

[54] DATA MACHINE KEYBOARD ASSEMBLY WITH ELONGATED KEY CAP FOR ACTUATING AN ELECTRIC SWITCH

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[57] ABSTRACT

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 [51] Int. Cl.<sup>2</sup> ..... H01H 3/12  
 [58] Field of Search ..... 200/340, 159 R, 153 C, 200/86.5, 153 T, 330; 197/98

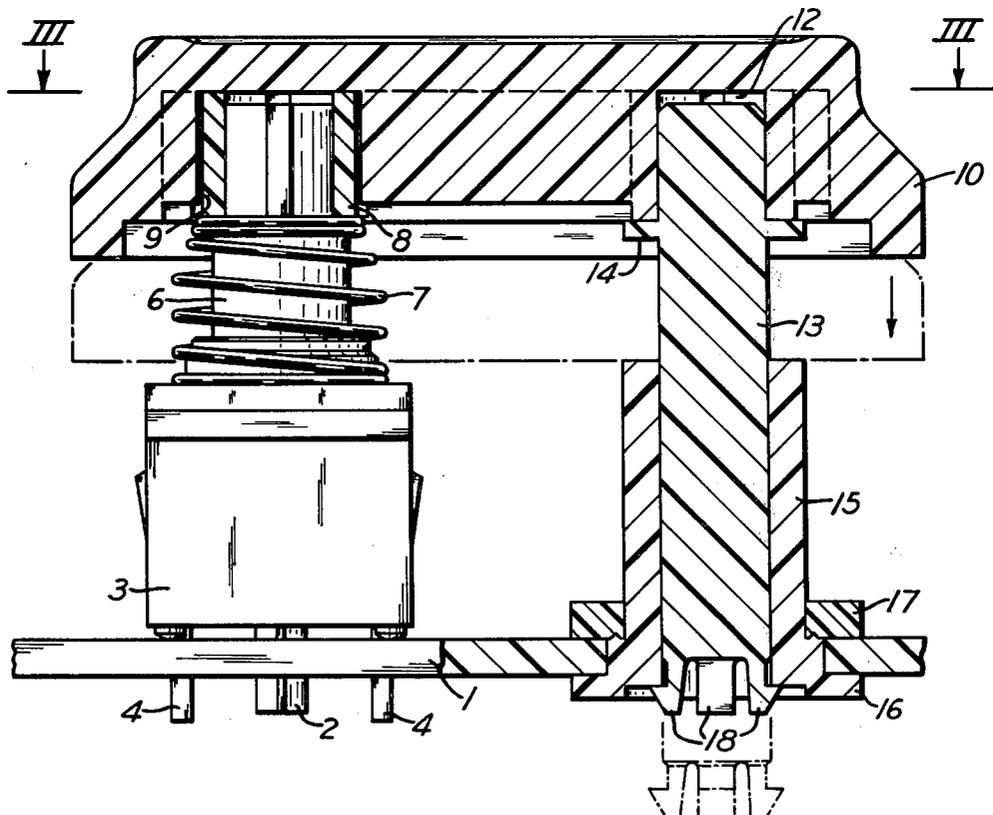
An electric switch rigidly mounted on a support has an actuating plunger that a spring normally urges outwardly in a direction away from the support. Mounted on the support beside the switch is a bushing, in which a guide post is slidably mounted parallel to the plunger. A key cap overlies the post and plunger and is rigidly mounted on the outer end of the post so that when either end of the key cap is depressed to actuate the switch the cap will be guided by the post, and the plunger will not bind in the switch.

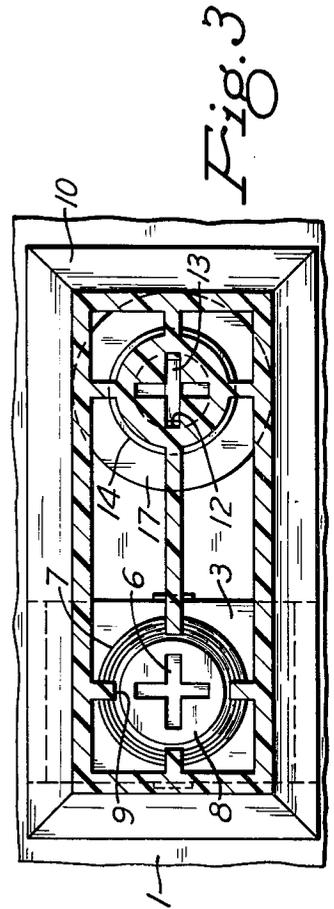
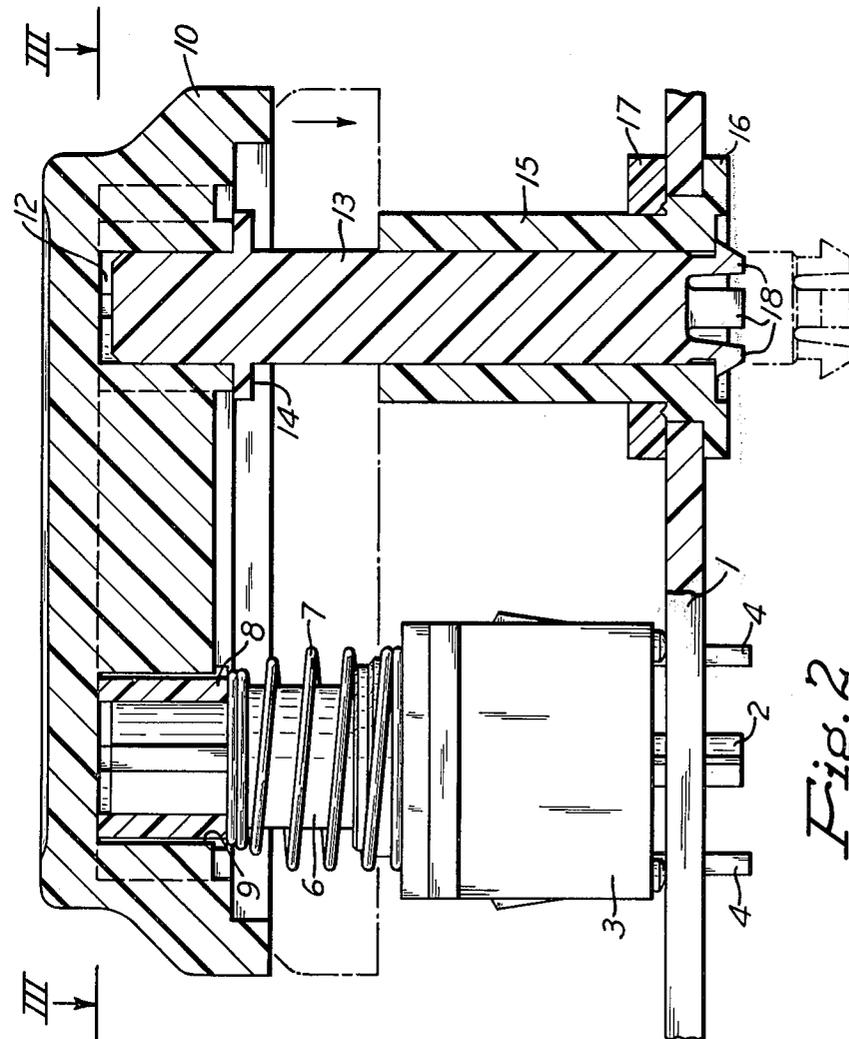
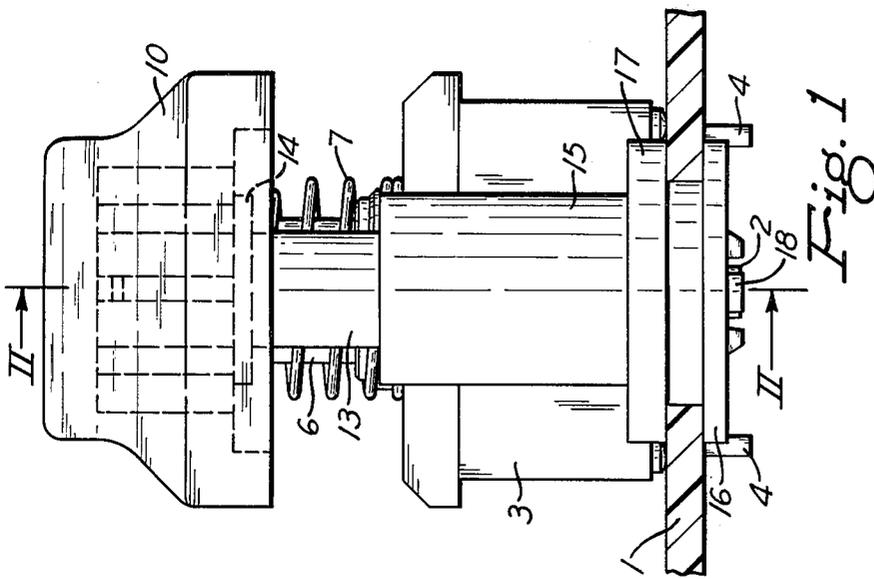
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3 Claims, 3 Drawing Figures





## DATA MACHINE KEYBOARD ASSEMBLY WITH ELONGATED KEY CAP FOR ACTUATING AN ELECTRIC SWITCH

Electrically operated data machines with keyboards, such as typewriters, calculators, and the like, include keys that are depressed by the fingers to register the desired data in the machines. The keys consists of push button electric switches that are closed when the keys are depressed, and caps on the outer ends of the switch buttons or plungers for engagement by the fingers in depressing the keys. In most cases the caps are centered on the switch plungers, but some keyboards require key caps that extend laterally away from the switch plungers far enough to resemble double key caps or several key caps joined together side by side. When such a key cap is struck by a finger directly over the switch plunger the switch is actuated without difficulty, but if the finger is pressed against the cap at one side of the plunger this off-center force tends to tilt the plunger and often causes it to bind in the switch so that the key either does not go down or is sluggish in its movement.

It is among the objects of this invention to provide a key for an electrically operated data machine keyboard, in which the key cap extends laterally away from the key, in which the switch plunger does not bind in the switch housing regardless of where the cap is struck by the finger, which can be mounted on a printed circuit board without difficulty and which is simple in construction and operation.

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

FIG. 1 is an end view;

FIG. 2 is a side view, partly in section on the line II—II of FIG. 1; and

FIG. 3 is a reduced horizontal section taken on the line III—III of FIG. 2.

Referring to the drawings, a support 1 is shown that is to be mounted in an electrically operated data machine of the type that uses a keyboard. This support is generally in the form of a printed circuit board having a printed electric circuit (not shown) on its lower surface. Mounted on the board is a plurality of finger-actuated keys, only one of which is shown in the drawings. Each key includes a push button electric switch that is rigidly mounted on the circuit board in any suitable manner, preferably by a positioning prong 2 projecting from the switch housing 3 down through a hole in the board, as shown in FIGS. 1 and 2. The switch terminals 4 also extend through the circuit board for connection to the printed circuit on it.

The internal construction of the switch is not important for this disclosure and will not be described, except that the switch is actuated by a push button or a plunger 6 that extends up above its housing and that is normally held in its upper position by a coil spring 7 encircling the plunger and compressed between the top of the switch housing and the bottom of a bushing 8 rigidly mounted on the upper end of the plunger. This bushing is disposed in a socket 9 in the bottom of a key cap 10, but the bushing preferably is not rigidly disposed in the socket but has a clearance around it so that the cap can move laterally slightly in all directions relative to the bushing if necessary, for a purpose to be explained.

Unlike the usual small key cap that is rigidly mounted on the upper end of a switch plunger, the key cap dis-

closed herein is elongated and extends laterally away from the switch a considerable distance, generally at least twice as far as the usual key cap. To hold the cap in place on the switch plunger and also for another reason that will be described, it is a feature of this invention that the outer end portion of the cap is provided with an upwardly extending opening 12 in which the upper end of a guide post 13 is rigidly mounted. The body of the post beneath the cap generally is cylindrical, but the upper end may be reduced in thickness to provide it with a narrow flat configuration extending up into opening 12, which may be in the form of a slot in which the post is tightly wedged. A collar 14 integral with the post limits the distance that the post can be inserted in the socket so that all key caps in the same row will be at the same level.

The guide post extends down through a bushing 15 beside the switch. The lower end portion of this bushing fits snugly in a hole through the circuit board and is encircled by an integral flange 16 that engages the bottom of the board. Encircling the bushing above the board and in tight engagement with both of them is a washer 17 that is secured to the bushing so that the latter is clamped securely in the board. The bushing and washer preferably are made of a plastic, such as nylon or Teflon, and they may be jointed together by ultrasonic welding if desired. In order to be able to insert the guide post 13 in the bushing from its upper end and then lock it in place, the lower end of the post is provided with four circumferentially spaced integral spring teeth 18 that extend downwardly and project laterally a slight distance beyond the body of the post as shown in FIG. 2. When the post is pressed down against the top of the bushing, these teeth are sprung inwardly far enough to permit the post to be pushed down through the bushing until the teeth can spring out below its lower end and thereby prevent withdrawal of the post. The post also preferably is made of a plastic, which is economical and assures the post sliding easily in the bushing. Bushing 15 is long enough to prevent any tendency of the guide post to tilt or bind in it. For this purpose the bushing preferably extends above the circuit board at least as far as the switch housing.

### OPERATION

When the key is pressed directly above the switch plunger, the force is applied more or less axially of the plunger and therefore it will move down into the switch easily. Furthermore, if the finger strikes the top of the outer end of the key cap, the cap still will be guided straight down by means of the guide post sliding downwardly in the bushing. This prevents the cap from tilting and applying a lateral force to the switch plunger that might cause it to bind in the switch housing. Consequently, regardless of where the finger strikes the key cap, the switch plunger will be depressed without any difficulty.

Due to the loose fit of plunger bushing 8 in the key cap socket, slight differences in the center to center distance between bushing 15 and the mounting hole for prong 2 will present no problem because such variations can be accommodated by the clearance between the bushing and the encircling wall of the key cap socket.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to rep-

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resent its best embodiment. However, we 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.

We claim:

1. In an electrically operated data machine keyboard assembly, a printed circuit board, an electric switch rigidly mounted thereon, said switch being provided with an actuating plunger extending outwardly away from said board, a spring normally urging the plunger in a direction away from the board, a bushing rigidly mounted on the board beside said switch and extending through the board, a guide post slidably mounted in the bushing parallel to said plunger, and a finger-actuated

2. In a keyboard assembly according to claim 1, the free end of the post being provided with laterally projecting spring teeth normally overlying the adjoining end of the bushing to limit the distance said cap can move away from the bushing, and said teeth being movable toward the axis of the guide post to permit initial insertion of the post in the bushing from the opposite end of the bushing.

3. In an electrically operated data machine keyboard

assembly, a printed circuit board, an electric switch rigidly mounted thereon, said switch being provided with an actuating plunger extending outwardly away from said board, a spring normally urging the plunger in a direction away from the board, a bushing rigidly mounted on the board beside said switch, a guide post slidably mounted in the bushing parallel to said plunger, and a finger-actuated elongated key cap overlying the post and plunger in engagement with the plunger, said cap being rigidly mounted on the outer end of the post, said bushing and guide post being made of a plastic and the bushing extending through said printed circuit board and being provided with an integral flange engaging the side of said board opposite said cap, said assembly including a plastic washer encircling the bushing at the other side of the printed circuit board in engagement with the board and secured to the bushing so that the bushing is held in said board by said flange and washer, whereby when either end of the key cap is depressed to actuate said switch the cap will be guided by said post and the plunger will not bind in the switch.

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