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(54) Keyswitch.

(57) A keyswitch includes an insulative substrate (5, 5′) and a conductive spring reed (1, 1′). First and second conductive paths (6 and 7, 6′ and 7′) are formed separately on the upper surface of the substrate (5, 5′). The reed (1, 1′) has an inclined long leg fixed on the first path (6, 6′), an inclined short leg positioned separately near the second path (7, 7′), and an upright stop (4, 4′) extending downward from the reed (1, 1′). The long leg, short leg, and stop (4, 4′) are all integral with the reed (1, 1′). The lower end of the stop (4, 4′) is above the lower end of the short leg. When the reed (1, 1′) is depressed, the short leg contacts the second path (7, 7′) to form a conductive path between the first and second paths (6 and 7, 6′ and 7′), and then the stop (4, 4′) contacts the substrate (5, 5′) so that the reed (1, 1′) no loner moves downward.

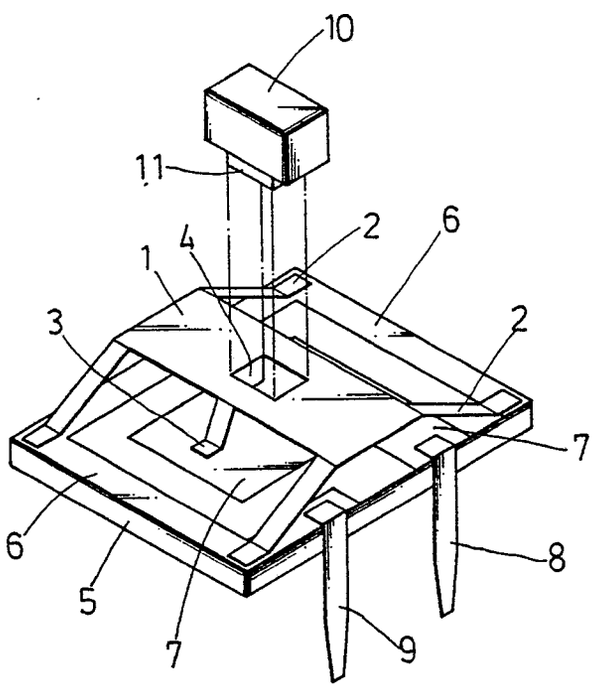

FIG. 1A

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KEYSWITCH

This invention relates to a keyswitch, and more particularly to a simple keyswitch.

Because computers have become more widely used in recent years, the quantity of the keyboards needed is has also greatly increased. Typically, the manufacturing cost of the keyswitches is about 30-40 % of the total manufacturing cost of a keyboard. The economic difficulty encountered in the computer field is that a conventional keyswitch generally has about ten elements of which about six of the elements are fixed or movable contacts. It is necessary to obtain small tolerance for these six elements. As a consequence, it is difficult and expensive to make conventional keyswitches.

It is therefore the object of this invention to provide an inexpensive keyswitch which is constructed of fewer elements.

According to this invention, a keyswitch includes an electrically insulative substrate, and an electrically conductive spring reed mounted on the substrate. The substrate has an upper surface on which electrically conductive first and second paths are separately formed. The reed has an inclined integral long leg secured at its lower end to the first path of the substrate for establishing an electrical connection therebetween, an inclined integral short leg having a lower end positioned separately above the second path of the substrate, and a vertical integral stop extending downward from the reed and having a lower end which is positioned at a predetermined level slightly higher than the lower end of the short leg.

When the reed is depressed, the short leg contacts the substrate just before the stop contacts the substrate. The reed may be despressed until the stop contacts the substrate so that the short leg makes electrical contact with the second path of the substrate, thereby completing an electrically conductive path between the first and second paths. After the reed has been depressed by an operator to contact the second path with the short leg, the operator may let go of the reed so that the reed automatically returns to its normal position, permitting the short leg to separate from the second path.

Other features and advantages of this invention will become apparent from the following detailed description of the preferred embodiments of this invention with reference to the accompanying drawings in which:

Fig. 1A is a partially exploded view of a keyswitch having a flat substrate in accordance with a first embodiment of this invention;

Fig. 1B is a top view showing the substrate of the keyswitch according to the first embodiment of this invention;

Fig. 1C is a top view showing the spring reed of the keyswitch according to the first embodiment of this invention;

Fig. 1D is a side view showing the spring reed of the keyswitch according to the first embodiment of this invention;

Fig. 2A is a side view of a keyswitch having a substantially vertical substrate and a generally vertical spring reed in accordance with a second embodiment of this invention;

Fig. 2B is a side view showing the substrate of the keyswitch according to the second embodiment of this invention; and

Fig. 2C is a side view showing the spring reed of the keyswitch according to the second embodiment of this invention.

Referring to Figs. 1A-D, a keyswitch of this invention includes a spring reed 1 having four inclined integral long legs 2 extending from the end portions of two sides thereof, two inclined integral short legs 3 extending from the middle portions of two sides of the reed 1, and two opposed upright stops 4 extending downward from the central portion of the reed 1. Only one stop 4 can be seen from Fig. 1A.

A flat substrate 5 of electrically insulative material underlies reed 1. A generally C-shaped first conductive path 6 and a L-shaped second conductive path 7 are formed separately on the upper surface of the substrate 5 in such a manner that the first path 6 surrounds the second path 7. Two conductive terminal pins 8 and 9 are respectively welded to the second path 7 and the first path 6. The substrate 5 can be made from an ordinary printed circuit board but should preferably be made of ceramic material for providing a better adhesive result of the conductive materials forming the paths 6 and 7. The first and second paths 6 and 7 may be formed on the substrate 5 using several methods: physical-vapor-deposition, chemical-vapor- deposition, thick-film coating, or printing. Preferably, the thick-film coating method is used so that the product of the keyswitch will be durable.

The long legs 2 of reed 1 are arranged to contact the first path 6 of the substrate 5 and thus function as the fixed contacts of the keyswitch. Of course, the long legs 2 may also be fixed to the first path 6. The short legs 3 of reed 1 are normally positioned separately above the second path 7 and thus function as the movable contacts of the keyswitch. An insulative pushbutton 10 (see Fig.

1A) is adapted to the reed 1. A rectangular tongue 11 extends downward from the center of the bottom surface of the pushbutton 10 to engage with a rectangular hole formed in the center of the reed 1 for positioning the pushbutton 10 on the reed 1. When the pushbutton 10 is depressed to impel reed 1, the short legs 3 of the reed 1 contact the second path 7 of the substrate 5, and then the stops 4 of reed 1 contact the substrate 5 so that reed 1 no longer moves downward. A conductive path is therefore formed between the first and second paths 6 and 7 through reed 1.

With the stops 4 extending downward from reed 1, the downward stroke of the 1 can be appropriately controlled. When the stops 4 contact on the substrate 5, an impact sound is incurred so as to signal the operator to let go of the pushbutton 10. At the same time, the contact of the stops 4 with the substrate 5 also makes reed 1 unable to move downward. Because of the provision of the stops 4, the resilience fatigue of the short legs 3 can be diminished.

Furthermore, because the keyswitch of this invention has few elements, it is easy to manufacture it.

Referring to Figs. 2A-C, another keyswitch of this invention includes a corrugated conductive spring reed 1′ which is in a generally vertical position. A substantially vertical substrate 5′ has a thin L-shaped conductive path 6′ and a thick L-shaped conductive path 7′ both positioned in such a manner that the thin path 6′ is separated from the thick path 7′. Two terminal pins 8′ and 9′ are respectively welded to the thick and thin paths 7′ and 6′. The reed 1′ is attached at its upper end portion to the thin path 6′ of the substrate 5′ and aligned at its lower end portion with the thick path 7′ of the substrate 5′. The upper end portion of reed 1′ functions as a fixed contact. The lower end portion of reed 1′ includes a first bent portion 3′ functioning as a movable contact, and a second bent portion 4′ functioning as a stop. A pushbutton 10′ is supported by a compression spring 11′ and aligned with the lower end portion of reed 1′. When the pushbutton 10′ is depressed as shown by arrow A to contact the second bent portion 4′ as shown by arrow B, the first bent portion 4′ of the lower end portion of reed 1′ is impelled by it to contact the thick path 7 so as to form a conductive path between the thin and thick paths 6′ and 7′ through reed 1′. It is easy to understand that the first bent portion 3′ and the second bent portion 4′ of reed 1′ serve the same function and operation as the short legs 3 and the stop 4 in the embodiment of the present invention shown in Figs. 1A-D.

With this invention thus explained, it is apparent that numerous modifications and variations can be made without departing from the scope and spirit of this invention. It is therefore intended that this invention be limited only as indicated in the appended claims.

Claims

1. A keyswitch comprising:
an electrically insulative substrate (5, 5′) having an upper surface on which electrically conductive first and second paths (6 and 7, 6′ and 7′) are separately formed; and
an electrically conductive spring reed (1, 1′) having a first member (2) secured at its lower end to said first path (6, 6′) of said substrate (5, 5′) for establishing an electrical connection therebetween, a second member (3, 3′) having a lower end positioned separately above said second path (7, 7′) of said substrate (5, 5′), and a stop (4, 4′) extending downward from said reed (1, 1′) and having a lower end which is positioned at a predetermined level slightly higher than said lower end of said second member (3, 3′);
whereby, when said reed (1, 1′) is depressed, said second member (3, 3′) contacts said substrate (5, 5′) just before said stop (4, 4′) contacts said substrate (5, 5′); said reed (1, 1′) may be despressed until said stop (4, 4′) contacts said substrate (5, 5′) so that said second member (3, 3′) makes electrical contact with said second path (7, 7′) of said substrate (5, 5′), thereby completing an electrically conductive path between said first and second paths (6 and 7, 6′ and 7′); after said reed (1, 1′) has been depressed by an operator to contact said second path (7, 7′) with said second member (3, 3′), the operator may let go of said reed (1, 1′) so that said reed (1, 1′) automatically returns to its normal position, permitting said second member (3, 3′) to separate from said second path (7, 7′).

2. A keyswitch as claimed in Claim 1 wherein said first member (2) includes a plurality of inclined integral long legs, and wherein said second member (3, 3′) includes a plurality of inclined integral short legs.

3. A keyswitch as claimed in Claim 1 wherein said substrate (5, 5′) is made of ceramic material.

4. A keyswitch as claimed in Claim 3 wherein said electrically conductive first and second paths (6 and 7, 6′ and 7′) are made of thick film conductive materials coated on said substrate (5, 5′).

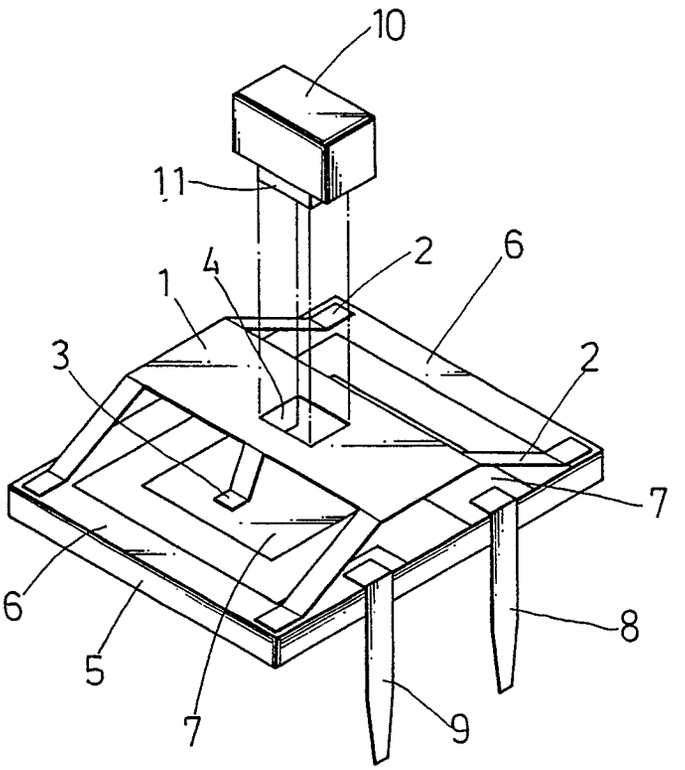

FIG. 1A

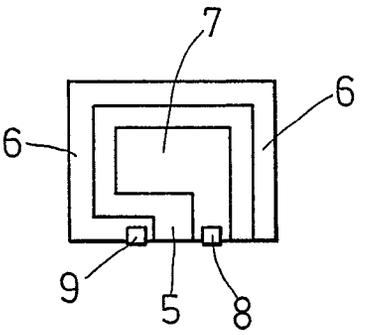

FIG.1B

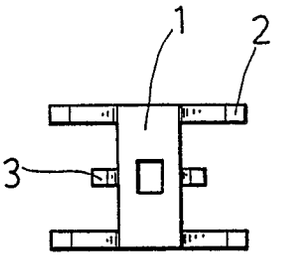

FIG.1C

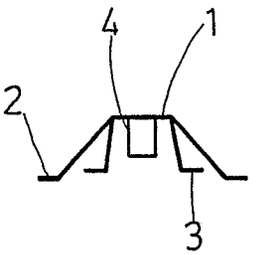

FIG.1D

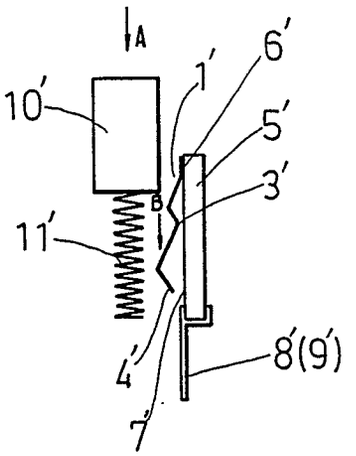

FIG.2A

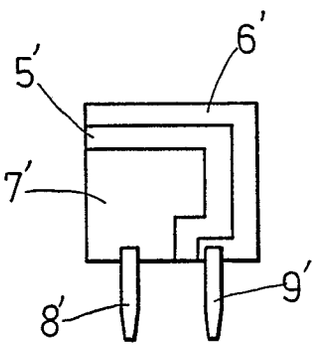

FIG.2B

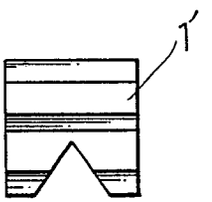

FIG.2C

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EUROPEAN SEARCH REPORT

Application Number

EP 88 30 3848

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	FR-A-2 545 976 (OFFICINE MECCANICE VIMERCATI) * page 2, line 31 - page 3, line 3; figure 2 *	1	H 01 H 13/52
X	DE-A-3 137 749 (ALPS ELECTRIC) * page 4, lines 23-28; figure 2 *	1-2	
A	DE-A-2 706 463 (ALPS ELECTRIC) * page 8, last paragraph; figures 1,4 *	1,3,4	
A	DE-U-8 323 340 (JAEGER) * page 2, lines 15-23; figure 7 *	3,4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			H 01 H 13/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	05-12-1988	DIOU J.M.

CATEGORY OF CITED DOCUMENTS

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