

[54] **KEYBOARD SWITCH ACTUATOR**

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[58] **Field of Search**.....235/145 R, 145 A; 197/98; 178/17 A, 17 C, 79, 81, 101, 110; 340/365 R; 200/172 R

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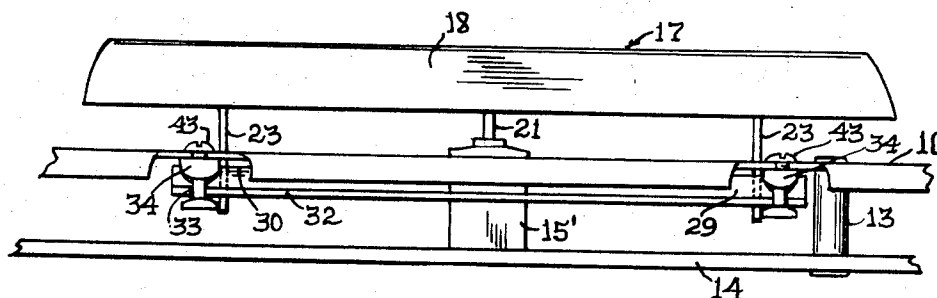
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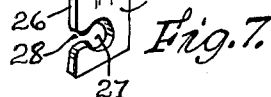
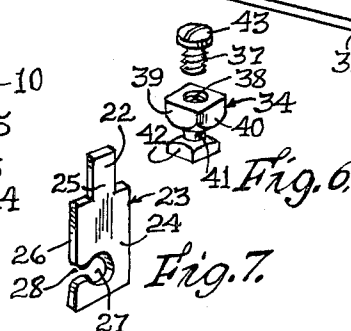
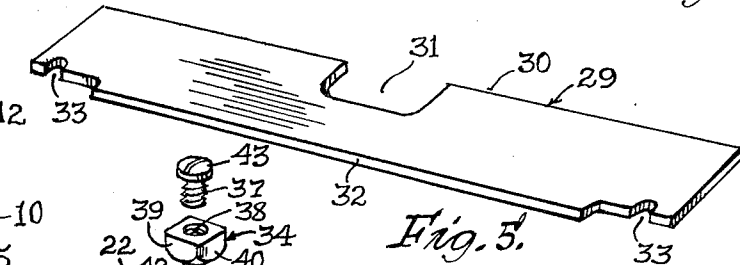
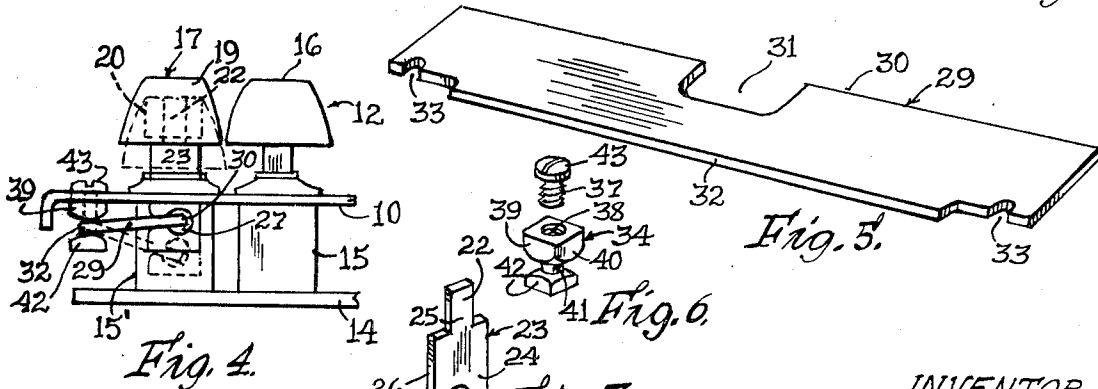
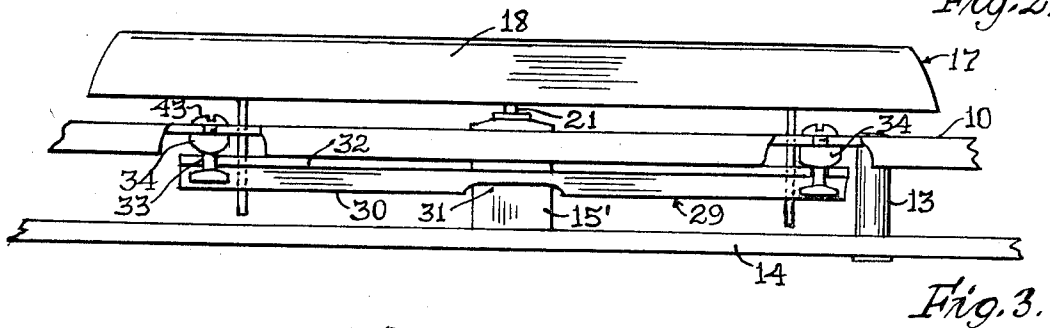
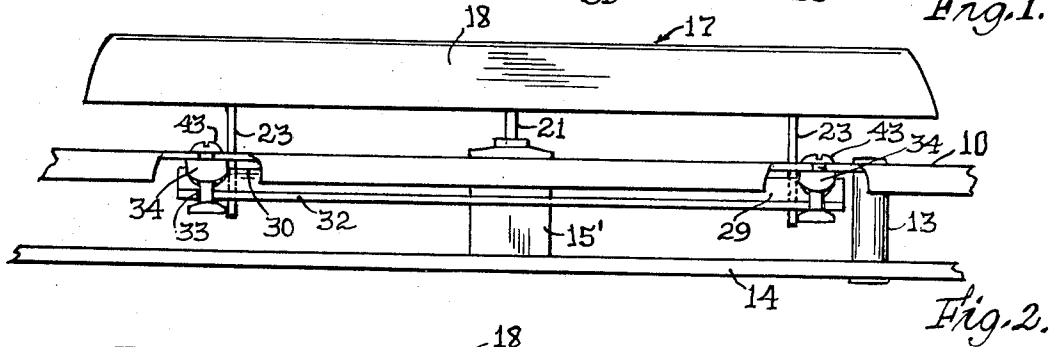
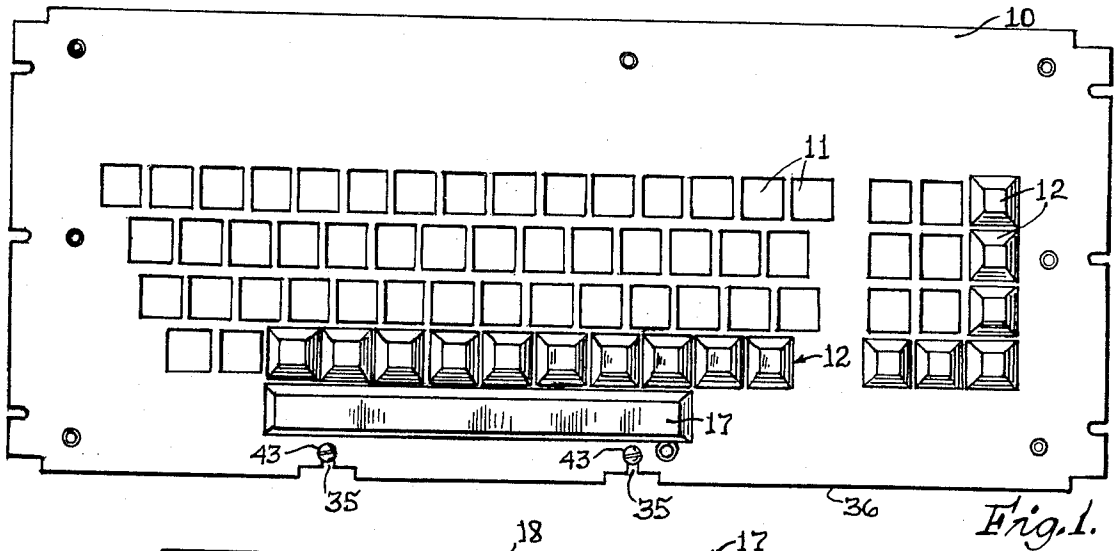
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[57] **ABSTRACT**

A keyboard switch actuator in the form of a so-called spacer bar commonly utilized in data processing machines, computers, and electric typewriters, all of which require the actuation of an associated electrical switch. The actuator in this application is a spacer bar normally rectangular in shape and of a size greater than other keys associated with the apparatus. This type of actuator must be constructed so as to maintain longitudinal stability during its operational movement by equally distributing the operating force thereon throughout its longitudinal length so as to prevent tilting, cocking, and oscillatory binding while preserving the operational characteristic of a highly sensitive, light operating force.

8 Claims, 7 Drawing Figures





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KEYBOARD SWITCH ACTUATOR

SUMMARY OF THE INVENTION

A generally horizontally disposed elongated switch-actuated key for a data processing machine, computer or electric typewriter having a substantially vertical movement induced by a force component applied at any point thereon throughout its length. The key is normally supported upon the plunger of a switch situated at a midpoint beneath the longitudinal length of the key. Equally spaced from the plunger and extending parallel thereto are a pair of stabilizing plungers, each of which has a free pivotal connection to a stabilizer plate that extends in a spaced parallel relation to the elongated key, the stabilizer plate in turn being pivotally connected to a pair of pivot bearings adjustably mounted upon the keyboard mounting plate. These pivotal bearings are disposed outboard of either of the stabilizing plungers and cooperate with the stabilizer plate to uniformly impart and distribute the operating force throughout the key's longitudinal length, thus preventing tilting, cocking, or binding of the key during its operational movement. The pivotal bearings are adjustably connected to the keyboard so as to regulate the pivotal movement of the stabilizer plate and condition the same to accommodate various operating forces.

GENERAL DESCRIPTION

The invention will be best understood by reference to the accompanying drawings which disclose the preferred form of embodiment of the invention, and in which:

FIG. 1 is a plan view of a keyboard with the keyboard switch actuator mounted thereon;

FIG. 2 is a fragmentary side elevational view of the keyboard switch actuator and its connection to the keyboard;

FIG. 3 is a fragmentary side elevational view similar to FIG. 2, but showing the parts thereof in an actuated position;

FIG. 4 is a fragmentary end elevational view of the keyboard switch actuator and its pivotal connection to the keyboard mounting plate;

FIG. 5 is a perspective view of the stabilizer plate as utilized in the invention;

FIG. 6 is a perspective view of one of the pivot bearings utilized in the invention;

FIG. 7 is a perspective view of one of the guide plungers used in the invention.

The device of this invention is utilized in connection with a keyboard 10 which can be prestyled with acceptably arranged openings 11 that frictionally receive sealed electrical switches 12. Beneath the keyboard 10 and connected thereto and spaced therefrom by suitable riveted spacers 13, is a printed circuit board 14 which forms the support for the switch housings 15 of the electrical switches 12, which switch housings 15 are arranged in the openings 11 and include an operating button 16 generally disposed in an elevated position with respect to the face of the keyboard 10.

Present on every keyboard 10 is a so-called spacer bar 17 which normally consists of a generally rectangularly shaped elongated body 18 disposed adjacent to one edge of the keyboard 10. The spacer bar 17 is so constructed that it may be actuated by a number of the

fingers of the operator and is actuated by a depressing force placed thereon at any point throughout its longitudinal length. Previously to the inclusion in the keyboard of electrical switches, movement of the spacer bar was not critical, in that it could be constructed so that a predetermined degree of operating force was necessary to move it into an actuated position. However, with the introduction of electrical keyboards whereby the resulting operation is an electrical pulse, the speed of operation has been greatly enhanced and therefore it is required that the spacer bar be operated by no greater force than that required to operate any of the other key switches. It is to that end that this invention is directed.

In FIG. 1 there is shown the keyboard 10 having formed therein the predetermined arranged openings 11 which receive the sealed electrical switches 12. The keyboard 10 by the spacers 13 supports the printed circuit plate 14 upon which in turn are mounted the housings 15 as well as the specific key switch 15' associated with the spacer bar 17 (see FIGS. 2 and 3).

The cap 19 of the spacer bar 17 provides internal bearings 20 (see dotted lines, FIG. 4) which frictionally receive the free end of the plunger 21 of the key switch 15' as well as the free ends 22 of a pair of stabilizers in the form of plungers 23. As shown in FIG. 7, the plungers 23 include a substantially flat rectangularly shaped body member 24 having a reduced neck portion 25 which terminates into the free end 22, as hereinbefore noted. One longitudinal edge 26 of the body 24 of the plunger 23 is notched so as to provide a substantially circular cut-out 27 having a reduced entrance-way 28. There are plungers 23 connected to the spacer bar 17 in an equally spaced parallel relation and to either side of the plunger 21 of the key switch 15' associated therewith. These plungers 23 freely extend through suitable openings formed in the keyboard 10.

Adapted to extend between the keyboard 10 and the printed circuit plate 14 in substantially parallel relation to the longitudinal axis of the spacer bar 17, is a stabilizer plate 29.

As viewed in FIG. 5, this stabilizer plate 29 is generally rectangular in shape and is provided on one longitudinal edge 30 with a center cut-out 31 that freely partially embraces the sealed switch 15'.

Formed in the other longitudinal edge 32 of the stabilizer plate 29 and adjacent the opposite ends thereof are semi-circular cut-outs 33. The stabilizer plate 29 is held in place between the plungers 23 and a pair of pivot bearings 34. These pivot bearings 34 are adapted to be mounted in slots 35 formed in the longitudinal edge 36 of the keyboard 10. These slots 35 are located so that they are positioned outboard of the plungers 23 when the latter are connected to the under surface of the spacer bar 17, as clearly shown in FIGS. 2 and 3, and for a purpose hereinafter made apparent.

Referring to FIG. 6, the pivot bearings 34 include a bolt 37 which is adapted to be threaded into a tapped opening 38 formed in the top surface of the pivot bearing 34. The pivot bearing 34 comprises a body having a top portion 39 which is generally square in cross section, with the bottom edge 40 thereof tapered gradually inwardly to a circular stud 41 that terminates into a substantially rectangular base 42. The bearing 34 is positioned beneath the slot 35 formed in the keyboard

10, with the bolt 37 threaded therein such that the bolt's enlarged head 43 will seat upon the edge surfaces of the keyboard 10 which define the slot 35, while the square body portion 39 of the pivot bearing 34 will engage the under surface of such keyboard. By this construction, it is apparent that the pivot bearings 34 may be positioned anywhere throughout the length of the slots 35. When the spacer bar 17 together with its switch 15' is mounted in the manner hereinbefore described and the plungers 23 are positioned to extend parallel to the plunger 21 of the switch 15' in the manner shown, the stabilizer plate 29 will be positioned so that its one longitudinal edge 30 will be projected through the narrow entranceway 28 of the circular cut-out 27, while the notches 33 formed in the other longitudinal edge 32 of the stabilizer plate 29 will receive the circular stud 41 of the pivot bearing 34, such as shown in FIG. 4.

By this arrangement, when there is applied a depressing force upon the spacer bar 17 at any point throughout its longitudinal length, such force will be transmitted equally throughout the plunger 21 of the switch 15' as well as the plungers 23, the plungers 23 in turn transmitting such force equally through the entire body of the stabilizer plate 29, effecting uniform movement of the spacer bar 17 under the depressing operating force.

The adjustment of the pivot bearings 34 in a plane transverse to the axis of the plungers 23 effects tiltable movement through the longitudinal axis of the stabilizer plate 29 between the circular openings 27 formed in the plungers 23 and the pivot bearings 34. The change in this compression will require a greater or lesser operating force on the spacer bar 17 for effecting movement thereof and subsequent closing of the key switch 15'.

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

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. An electrical keyboard switch actuator assembly adapted to be operatively mounted upon a keyboard and operated by an externally moving force applied thereto, comprising

- a. an elongated key bar mounted above the keyboard and movable reciprocally through a plane perpendicular thereto,
- b. an electrical switch assembly carried beneath the keyboard including a movable plunger actuator connected to and supporting said key bar above the keyboard,
- c. stabilizing means beneath the keyboard extending in a plane normal to the longitudinal plane of said key bar and tiltable about an axis parallel thereto in unison with movement of said key bar so as to uniformly distribute the moving force upon the key bar throughout its longitudinal length,
- d. means carried by said key bar providing a pivotal connection between said stabilizing means and said key bar, and

e. means providing points of pivotal connection between said stabilizing means and the keyboard.

2. An electrical keyboard switch actuator assembly as defined by claim 1, wherein said means carried by said key bar for providing a pivotal connection to said stabilizing means comprise a pair of depending stabilizing plungers connected to the underside of said key bar to either side and equidistant from the movable plunger actuator of said electrical switch assembly and extending to a predetermined plane beneath the keyboard, said stabilizer plungers providing means for receiving one edge of said stabilizing means so as to move the same through a predetermined path when said key bar is moved through a plane perpendicular to the keyboard.

3. An electrical keyboard switch actuator assembly as defined by claim 1, wherein said stabilizing means comprises a substantially flat, generally rectangularly shaped plate extending beneath said key bar in a substantially parallel longitudinal plane with respect thereto, with said plate having its opposite longitudinal edges pivotally connected to said connecting means between said key bar and said plate and the connecting means between the stabilizing plate and the keyboard.

4. An electrical keyboard switch actuator assembly as defined by claim 3, wherein said means carried by said key bar for providing a pivotal connection to said plate comprise a pair of depending stabilizing plungers connected to the underside of said key bar to either side and equidistant from the movable plunger actuator of said electrical switch assembly and extending to a predetermined plane beneath the keyboard, said stabilizer plungers providing means for receiving one edge of said plate so as to move the same through a predetermined path when said key bar is moved through a plane perpendicular to the keyboard.

5. An electrical keyboard switch actuator assembly as defined by claim 3, wherein said means providing points of pivotal connection between said plate and the keyboard comprise a pair of pivotal bearings carried by the keyboard at points equidistant from the movable plunger of said electrical switch assembly and outboard of the pivotal connecting means between said plate and said key bar, said pivotal bearings adapted to receive an edge of said plate so as to provide an axis about which said plate may be tilted in unison with movement of said key bar.

6. An electrical keyboard switch actuator assembly as defined by claim 5, wherein said means carried by said key bar for providing a pivotal connection to said plate comprise a pair of depending stabilizing plungers connected to the underside of said key bar to either side and equidistant from the movable plunger actuator of said electrical switch assembly and extending to a predetermined plane beneath the keyboard, said stabilizer plungers providing means for receiving the other edge of said plate so as to move the same through a predetermined path when said key bar is moved through a plane perpendicular to the keyboard.

7. An electrical keyboard switch actuator assembly as defined by claim 1, wherein said means providing points of pivotal connection between said stabilizing means and the keyboard comprise a pair of pivotal bearings carried by the keyboard at points equidistant from the movable plunger of said electrical switch assembly and outboard of the pivotal connecting means

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between said stabilizing means and said key bar, said pivotal bearings adapted to receive an edge of said stabilizing means so as to provide an axis about which said stabilizing means may be tilted in unison with movement of said key bar.

8. An electrical keyboard switch actuator assembly as defined by claim 7, wherein said means carried by said key bar for providing a pivotal connection to said stabilizing means comprise a pair of depending stabilizing plungers connected to the underside of said key bar 10

to either side and equidistant from the movable plunger actuator of said electrical switch assembly and extending to a predetermined plane beneath the keyboard, said stabilizing plungers providing means for receiving the other edge of said stabilizing means so as to move the same through a predetermined path when said key bar is moved through a plane perpendicular to the keyboard.

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