

[54] **FLEX SPRING CONTACT SWITCH FOR PUSH BUTTONS**

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[51] Int. Cl. **H01h 3/12**

[58] Field of Search **200/5 A, 159 R, 159 A, 200/166 BH, 166 J, 166 PC, 241, 27 S, 340**

[56] **References Cited**

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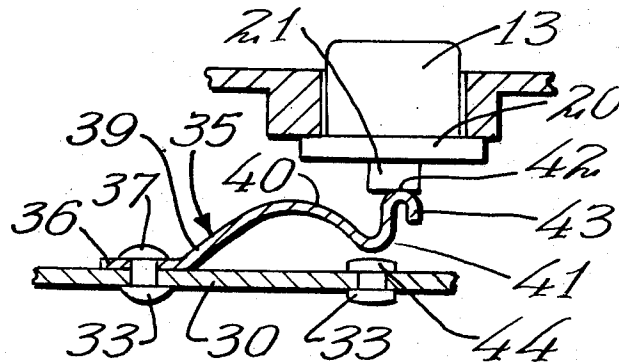
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[57] ABSTRACT

An insulation panel having a printed circuit on one surface and is provided with button actuated switch blades on its opposite surface. Each blade is connected through the panel with a portion of the printed circuit, and is opposed to a stationary contact also connected through the panel to a portion of the printed circuit. The switches are preferably actuated by buttons slidably supported above said blades and operable to engage said blades with said stationary contacts with a wiping action.

1 Claim, 5 Drawing Figures



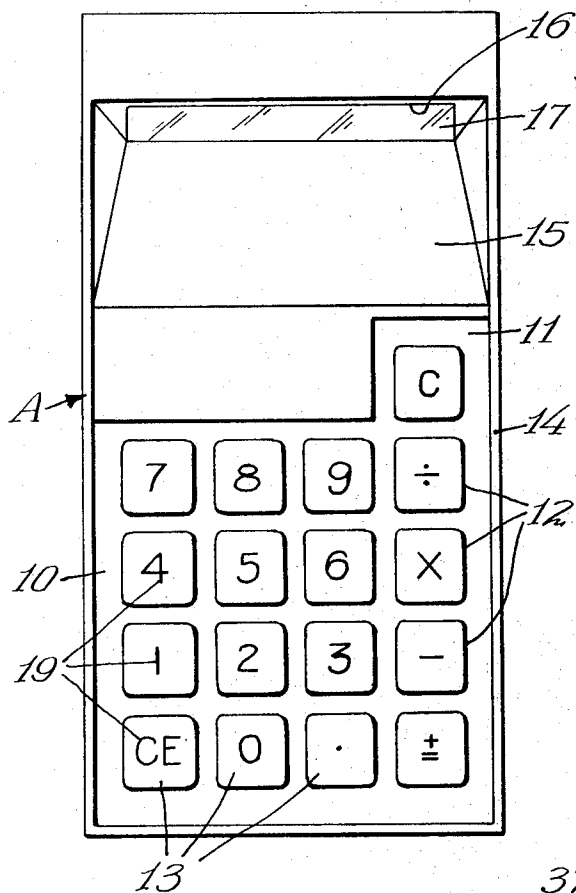


FIG. 1

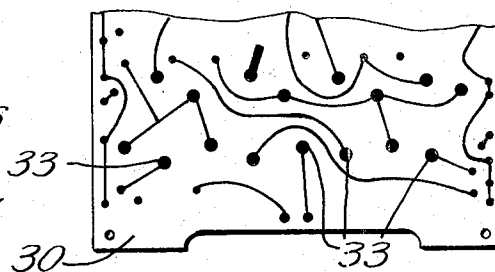


FIG. 3

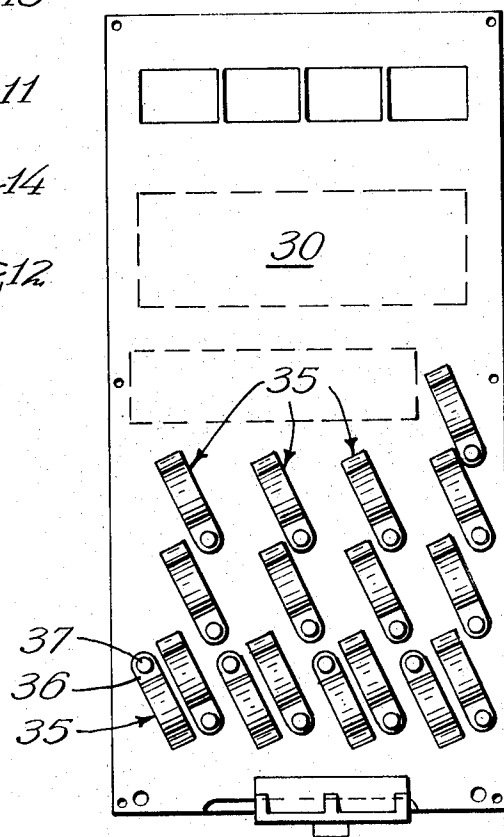


FIG. 2

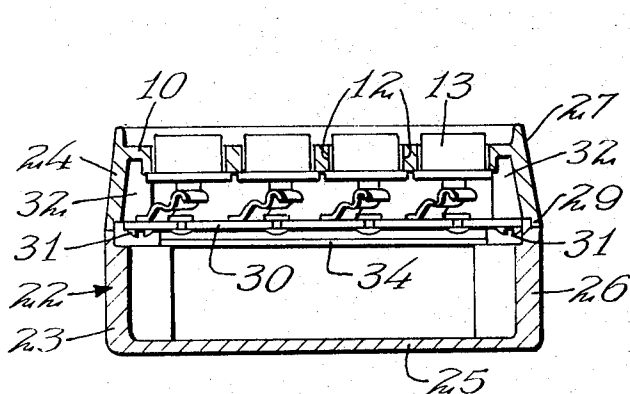


FIG. 4

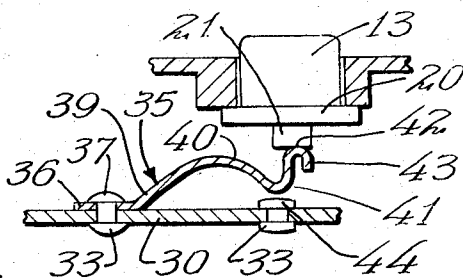


FIG. 5

FLEX SPRING CONTACT SWITCH FOR PUSH BUTTONS

This invention relates to an improvement in Flex Spring Contact Switch and deals particularly with a type of switch which can be mounted on a printed circuit panel or the like.

BACKGROUND OF THE INVENTION

During recent years the production of electronic computers has tremendously increased. These computers are electronically capable of adding, subtracting, multiplying or dividing by merely depressing actuating buttons on the surface of the computer body. These computers have become smaller and smaller in size, and are now becoming available in a size which can be readily carried in a pocket if desired.

One of the problems which has been experienced with any device of this type lies in the fact that after a period of time, the contacts which are push button actuated become coated or partially covered with a film which at times will prevent the contacts from closing the circuit. If any of the push button contacts does not function properly, the entire computation is is thrown off, and the result received is erroneous. This can cause serious problems and considerable embarrassment when the computer is being depended upon for supplying accurate results.

SUMMARY OF THE INVENTION

We have found that an extremely effective and reliable switch may result if the switch blade is so shaped as to engage the stationary contact upon depression of an actuating button, and if the contacting portion of the spring blade will wipe over the stationary contact upon slight further depression of the button. This slight wiping action maintains the contacts clean and eliminates the chance of the spring switch blade from continuously contacting one area only of the stationary contact as is usual practice.

An added feature of the present invention resides in the provision of flex spring contact switches which may be mounted directly upon one side of an insulation panel and which may be electrically connected by electrically conductive rivets or similar means to portions of a printed circuit on the opposite side of the panel. With this arrangement, the spring contacts and stationary contacts are directly connected through the panel to the printed circuit, minimizing the chance of incurring broken connections between the switches and the remainder of the circuit.

A further feature of the present invention resides in the provision of a flex spring contact switch including a blade which is anchored to the circuit board panel, and is curved to present a convex wiping surface to the stationary contact. The switch blade is extended to provide an actuating end which is curved to provide reversely curve to provide a convex surface in contact with an actuating button. When this actuating button is depressed toward the circuit board, the convex wiping surface engages the stationary contact on the circuit board. Further depression causes the convex wiping surface to slide along the surface of the stationary contact, keeping the interengaging surfaces clean.

A further feature of the present invention lies in the fact that the flex spring contacts serve the dual purpose of closing circuits of the circuit board, and also resili-

ently supporting the spring actuating buttons in circuit breaking position.

These and other objects and novel features of the invention will be more clearly and fully set forth in the following specification and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of an electronic computer showing the general arrangement of parts therein.

FIG. 2 is a top plan view of the printed circuit board.

FIG. 3 is a fragmentary bottom of the under surface of the printed circuit board.

FIG. 4 is a transverse sectional view through the computer, the electronic components being omitted to simplify the illustration.

FIG. 5 is an enlarged sectional view through one of the switches and one of the actuating buttons.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawings illustrate a portable electronic computer of the type which may be battery actuated, or may be plugged into a normal electrical outlet. In view of the fact that details of the circuit are unimportant to the structure being claimed, such details have been omitted. As indicated in FIG. 1, the top panel 10 of the computer A is provided with a flat top surface 11 having a series of apertures 12 extending therethrough to slidably support the necessary actuating buttons 13. An upwardly extending flange 14 forming the upper edges of the side walls and one end wall encircles the panel surface 11 to act as a protection for the buttons 13, the flange extending slightly above the level of the buttons 13 in their normal position.

The top panel 10 is provided with a slightly inclined panel portion 15 which slopes downwardly to a window opening 16 in which is supported a lens 17 through which the answer of the computation is visible.

As indicated in FIG. 4 of the drawings, the portion of the top panel 10 through which the button apertures 12 are provided is thickened to provide bearing portions of suitable length to maintain the buttons 13 for sliding movement. As indicated, the buttons are preferably square in horizontal section and bear suitable indicia 18 to identify the button. As indicated in FIGS. 4 and 5 of the drawings, each button is provided with a laterally projecting peripheral flange at its lower extremity. This flange 20 limits the upward movement of each button through the panel 10. Each button 13 also includes a downwardly extending projection 21 coaxial with the button, the projection engaging the flex spring contact switch associated therewith as will be later described.

As is indicated in FIG. 4 of the drawings, the housing 22 of the computer includes a bottom section 23 and a top section 24 of which the top panel 10 forms a part. The bottom section 23 includes a bottom panel 25 and rectangularly arranged side and end walls such as 26 extending upwardly therefrom. The top panel 10 is supported by downwardly and outwardly inclined side walls 27 and parallel end walls which are not shown in the drawings. The lower periphery of the upper section side walls and end walls may dovetail with the upper edges of the lower section 23 as indicated at 29.

A printed circuit board panel 30 closes the lower end of the upper section 24 and is secured thereto by

screws 31 or other suitable means extending into internally threaded bosses 32 in the upper section 24. The under surface of the panel 30 bears a printed circuit 33, a small fragment of which is shown in FIG. 3 of the drawings merely for the purpose of illustration. A second partial printed circuit board 34 may be mounted near the upper extremity of the lower section 23, for connecting and suspending various components of the circuit.

With reference now to FIG. 5 of the drawings, an enlarged section of the printed circuit board is provided diagrammatically showing one of the flex spring contact switches, together with its cooperable stationary contact and push button actuator. The spring is indicated in general by the numeral 35 and includes a flat anchoring end 36 in face contact with the panel 30 and secured thereto by a fixed contact 37 which extends through the spring, through the panel 30 and through a portion of the metal forming the printed circuit 33. From the flat anchoring end, the blade 35 extends upwardly as indicated at 39 at an acute angle to the upper surface of the panel 30. The blade 35 extends to form a curved portion 40 which passes through an area which is parallel to the surface of the panel 30 and curves back toward the panel 30. The blade is then reversely curved as indicated at 41 to provide a convex wiping surface, the reversely curved portion being of relatively short radius. The blade 35 then extends upwardly and is again reversely curved at 42 to terminate in a downturned end directed toward the panel 30. This reversely curved portion 42 of the actuator end of the switch blade forms a convex surface which is directed away from the panel 30 and engages the downwardly projecting actuator portion 21 of a corresponding push button 13.

A stationary contact 44 is preferably formed by a rivet or similar means extending through the panel 30 and electrically connected to a portion of the printed circuit 33. The upper surface of the stationary contact 44 is preferably rounded to some extent.

The shape of the switch blade 35, and its position of engagement with the push button 13 is such that the push button 13 is normally held in its elevated position by the resiliency of the switch blade. When each button such as 13 is depressed, the convex wiping surface of the reversely curved portion 41 of the blade makes contact with the stationary contact 44. Further slight depression of the push button causes the convex wiping surface in the area 41 to slide over the stationary contact 44 in a direction toward the anchored end 36 of the switch blade, creating a wiping action which

tends to maintain the contacting surfaces clean.

In accordance with the Patent Statutes, we have described the principles of construction and operation of our improvement in Flex Spring Contact Switch and while we have endeavored to set forth the best embodiment thereof, we desire to have it understood that changes may be made within the scope of the following claims without departing from the spirit of our invention.

We claim:

1. A switch for use in combination with a panel of insulating material including:

- a spring blade having an anchoring end portion in face contact with the insulating panel,
- a curved blade portion connected to said anchoring end portion at an acute angle to said panel,
- said curved blade portion curving gradually toward parallel relation to the surface of said panel and then toward the surface of the panel,
- an actuating end connected to the end of said curved blade portion along a reversely curved area of short radius providing a convex wiping surface directed toward said panel and in spaced relation thereto,
- means securing said anchoring end portion in face contact with said panel,
- a stationary contact on one surface of said panel having a rounded surface in spaced opposed relation to said spring blade,
- said actuating end of said blade extending from said convex wiping surface in a direction away from said panel and having a reversely curved extremity to provide a convex actuating surface directed away from said panel, said convex wiping surface being between said convex actuating surface and said anchoring end portion,
- a top panel in spaced parallel relation to said panel of insulating material having an aperture in opposed relation to said actuating end of said blade, and
- a button slideably supported in said aperture removably bearing against said convex actuating surface and operable, when actuated to flex said curved blade portion to cause engagement between said convex wiping surface of said blade against said stationary contact, further movement of said button acting to flex said convex wiping surface of said blade toward said anchoring end portion to create a wiping action of said convex wiping surface of said blade relative to said stationary contact.

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