

[54] **KEYBOARD SWITCH**

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[51] Int. Cl. **H01h 13/52, H01h 1/24**

[58] Field of Search **200/159 R, 159 A, 200/166 BA, 166 CT**

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Primary Examiner—J. R. Scott

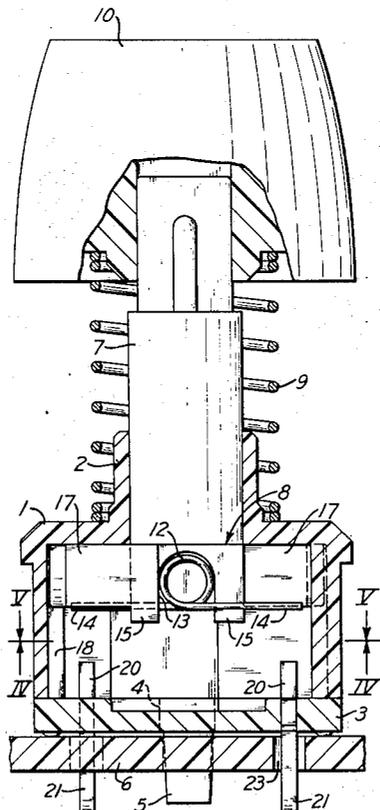
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[57] **ABSTRACT**

A switch case has a top provided with a central opening in which slides the stem of a plunger that has a foot inside the case and a cap on its upper end. A spring normally holds the plunger in its upper position with its foot adjacent the top of the case. The foot carries a bridging contact formed from a spring having free end portions extending away from the opposite sides of the foot to form movable contacts that engage stationary contacts in the case when the plunger is depressed.

6 Claims, 6 Drawing Figures



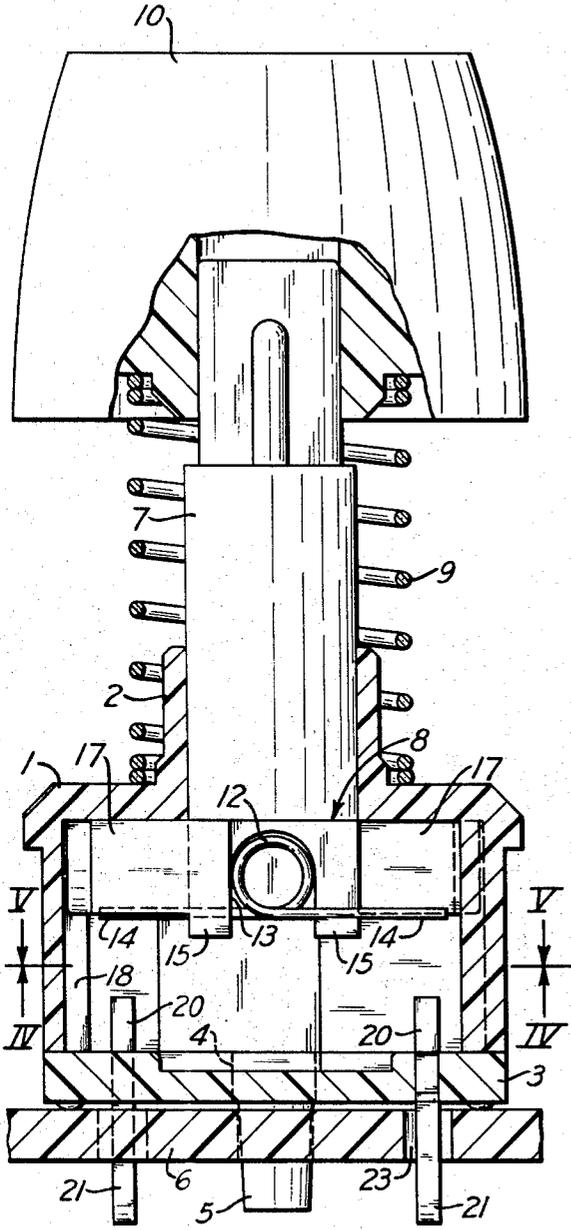


Fig. 1

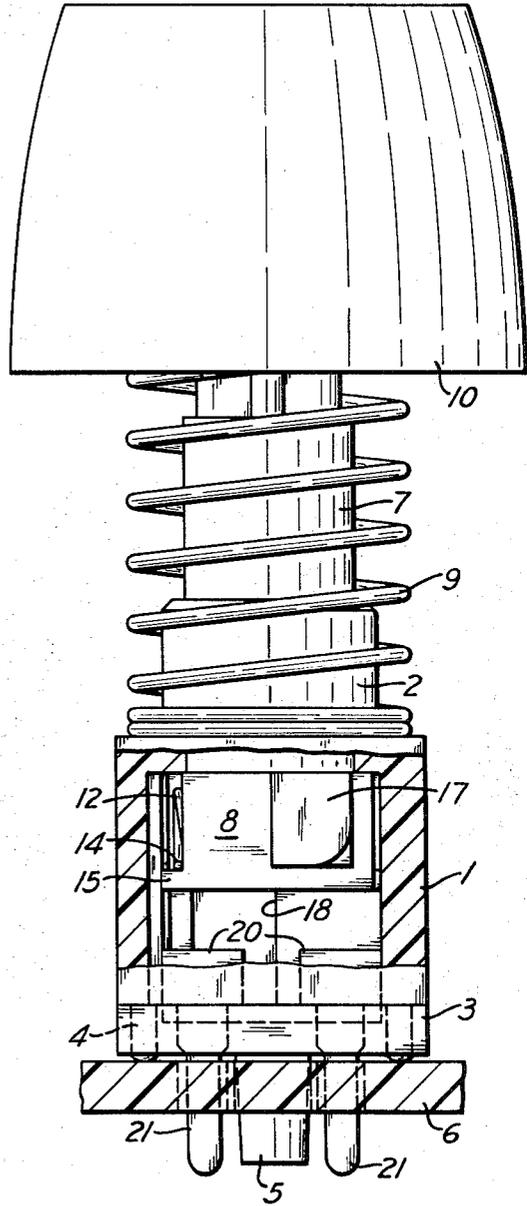


Fig. 2

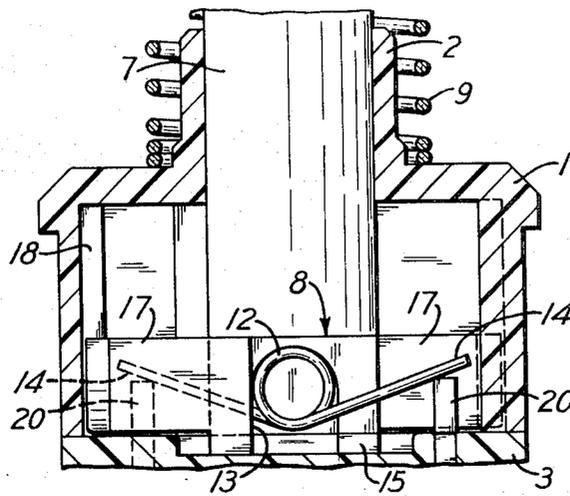


Fig. 3

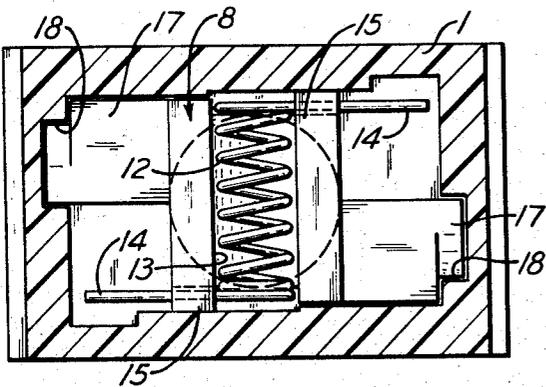


Fig. 4

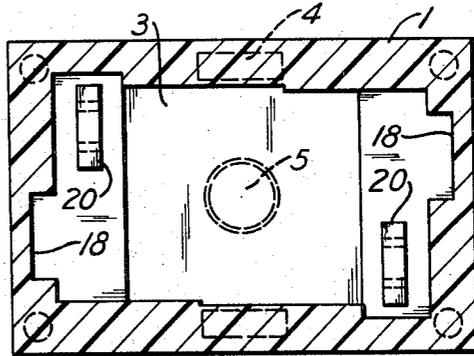


Fig. 5

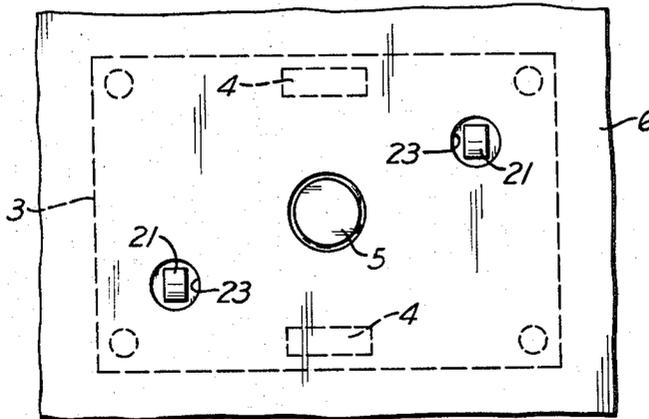


Fig. 6

KEYBOARD SWITCH

This invention relates to keyboard switches suitable for use in calculators, data processing and stock quotation equipment, cash registers, audio-visual education equipment, communication equipment, typewriters and other devices.

It is among the objects of this invention to provide a keyboard switch of simple and inexpensive construction, which has a long life and an extremely small bounce that remains uniform throughout the life of the switch.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a vertical section of the open switch;

FIG. 2 is a view at 90° to FIG. 1, with part of the switch case broken away;

FIG. 3 is a fragmentary vertical section similar to FIG. 1, but with the switch closed;

FIGS. 4 and 5 are horizontal sections taken on the lines IV—IV and V—V, respectively; and

FIG. 6 is a fragmentary bottom view of a panel supporting the switch.

Referring to FIGS. 1, 2 and 5 of the drawings, a rectangular case 1, generally molded from a plastic, has in its top wall a central vertical opening, from which a cylindrical flange 2 extends upwardly a short distance. The bottom wall 3 of the case may be attached to the rest of the case by downwardly extending lugs 4 that project through slots in the bottom wall. The lower ends of these lugs can be deformed by heat to lock the bottom wall in place. The bottom of the case is provided with a central vertical post 5 designed to have a press fit in a printed circuit board or other panel 6 on which the switch can be mounted. The post holds the switch in place.

The stem of a plunger 7 is slidably mounted in the top wall opening and flange 2 of the case and extends above the flange. The lower end of the stem inside the case is provided with a foot 8 that normally is held against the top wall of the case by means of a coil spring 9 encircling the plunger and compressed between the case and a cap 10 frictionally mounted on the upper end of the plunger and always spaced from the case.

The foot of the plunger carries a bridging contact inside the case. It is a feature of this invention that the bridging contact is a spring attached to the plunger foot and having free end portions extending away from opposite sides of the foot to form movable contacts. Preferably, this contact spring is formed from a spring wire coil 12 that extends across the plunger foot as shown in FIG. 4. The coil is disposed in a downwardly opening transverse slot 13 in the foot. The opposite end portions of the coil are more or less straight and extend tangentially away from opposite sides of the bottom of the coil to form the movable contacts 14 of the switch, as shown in FIG. 1. These free end portions or contacts will constantly press downwardly if they are pressed upwardly relative to the axis of the coil by stops 15 formed by extending beneath the contacts diagonally opposite lower corners of the side walls of the slot. With this construction the contacts press down against the stops and extend away from them towards the opposite ends of the case.

To help guide the foot of the plunger in the case so as to prevent it from turning, the foot preferably is provided with guide lugs 17 extending away from the opposite side walls of slot 13 in substantially parallel

spaced relation with the movable contacts 14, as shown in FIG. 4. These guide lugs project beyond the ends of the contacts and into sliding engagement with the end walls of the case. Preferably, the end walls are provided with guide slots 18 extending vertically across them for receiving the ends of the lugs. Also, it is preferred that the lugs be located at diagonally opposite corners of the foot of the plunger.

The inside of the case is provided with a pair of fixed or stationary electric contacts 20 normally spaced beneath the movable contacts and in their paths. Most conveniently, the stationary contacts project upwardly from the bottom wall of the case. Also, it is preferred to make these stationary contacts integral with the terminals 21 that project from the bottom of the case. Thus, each stationary contact can be the exposed wide head of narrow terminal that extends down through an opening in the bottom wall of the case. The contact and terminal can be held firmly in place by providing the portion of the terminal inside the wall opening with teeth that tightly engage the sides of the opening.

When the cap 10 is pressed to depress the plunger, the bridging contact is moved downwardly in the case and the spring wire movable contacts 14 engage the stationary contacts below them as shown in FIG. 3. Although one movable contact may engage the underlying stationary contact shortly before the other two contacts come into engagement, the plunger moves down far enough to ensure that both sets of contacts will engage firmly. Since both ends of the spring wire coil are pressed against the stationary contacts, the pressure of the two movable contacts against the stationary contacts is equalized because the coil is free to turn on its axis to the extent necessary for pressure equalization.

With the keyboard switch disclosed herein, it has been found that the bounce is less than 1 millisecond, which is an acceptable figure for such a switch. Bounce duration much greater than this might possibly cause a double signal.

As shown in FIG. 6, the panel into which the switch post 5 is inserted is provided with enlarged openings 23 for the switch terminals. These openings allow the post to be turned in the panel sufficiently to properly align the switch cap with like caps on the other switches mounted on the same panel.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A keyboard switch comprising a case having a top with a central opening therethrough, a plunger having a foot in the case and a stem extending upwardly through said opening and above the case, a cap mounted on the upper end of the plunger and spaced from the case, a spring normally holding the plunger in its upper position with its foot adjacent the top of the case, the plunger foot having an opening extending across it, a spring wire coil extending across said foot in said opening and having free end portions extending tangentially away from opposite sides of the coil to form movable contacts, said foot being provided with means holding the coil in said opening with the movable contacts spaced from the case, a pair of stationary

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electric contacts mounted in the case beneath said movable contacts and normally spaced therefrom, said movable contacts being engageable with the stationary contacts when the plunger is depressed by said cap, and terminals connected with the stationary contacts and extending out of the case.

2. A keyboard switch according to claim 1, in which said plunger foot has guide lugs extending in substantially parallel spaced relation with said free end portions of the bridging contact spring for sliding engagement with opposite side walls of the case.

3. A keyboard switch according to claim 2, in which said opposite side walls of the case have guide slots extending vertically across them receiving said guide lugs.

4. A keyboard switch according to claim 1, in which

4

said coil-holding means are stops limiting downward movement of said movable contacts relative to the plunger.

5. A keyboard switch according to claim 1, in which said foot opening is a downwardly opening transverse slot containing said coil, said free end portions extend laterally away from the bottom of the ends of the coil at opposite ends of said slot, and said coil-holding means are stops limiting downward movement of said free end portions relative to the plunger.

6. A keyboard switch according to claim 5, in which said stops are diagonally opposite lower corners of the walls of said slot projecting beneath said movable contacts.

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