ABSTRACT

A matrix keyboard for use with electronic equipment having a one-piece molded base providing on its upper surface a series of hollow upstanding projections through which slidably project the actuator stems of a plurality of actuating keys. The underside of the base provides a series of switching compartments including structure for receiving in a fixed relation one to another as well as to the free end of the actuator stem, an array of current-conducting strips. One strip provides the movable switch blade, while the other strip extending in spaced transverse relation to the first strip, provides the fixed terminal contact.

6 Claims, 7 Drawing Figures
MATRIX KEYBOARD ASSEMBLY

SUMMARY OF THE INVENTION

A one-piece keyboard molded from a suitable dielectric material forming the assembly base for the matrix keyboard assembly. The upper surface of the base provides a series of upstanding hollow projections adapted to receive the actuator stem of an operating key button. The underside of the molded base provides pre-arranged wall structures as well as hollow wall abutments forming switch compartments for the matrix system of key switches. The hollow wall abutments are designed to receive snap-in clips provided by an array of current-conducting terminal strips, one terminal strip providing a series of movable switch blades, with one blade disposed within each switch compartment, while the other strip extends in a spaced transverse relation with respect to the first strip and provides a series of fixed contacts disposed in each compartment in operative relation to the movable switch blade.

The present invention provides an improved matrix keyboard construction including a novel arrangement of strip conductors forming a two-dimensional or X-Y matrix in which the entire area of the base is used to advantage, accommodating a high density of conductors and switch components and in which the making of pre-selected connections between each key switch is simplified.

GENERAL DESCRIPTION

The construction of parts and their arrangement and relation both structurally and functionally are best illustrated in the accompanying drawings showing the preferred form of invention, wherein:

FIG. 1 is a perspective view of a fully assembled matrix keyboard;
FIG. 2 is a plan view of the underside of the keyboard base partially showing the structural arrangements of the matrix conductors associated with the switch;
FIG. 3 is a fragmentary enlarged view of a portion of a switch compartment;
FIG. 4 is a perspective view of one of the conductors including the movable switch blade associated therewith;
FIG. 5 is an end view of the conductor illustrated in FIG. 4;
FIG. 6 is a perspective view of the second conductor, showing the fixed contact terminal thereon;
FIG. 7 is a fragmentary detail sectional view of one of the key button switch assemblies.

As shown in FIG. 1, the assembled matrix keyboard consists of a one-piece molded base 11 having at corresponding corners thereof mounting flanges 12 and connector-receiving bearings 13. A plurality of individual key buttons 14 are positioned above the upper surface of the base 11 and may be of a single switch construction or of a double switch construction, such as shown by the switch key button indicated at 15.

Referring to FIG. 2 and particularly the right-hand portion thereof, it is seen that the underside of the base 11 provides a series of wall members 16 extending transversely of the longitudinal length of the base member 11. These wall members 16 cooperate with a series of partial walls 17 extending perpendicularly to the walls 16 to define switch compartments 18. As will be apparent, each compartment contains a fixed terminal contact provided by one conductor and a movable switch blade provided by another conductor, the free end of which is in axial alignment with the inner end 19 of a key stem 20.

As shown in FIG. 6, the base 11 provides a series of hollow projections 21 extending upwardly from the top surface of the base 11, which provide open passages 21' therethrough, there being a hollow projection for each of the switch compartments 18. These passages 21' formed in the projections 21 slideably receive the actuator stem 20 of a key button 14.

Also molded into the base 11 and projected upwardly from the top surface thereof adjacent to each of the hollow projections 21, is a pair of hollow sockets 22 and 23, with the sockets 22 and 23 being disposed at right angles with respect to each other. Each pair of sockets 22 and 23 has open communication, through slots formed in the base 11, with a compartment 18.

In FIGS. 4 and 5 there is disclosed a continuous conductor strip 24 having integrally formed as a part thereof a curved arm 25 which has a free end 26 adapted to be in contact with the innermost end 19 of the actuator stem 20 as shown in FIG. 6. This conductor 24 provides a spring tab 27 disposed perpendicularly to the longitudinal length of the conductor. The spring tab 27 is adapted to be frictionally proj ected into the hollow socket 23, through the open slot formed in the underside of the base 11, as shown in FIG. 7. By reason of the length of the stem 20, its free end 19 will bias the free end 26 of the curved arm 25 out of its normal plane into the configuration shown in FIG. 7. This arrangement provides yieldable pressure against the key 14 and maintains it in normal inoperative position.

The second terminal 28 provides a plurality of L-shaped contact-bearing terminals 29. This second conductor 28 also provides a spring tab 30 which is adapted to be received in the hollow socket 22. However, the second conductor 28 has its body portion 31 seated upon a stud-bearing positioning post 32 so that it and its contact 29 are normally spaced from the movable contact finger 25 of the first conductor 24. When the key button is depressed upon the projection 21, the free actuator end 19 of the stem 20 thereof will spring-bias the arm 25 so that the contact 33 carried thereon will move into contact with the contact 34 carried by the fixed terminal 29, thus establishing a current-conducting surface therebetween.

It should be noted that the partial wall member 17 provides an angled end portion 35 which extends inwardly of the compartment 18 and which is adapted to lie beneath the free end 36 of the terminal 29 to assist in maintaining it in a fixed position with respect to the arm 25 of the conductor 24.

The conductors shown in FIGS. 4, 5 and 6 include terminal connectors 37 which, when the keyboard 10 is utilized with a printed circuit, would project through suitable apertures in such printed circuit so as to establish a complete circuit therewith. In the event that the keyboard is not to be used with a printed circuit, certain ends of the conductors 24 and 28 may be provided with a flange member, such as that shown at 38 in FIG. 1, to which a suitable current-conducting connector may be connected.

In some circumstances it may be desired to isolate a given switch, and in such event there is provided structure whereby this may be simply and effectively accom-
plished. To this end there is provided in each of the interior switch compartments 18 a well 39 formed in the underside of the base 11, as shown in FIG. 3. This well 39 lies beneath the conductor strip 24 immediately adjacent to a locating stud 40 projecting outwardly from the surface of the base 11 and which is journaled in an accommodating aperture 41 formed in the strip 24. The conductor 28 extends across a pocket 42 formed between the partial wall 17 and the post 32. The locating stud 43 carried by the post 32 is adapted to be projected into an aperture 44 formed in the body portion 31 of the conductor 28.

Through the use of a suitable tool, such as a punch or chisel, the portion of the conductors 24 and 28 which extends across their associated wells 39 and pockets 42, can be struck, severing the conductor strips. The struck strip will have a portion thereof folded into its respective well so as to be held thereby.

An isolated switch unit and the remaining conductor strips may by any suitable means be connected to separate current-conducting terminals. Thus, after fully assembling the keyboard, any switching arrangement may be achieved without destruction or interruption of the remaining circuitry components.

While we have illustrated and described the preferred form of construction for carrying our invention into effect, this is capable of variation and modification without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to protect by letters Patent is:

1. A matrix switch keyboard having a plurality of manually depressible switch keys each with switch-actuating key stems, wherein the improvement comprises
   a. a molded one-piece electrically non-conductive base member providing top and bottom surfaces,
   b. rows of hollow projections extending vertically from the top surface of said base member and extending therethrough and dividing said top and bottom surfaces into separate switch areas, with each hollow projection adapted to slidably receive therein a stem of a switch key,
   c. a first set of electrical conductor strips connected in parallel relation to the bottom surface of said base member with said strips providing a plurality of movable switch blades, with a blade positioned beneath each of said hollow projections,
   d. a second set of electrical conductor strips connected in parallel relation to the bottom of said base member so as to extend transversely to and in spaced relation to said first set of electrical conductor strips, with said second set of strips providing a plurality of terminal contacts, with a terminal contact positioned in the path of movement of each of said movable switch blades,
   e. holding means provided by each of said set of electrical conductor strips for securing the same on said bottom surface of said base member, and
   f. means formed in said bottom surface of said base member cooperating with said holding means for securing said sets of electrical conductor strips onto the bottom surface of said base member.

2. A matrix switch keyboard as defined by claim 1 wherein said means formed in said base member cooperating with the holding means provided by said conductor strips for holding the same on said base comprise hollow sockets formed in the bottom surface of said base, with said sockets disposed at right angles to each other and spaced correspondingly from said hollow projections.

3. A matrix switch keyboard as defined by claim 1 wherein said holding means formed on said conductor strips comprise spring tabs carried by said conductor strips and extending at right angles to said switch blade and said terminal ends on their respective conductor strips and frictionally held within said cooperating means formed in said base.

4. A matrix switch keyboard as defined by claim 1 wherein said bottom surface of said base provides areas of suspension for said conductor strips through which individual switch units comprising a movable switch blade of one conductor strip and a terminal end of said other conductor strip may be severed from their respective conductor strips.

5. A matrix switch keyboard as defined by claim 4 wherein said areas of suspension consist of a well and a pocket over which said conductors extend when said holding means formed thereon secure said conductors onto said base relative to each other and to their associated key stem.

6. A matrix switch keyboard as defined by claim 1 wherein said switch blade comprises a curved arm having its free end beneath and in contact with the key stem and a portion thereof biased out of its normal plane and bendable into contact with said terminal end upon depression of said key.

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