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 340/365, 172.5; 178/79; 35/5; 200/5 E

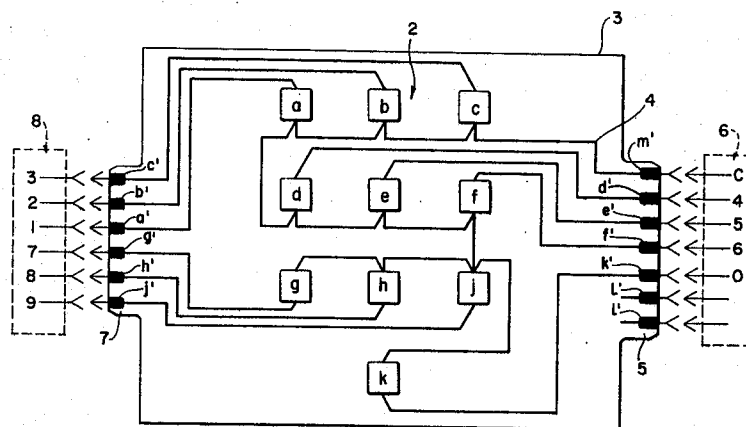
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[54] **APPARATUS FOR CONVERTING KEYBOARD FORMATS**
8 Claims, 3 Drawing Figs.

[52] U.S. Cl..... **200/5 E,**
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 [51] Int. Cl..... **H01h 9/26,**
H04m 1/26

ABSTRACT: The electrical circuitry to the switches of a keyboard are changed between a business machine format and a telephone format by the removal, inversion, and reconnection of a connector. The keys are rearranged manually to reflect the changed electrical format.



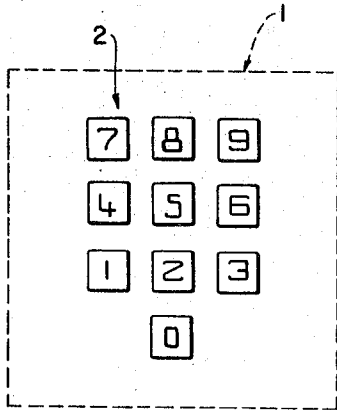


FIG. 1

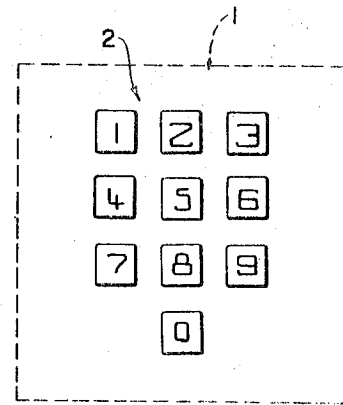


FIG. 2

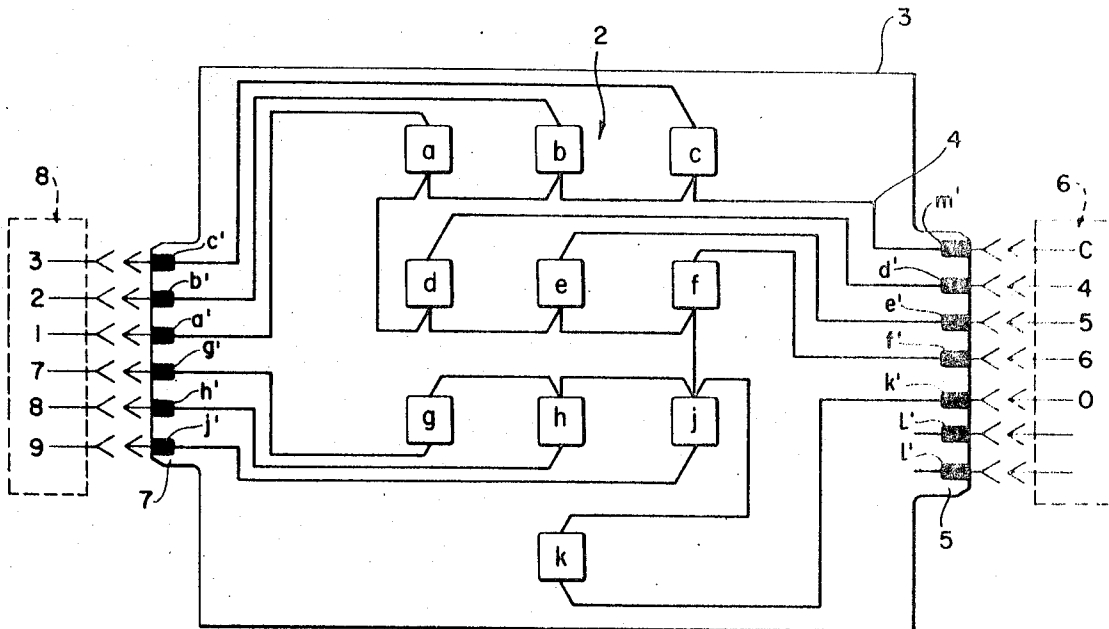


FIG. 3

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APPARATUS FOR CONVERTING KEYBOARD FORMATS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is directed to the field of manually operated keyboards of the type in which the depression of a numerically valued key by an operator is translated into electrical signals to control, or be manipulated by, associated machines. More particularly, the invention relates to apparatus which allows an operator to quickly change the formats of such a keyboard.

2. Description of the Prior Art

At present there are keyboards designed for use in business machines that are arranged in a format that differs from the dialing format used by the Bell Telephone System. Basically, the first and third rows of keyboard numerals, of the telephone dialing format are transposed to the third and first rows, respectively, in the business machine format.

A desirable feature of products having such keyboards has been found to be the ability to change from one format to the other in accordance with the customers' preference and the task to be performed.

In prior art keyboards, the electrical connections between the keyboard switches and their associated transmission lines are soldered and relatively permanent. Therefore, the presently available keyboards do not readily lend themselves to alteration by the customer between business machine format and telephone format.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an apparatus by which the format of a keyboard may be altered without time consuming rewiring of the switch terminals.

Another object of the invention is to provide apparatus whereby the operator of a keyboard may readily alter the format of the keyboard without the use of special tools or skill.

A further object of the invention is to provide an apparatus whereby the operator of a keyboard can visually determine the nature of its format.

To accomplish these objectives, the present invention provides a connector means which in one orientation connects the individual keyboard switches to output circuits in correspondence to a first format and in another orientation connects the keyboard switches to output circuits in accordance with a different format. It will be appreciated, of course, that it is also within the scope of the present invention to utilize the concept of the orientable connector for varying formats beyond two, i.e., by providing more than two orientations for the connector means.

In accordance with one preferred embodiment, the present invention provides a number of keyboard switches mounted in a predetermined array and electrically connected to printed circuits on the mounting board that terminate at edge terminals. A corresponding number of output conductors are terminated in a connector which may be attached to the edge terminals in one of two orientations. An operator of the keyboard can alter the format of the switches in the array by reversing the orientation of the connector. The keys are thereafter renumbered to reflect the altered format.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described further, by way of example, with reference to the accompanying drawings wherein:

FIG. 1 shows a keyboard in business machine format.

FIG. 2 shows a keyboard in telephone format.

FIG. 3 shows an arrangement of the printed circuit board and reversible connector according to the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

The switches of a numerical keyboard are arranged in three rows and columns in a matrix array and designated by the numbers 1-9. The switch corresponding to the number 0 is added to the center column.

FIG. 1 shows in block form the arrangement of switches 2, numbered 0-9, on a panel 1 in conventional business machine format. This format is in general use by the computer and business machine industry, and customers of such products have come to expect that all keyboards purchased for such use will conform to this format.

In the telephone industry, however, a second keyboard format is commonly used and that arrangement of switches 2, numbered 1-9 and 0, as shown in block form in FIG. 2. In telephone format, the first row of switches are numbered 1-2-3 and the third row of switches are numbered 7-8-9. In the business machine format of FIG. 1, the numerical designations of the first and third row are transposed.

Keyboards are normally manufactured as a component of systems offered for sale to, among others, the business machine or telephone industry. The practice in the past has been to manufacture the keyboard to conform with one or the other of the formats. For economy however, it has been found desirable to offer for sale a single keyboard that will fulfill the needs of either industry by allowing the customer to select the format he desires.

FIG. 3 shows in schematic form one preferred embodiment of the present invention that offers this flexibility. A printed circuit board 3 has mounted thereon the 10 switches lettered *a* to *k* in the array corresponding to the array of the formats in FIG. 1 and FIG. 2. The switches can be of the normally open, single pole, single throw variety and have two terminals.

Electrically attached to the first terminal of all the switches is a common printed circuit 4 that terminates at connector pad *m'* of edge connector 5. The second terminal of switches *d*, *e*, *f* and *k* is attached to respective printed circuits that terminate in connector pads *d'*, *e'*, *f'* and *k'*, respectively, of edge connector 5. If additional switches are provided to perform functions other than those of the keyboard disclosed herein, they are connected to additional printed circuits on board 3 that terminate in additional connector pads *L'* of connector 5. A mating multicontact, nonreversible connector 6 attached to the edge connector 5 completes the connection of the output circuits C, 4, 5, 6, 0 to their respective switch terminals. Alternatively, the output circuits could be directly soldered to their respective connector pads. The switches *d*, *e*, *f* are therefore always connected to line 4, 5, 6.

Electrically attached to the second terminals of switches *a*, *b*, *c* are respective printed circuits that terminate in connector pads *a'*, *b'*, *c'* of edge connector 7. In like manner, the second terminals of switches *g*, *h*, *j* are attached to respective printed circuits that terminate in connector pads *g'*, *h'*, *j'* of edge connector 7. A mating six-position, dual contact, connector 8 releasably attaches the output circuits numbered 3, 2, 1, 7, 8, 9 to edge connector 7.

When connector 8 is attached in the orientation depicted in FIG. 3, switches *a*, *b*, *c* are connected to output circuits numbered 1, 2, 3 respectively and switches *g*, *h*, *j* are connected to output circuits numbered 7, 8, 9, respectively. Thus the keyboard is connected to operate in accordance with the telephone format of FIG. 2.

If the connector 8 is disconnected, inverted, and reattached, switches *a*, *b*, *c*, are connected to output circuits 7, 8, 9 respectively, and switches *g*, *h*, *j*, are connected to output circuits 1, 2, 3, respectively. Thereafter, the keyboard is connected to operate with the business machine format of FIG. 1.

The connector 8 can be a dual contact, six-position connector such as is commercially sold by the Cinch Manufacturing Company. On the appropriate opposite faces thereof may be stamped the inscription "Telephone" and "Business Machine" to insure that the connector is properly oriented by the customer.

In the operation of the invention, the keyboard format is selected by the customer who attaches the connector 8 in the depicted or inverted orientation and rearranges the numbered keys to correspond with the selected format. Preferably the keys are readily removable by hand from their switch activating mechanism. An example of such a key and switch arrangement is the Honeywell, Inc., "Microswitch" Series KB reed switch.

In the manufacture of the keyboard, the electrical connections to the switch terminals may be effected by an automatic soldering machine. Thereafter, the wiring to the switch terminals need not be disturbed in changing formats.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

I claim:

1. In combination with a plurality of keys mounted in a predetermined array and which are each adapted for mechanically activating a switch output terminal, apparatus for interchanging, according to a preselected pattern, the respective first and second switch output terminals of at least first and second keys of said plurality of keys with first and second output circuits of a plurality of output circuits, said apparatus comprising:

a plurality of switches, including first and second switches corresponding to said first and second keys, located in operative relation with said plurality of keys, each of said switches having a switch output terminal actuatable by a respective key; and

orientable connector means attachable to said plurality of switch output terminals in a first orientation, for connecting said first and second output circuits to said first and second switch output terminals, respectively, and attachable to said plurality of switch output terminals in a second orientation, for connecting said first and second output circuits to said second and first switch output terminals, respectively.

2. The apparatus of claim 1 wherein said connector means comprises a multiposition, dual contact connector attached to said first and second output circuits.

3. Apparatus for changing the format of switches constituting a keyboard, said apparatus comprising:

a mounting board including a plurality of edge terminals; a plurality of keyboard switches including first and second keyboard switches, attached to said mounting board; a plurality of circuits, including first and second circuits, on said mounting board each circuit electrically connected between a keyboard switch and an edge terminal; and a plurality of electrical output conductors, including first

and second electrical output conductors, for connecting the plurality of keyboard switches to external equipment; and

orientable connector means adapted to releasably engage said plurality of edge terminals for selectively connecting said first and second electrical output conductors, in a first orientation, to the first and second edge terminals electrically connected by said first and second circuits to said first and second keyboard switches, respectively, and, in a second orientation, to said second and first edge terminals, electrically connected by said second and first circuits to said second and first keyboard switches, respectively, whereby the selective orientation of the connector means determines the format of the switches constituting the keyboard.

4. The apparatus of claim 3 wherein the connector means comprises a multiposition dual contact connector attached to said first and second electrical output conductors.

5. The apparatus of claim 3 wherein:

said keyboard switches are arranged in a matrix array on said mounting board;

said first keyboard switches correspond to a first row of the array; and

said second keyboard switches correspond to a second row of the array.

6. The apparatus of claim 5 wherein:

said matrix array of keyboard switches consists of nine switches each having a numbered key thereon;

said first and second rows consist of three switches each; and

a third row of three switches is interposed between said first and second rows.

7. The apparatus of claim 6 wherein each keyboard switch includes means for changing the numbered keys of said first and second rows to reflect the orientation of the connector means.

8. The apparatus of claim 7 wherein the first orientation of the connector means enables the keyboard to be operated with a business machine format, and the second orientation of the connector means enables the keyboard to be operated with a telephone format.

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