

PATENT SPECIFICATION

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(54) SLIDE SWITCH

- (71) We, PHILIPS ELECTRONIC AND ASSOCIATED INDUSTRIES LIMITED of Abacus House, 33 Gutter Lane, London, E.C.2., a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 The invention relates to a slide switch comprising a slidable contact strip provided with movable contacts mounted thereon and which is slidable in its longitudinal direction between two plates which are arranged parallel to the plane of the contact strip and which constitute walls of a housing, on which walls stationary contacts are provided which cooperate with the movable contacts, each of the movable contacts consisting of
- 15 a pair of resilient reeds which are situated on respective sides of a centre part which is adapted to serve for mounting of the movable contact on the contact strip, the said reeds constituting one integral unit of a
- 20 plate-like material with said centre part and being provided with respective contact are as near their free ends. Such a slide switch is hereinafter referred to as being of the type described.
- 30 The contact areas of the movable contacts must be pressed against the stationary contacts with an adequate pressure in order to ensure proper electrical connection. On the other hand, this pressure must not be too large because the movement of the contact slide will otherwise be impeded by friction. Because a slide switch is a mass product which is assembled in large quantities from preformed parts, the said
- 40 requirements must be satisfied in spite of unavoidable dimensional deviations. A requirement in this respect is that the movable contacts must have a flat resilience characteristic in their operating range, *i.e.* the re-
- [Price 33p]

silience must be dependent on the deformation of the spring to a small extent only.

In a known slide switch, the resilience is obtained substantially exclusively by the bending of the resilient reeds. So as to achieve the required flat resilience characteristic, these reeds must be comparatively long, which opposes a further requirement which must often be satisfied by slide switches, *i.e.* the dimensions must be limited in view of the space available for mounting the slide switch in, for example, a radio receiver.

The invention has for its object to provide a slide switch whose movable contacts have the desired flat resilience characteristic, whilst the dimensions of the switch can be very small. According to the invention, there is provided a slide switch of the type described wherein each of the movable contacts includes two connecting strips which extend approximately perpendicularly to the longitudinal direction of the reeds, each connecting strip connecting the non-free end of a respective reed to a respective portion of the centre part which is situated near the other reed, the length of said connecting strips exceeding their width, the centre part of each movable contact having a central opening which is slid over a respective pin projecting from the contact strip in order to mount this contact on the strip.

The connecting strips act as torsion springs, thus making a substantial contribution to the flattening of the resilience characteristic, without the dimensions of the movable contacts being significantly increased.

In order to increase the contact pressure, the resilient reeds in a preferred embodiment of the slide switch according to the invention are each provided with a constriction at the contact area. This constriction reduces the contact area.

Slide switches are generally operated by a

pushbutton by means of which a force acting in the longitudinal direction of the contact strip can be exerted on the strip, with the result that the latter is slid from a first
5 to a second position. The contact strip can be locked in the second position, a reset spring being provided for returning the contact slide to the first position after the strip has been released. With this kind of slide
10 switch, the contact strip is first slid slightly beyond the second position when the pushbutton is depressed in order to ensure proper operation of the locking mechanism. When the pushbutton is released, the contact
15 strip is pressed against the lock by the reset spring, with the result that it remains in the second position. Because the dimensions of the contacts are very small in the direction of movement of the contact strip in the slide
20 switch according to the invention, it may occur that, when the contact strip is slid beyond the second position, the contact areas of the movable contacts are slid beyond the stationary contacts. As a result, an electrical
25 connection would first be established which would subsequently be broken and then be re-established. This is often undesirable, and so as to prevent this phenomenon, a slide switch of this type is preferably
30 characterized in that in the movement direction of the contact strip the dimension of the stationary contacts are extended at areas where they contact the movable contacts when the contact slide is in the second position.
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An embodiment of the invention will be described in detail, by way of example, with reference to the accompanying drawing, of which:—
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Figure 1 is a plan view of the interior of a slide switch according to the invention.

Figure 2 is a side elevation at an enlarged scale of a part of a contact slide of the slide
45 switch shown in Figure 1.

Figure 3a is a side elevation of a movable contact for connection to the contact slide shown in Figure 2.

Figure 3b is a sectional view along the line
50 BB of the movable contact shown in Figure 3a, and

Figure 4 is a side elevation of a partly broken open part of a housing for the slide switch of Figure 1.

55 The slide switch shown in Figure 1 comprises a housing 1, the walls of which are formed by two parallel plates 3 which are provided with stationary contacts 4, a contact slide strip 5 which is provided with
60 movable contacts 6 arranged between the said plates. The contact slide 5 can be slid in its longitudinal direction from a first position (the position shown in Figure 1) to a second position (not shown) in which the
65 contact slide has been displaced to the left

with respect to the situation shown in Figure 1. The displacement can be effected by depression a pushbutton 7 which is connected to the contact slide 5 by way of a button
70 rod 9. A reset spring 11 serves to ensure that the contact slide 5 returns to the first position when the pushbutton is released. The returning of the slide can be prevented by means of a locking mechanism which
85 locks the contact slide 5 in the second position. Various embodiments of locking mechanisms of this kind are known. One of these embodiments is diagrammatically shown in Figure 1.

In this embodiment the switch is slid into 80 respective cut-outs in the side walls of a trough-like connecting member 13, the longitudinal direction of which is perpendicular to the longitudinal direction of the switch. Arranged on the bottom of the
75 connecting member 13 is a button lock strip 15 which is slidable in its longitudinal direction (denoted partly by broken lines). A pawl 19, associated with the button lock
15, projects through an opening 17 in the
95 bottom of the housing. When the pushbutton 7 is depressed, a cam 21 which is formed on the slide 5 abuts against the pawl 19, so that the button lock 15 is moved in the direction of the arrow 23. After the
90 cam 21 has passed the pawl 19, the button lock 15 slides back, under the influence of a spring (not shown), against the direction of the arrow 23, so that the cam 21 comes to rest against the pawl 19 when the push-
100 button 7 is released, thus preventing the returning of the slide 5 to the first position. Unlocking takes place only when the button lock is again displaced over a sufficiently
105 long distance in the direction of the arrow 23, for example, by depression of the pushbutton of a second switch (not shown) which is connected in the same manner to the connecting member 13.
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Each of the movable contacts 6 (see also Figures 3a and b) comprises a pair of resilient reeds 25 which are arranged on respective sides of a centre part 27 provided with a central opening 29 which serves for
115 mounting the contact on the contact slide 5. To this end, the contact slide 5, having a respective chamber 30 (see Figure 2) for each movable contact 6, is provided with a
120 pin 31 in the centre of each of these chambers. The circumference of the central opening 29 corresponds substantially to that of the pin 31 except that a number
125 (two in the case shown) of inwardly projecting teeth 33 are provided on the circumference of the opening. The material of the contact 6 (for example, phosphor bronze) is substantially harder than the material of the contact slide 5 (synthetic resin), so that the teeth 33 penetrate into
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the pin 31 when the contact 6 is pressed on the contact slide. The contact 6 is thus prevented from coming loose from the contact slide 5, without an additional operation being required.

One end of each of the reeds 25 is connected, *via* a connecting strip 35, to an extension 37 of the centre part 27 which, in order to increase the length of the connecting strip, adjoins the half of this centre part which is situated near the other reed. Thus, with very small dimensions of the contacts, the length of the connecting strip 35 is larger than its width, so that the connecting strip can act as a torsion spring. Each of the reeds 25 furthermore comprises a contact area 41 which, after the mounting of the contact slide 5 in the housing, abuts against a stationary contact 4. In order to reduce the surface of this contact area, the reed 25 is provided with a constriction at the contact area. The contact pressure is thus increased. The contact pressure is delivered partly by elastic twisting of the connecting strip 35, and partly by the elastic bending of the reed 25. To this end the reed 25 is so far bent out of the plane of the centre part 27 (see Figure 3b) that it is bent slightly back again when the contact slide 5 is placed in the housing 1. In order to ensure that only the contact area 41 contacts the wall 3 of the housing 1, the free end 43 of the reed 25 is bent backwards in the direction of the centre part 27. The contact slide 5 is provided with openings 45 in which this free end is movable. The complete movable contact 6 can be formed from plate-like material by a punching operation.

For the proper operation of a locking mechanism of the kind set forth, it is desirable that the contact slide 5 is slid slightly beyond the second position when the push-button 7 is depressed. This is necessary to ensure that the cam 21 indeed passes the pawl 19. However, because the dimensions of the described movable contacts may be very small as a result of the steps taken according to the invention, so that the stationary contacts 4 may also be very small, the contact area 41 is liable to be pushed slightly beyond the stationary contact 4 during the depression of the pushbutton 7, so that an already established connection is temporarily broken again. So as to prevent this phenomenon, the dimensions of the stationary contacts 4 are extended at the areas 47 where they contact the movable contact 6 in the movement direction of the contact slide 5. This is clearly illustrated in Figure 4, which is a side elevation of a part of the housing 1 with a partly broken away sidewall 3, without the contact slide

5. The stationary contacts 4 consist of a metal coating on the synthetic resin wall 3. They are connected on the one side to soldering pins 49 which may be used, for example, for soldering the switch to a printed circuit board, and on the other side to hook-like soldering lugs 51 for the connection of connecting wires. Other connecting means are obviously also feasible.

WHAT WE CLAIM IS:—

1. A slide switch comprising a slidable contact strip provided with movable contacts mounted thereon and which is slidable in its longitudinal direction between two plates which are arranged parallel to the plane of the contact strip and which constitute walls of a housing, on which walls stationary contacts are provided which co-operate with the movable contacts, each of the movable contacts consisting of a pair of resilient reeds which are situated on respective sides of a centre part which is adapted to serve for mounting the movable contact on the contact strip, the said reeds constituting one integral unit of a plate-like material with said centre part and being provided with respective contact areas near their free ends, wherein each of the movable contacts includes two connecting strips which extend approximately perpendicularly to the longitudinal direction of the reeds, each connecting strip connecting the non-free end of a respective reed to a respective portion of the centre which is situated near the other reed, the length of said connecting strips exceeding their width, the centre part of each movable contact having a central opening which is slid over a respective pin projecting from the contact strip in order to mount this contact on the strip.

2. A slide switch as claimed in Claim 1, wherein the reeds are each provided with a constriction at the contact area.

3. A slide switch as claimed in Claim 1 or 2, wherein at least one inwardly projecting tooth which penetrates into the pin is provided on the circumference of said central opening.

4. A slide switch as claimed in any of the preceding Claims, in which the contact strip can be slid from a first to a second position by a force which acts in its longitudinal direction, locking means being provided to lock the contact strip in said second position, reset means being provided for returning the strip to its first position after unlocking, wherein in the movement direction of the contact strip, the dimensions of the stationary contacts are extended at areas where they contact the movable contacts



the pin 31 when the contact 6 is pressed on the contact slide. The contact 6 is thus prevented from coming loose from the contact slide 5, without an additional operation being required.

One end of each of the reeds 25 is connected, *via* a connecting strip 35, to an extension 37 of the centre part 27 which, in order to increase the length of the connecting strip, adjoins the half of this centre part which is situated near the other reed. Thus, with very small dimensions of the contacts, the length of the connecting strip 35 is larger than its width, so that the connecting strip can act as a torsion spring. Each of the reeds 25 furthermore comprises a contact area 41 which, after the mounting of the contact slide 5 in the housing, abuts against a stationary contact 4. In order to reduce the surface of this contact area, the reed 25 is provided with a constriction at the contact area. The contact pressure is thus increased. The contact pressure is delivered partly by elastic twisting of the connecting strip 35, and partly by the elastic bending of the reed 25. To this end the reed 25 is so far bent out of the plane of the centre part 27 (see Figure 3b) that it is bent slightly back again when the contact slide 5 is placed in the housing 1. In order to ensure that only the contact area 41 contacts the wall 3 of the housing 1, the free end 43 of the reed 25 is bent backwards in the direction of the centre part 27. The contact slide 5 is provided with openings 45 in which this free end is movable. The complete movable contact 6 can be formed from plate-like material by a punching operation.

For the proper operation of a locking mechanism of the kind set forth, it is desirable that the contact slide 5 is slid slightly beyond the second position when the pushbutton 7 is depressed. This is necessary to ensure that the cam 21 indeed passes the pawl 19. However, because the dimensions of the described movable contacts may be very small as a result of the steps taken according to the invention, so that the stationary contacts 4 may also be very small, the contact area 41 is liable to be pushed slightly beyond the stationary contact 4 during the depression of the pushbutton 7, so that an already established connection is temporarily broken again. So as to prevent this phenomenon, the dimensions of the stationary contacts 4 are extended at the areas 47 where they contact the movable contact 6 in the movement direction of the contact slide 5. This is clearly illustrated in Figure 4, which is a side elevation of a part of the housing 1 with a partly broken away sidewall 3, without the contact slide

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WHAT WE CLAIM IS:--

1. A slide switch comprising a slidable contact strip provided with movable contacts mounted thereon and which is slidable in its longitudinal direction between two plates which are arranged parallel to the plane of the contact strip and which constitute walls of a housing, on which walls stationary contacts are provided which co-operate with the movable contacts, each of the movable contacts consisting of a pair of resilient reeds which are situated on respective sides of a centre part which is adapted to serve for mounting the movable contact on the contact strip, the said reeds constituting one integral unit of a plate-like material with said centre part and being provided with respective contact areas near their free ends, wherein each of the movable contacts includes two connecting strips which extend approximately perpendicularly to the longitudinal direction of the reeds, each connecting strip connecting the non-free end of a respective reed to a respective portion the centre which is situated near the other reed, the length of said connecting strips exceeding their width, the centre part of each movable contact having a central opening which is slid over a respective pin projecting from the contact strip in order to mount this contact on the strip.

2. A slide switch as claimed in Claim 1, wherein the reeds are each provided with a constriction at the contact area.

3. A slide switch as claimed in Claim 1 or 2, wherein at least one inwardly projecting tooth which penetrates into the pin is provided on the circumference of said central opening.

4. A slide switch as claimed in any of the preceding Claims, in which the contact strip can be slid from a first to a second position by a force which acts in its longitudinal direction, locking means being provided to lock the contact strip in said second position, reset means being provided for returning the strip to its first position after unlocking, wherein in the movement direction of the contact strip, the dimensions of the stationary contacts are extended at areas where they contact the movable contacts



when the contact strip is in the second position.

5. A slide switch, substantially as herein described with reference to the accompanying diagrammatic drawing.

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