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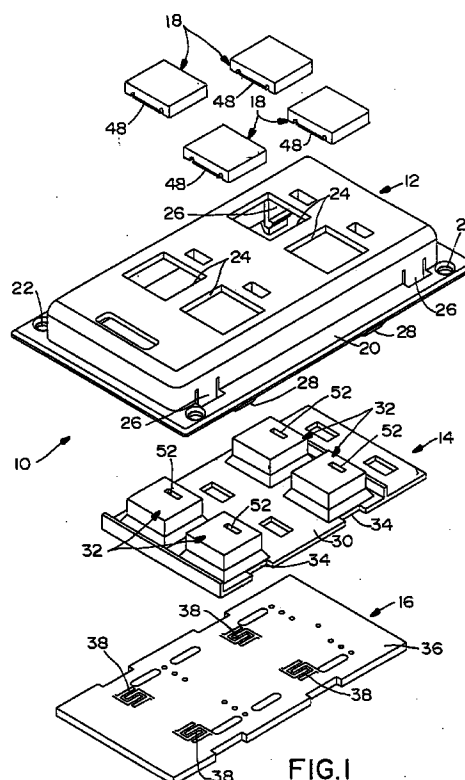
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(54) **Electrical switch module**

(57) A push button switch module (10) is provided for mounting on a switch wiring chassis (56). A front housing (12) includes at least one push button aperture (24). An actuator pad (14) is mounted to the rear of the front housing (12) and includes a push button switch actuator (32) exposed in the aperture. A printed circuit board (16) is mounted to the rear of the actuator pad (14) at the rear of the front housing (12) and includes a switch pad (38) operatively associated with the switch actuator. A switch cap (18) is interchangeably mounted to the front of the front housing (12) at the aperture (24) and is movable relative to the housing for engaging the push button switch actuator (32).



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Description

Field of the Invention

This invention generally relates to the art of electrical switches and, particularly, to a switch module, such as a push button switch module, for mounting on a switch wiring chassis.

Background of the Invention

Push button switches are used in a variety of applications for actuating switches of a switching unit. The push button switch may be purely mechanical, wherein the push button physically moves a first switch contact into or out of engagement with a second switch contact to close or open a circuit. In printed circuit board applications, the push button may carry a switch contact for closing the elements of a switch pad on the printed circuit board.

Push button switches of the character described above include switches of the elastomeric dome variety which are convenient to use in arrays which are easy to manufacture and easy to assemble to multiple switching panels. In particular, a unitary actuator pad includes a flange portion with a plurality of integral, raised push buttons. Such actuator pads or panels are readily used in conjunction with a printed circuit board. The integral push buttons include planar switch contacts for engaging planar switch pads on the circuit board.

In many applications, it is desirable to cover the push buttons of the switch assembly with a cap which can have indicia thereon to indicate the function of any given push button and its associated switch. When used in conjunction with an array of push buttons which, in turn, are used in conjunction with switch pads on a printed circuit board, it is highly desirable that the button caps be readily removable and interchangeable to accommodate readily programmable circuitry on the printed circuit board.

A problem with such systems as outlined above is that it becomes complicated and expensive to incorporate each of the described components, with their desirable functions, in an assembly or subassembly for practical use in a switching unit or chassis. The present invention is directed to solving such problems by providing a push button switch module which includes all of the described desirable components in a module which is extremely simple to assemble for ready use in a variety of switch wiring chassis.

Summary of the Invention

An object, therefore, of the invention is to provide a new and improved push button switch module of the character described.

In the exemplary embodiment of the invention, the switch module includes a front housing having at least

one push button aperture. An actuator pad is mounted to the rear of the front housing and includes a push button switch actuator exposed in the aperture. A printed circuit board is mounted to the rear of the actuator pad at the rear of the front housing and includes a switch pad operatively associated with the switch actuator. A switch cap is interchangeably mounted to the front of the front housing at the aperture and is movable relative to the housing for engaging the push button switch actuator. Therefore, the entire module can be mounted as a sub-assembly to an appropriate switching unit or switch wiring chassis.

As disclosed herein, the front housing is unitarily molded of relatively rigid plastic material. The actuator pad is unitarily molded of elastomeric material. The elastomeric actuator pad includes a flange portion and an integral dome-type, relatively movable switch actuator portion forming the push button switch actuator. A conductive switch contact is carried on the underside of the switch actuator for engaging the switch pad on the printed circuit board.

The invention contemplates the use of a first snap-latch means on the underside of the front housing for mounting the printed circuit board thereto, sandwiching the actuator pad between the front housing and the printed circuit board. A second snap-latch means is provided for removably and interchangeably mounting the switch cap to the front housing through the aperture. A third snap-latch means is provided on the front housing for readily mounting the entire module to an appropriate switch wiring chassis or the like. Therefore, the entire module is extremely simple to assemble and use.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is an exploded perspective view of the components of the push button switch module of the invention;

FIGURE 2 is a perspective view of the switch module in assembled condition;

FIGURE 3 is an enlarged vertical section taken generally along line 3-3 of Figure 2;

FIGURE 4 is an enlarged section taken generally along line 4-4 of Figure 2;

FIGURE 5 is a bottom plan view of one of the switch

caps;

FIGURE 6 is a side elevational view of the switch cap;

FIGURE 7 is a section taken generally along line 7-7 of Figure 5;

FIGURE 8 is an enlarged section taken generally along line 8-8 of Figure 5;

FIGURE 9 is a perspective view of the switch module mounted on a switch wiring chassis; and

FIGURE 10 is a vertical section through an assembly such as in Figure 9, but with only one push button.

Detailed Description of the Preferred Embodiment

Referring to the drawings in greater detail, and first to Figure 1, an electrical switch assembly or push button switch module, generally designated 10, includes a front housing, generally designated 12; a 4-button switch actuator pad, generally designated 14; a switch printed circuit board, generally designated 16; and four switch caps, generally designated 18.

More particularly, front housing 12 of switch module 10 is a unitary structure integrally molded of fairly rigid plastic material. The housing includes a peripheral flange 20 having attaching holes 22 near the corners thereof. The remainder of the housing is raised above peripheral flange 20 and defines four generally square push button apertures 24. Four (only one being visible in Fig. 1) inwardly directed hooked latches 26 project downwardly on the inside of the raised portion of the housing. A pair of outwardly directed hooked latches 28 project downwardly from peripheral flange 18 on each side of the housing.

The 4-button switch actuator pad 14 of switch module 10 is a unitary structure molded of elastomeric material (i.e. considerably softer or more flexible than the molded plastic material of front housing 12). Actuator pad 14 includes a peripheral flange 30, with four push button switch actuators, generally designated 32, projecting upwardly therefrom. In assembly, push button actuators 32 project upwardly through apertures 24 in front housing 12. Peripheral flange 30 of actuator pad 14 includes four notches 34 in the edges thereof through which inwardly directed hooked latches 26 of front housing 12 project.

Switch printed circuit board 16 of switch module 10 includes a generally planar substrate 36 having four planar switch pads 38 on the upper surface thereof. In Figure 1, planar switch pads 38 are shown as a planar array of circuit traces in a particular electrical configuration. However, the planar switch pads can take a wide variety of configurations, including a flat foil pad being divided by an open slit to define a pair of closable contacts within the planar switch pad, as is known in the art.

Switch caps 18 of switch module 10 are designed to snap fit into apertures 24 from the front of housing 12 to cover switch actuators 30 of actuator pad 14. The switch

caps typically have indicia on the top thereof to indicate the switch function effected by depressing the respective push button switch actuator 32 on actuator pad 14. Therefore, the switch caps must be movably mounted within their respective apertures 24.

Figures 2-4 show the components (Fig. 1) of switch module 10 in assembled condition. As best seen in Figures 3 and 4, 4-button switch actuator pad 14 is located beneath front housing 12 with push button switch actuators 32 projecting upwardly through apertures 24 in the housing. Switch printed circuit board 16 is pushed upwardly beneath the actuator pad until the printed circuit board snaps into latching engagement with inwardly directed hooked latches 26, thereby supporting the actuator pad, while interior flanges 40 on the inside of housing 12 hold the actuator pad downwardly against the printed circuit board. Figure 4 also shows more clearly the size and configuration of outwardly directed hooked latches 28 depending from the underside of housing 12, for purposes described below.

Figures 3 and 4 show that a planar switch contact 42 is disposed on the bottom of each push button switch actuator 32. These planar switch contacts are provided for engaging planar switch pads 38 on printed circuit board 16.

Referring to Figures 5-8 in conjunction with Figures 1-7 and particularly Figure 3, each switch cap 18 is configured in a generally inverted cup shape to define a top wall 44, a pair of opposite side walls 46 and a pair of hooked latches 48 defining the other opposite side walls of the cup-shaped configuration. A locating rib 50 depends from the inside of top wall 44 as shown in Figure 3 for positioning in a locating recess 52 in the top of a respective one of the switch actuators 32. Therefore, each switch cap 18 is designed for removably and interchangeably mounting within a respective one of the apertures 24 in front housing 12 in a direction from outside or at the front of the housing. As seen best in Figure 3, the outer edges of hooked latches 48 are chamfered so that the switch caps can be mounted into apertures 24 in a snap-latch action by pushing the caps downwardly in the direction of arrows "A" (Fig. 3).

Figure 9 shows switch module 10 mounted on top of a front plate 54 of a rear wiring module or box, generally designated 56, by means of four attaching screws 58 passing through attaching holes 22 in peripheral flange 20 of front housing 12. As will be seen in the description of Figure 10, below, hooked latches 28 are used to snap-fit switch module 10 onto wiring module or box 56. It should be understood that the wiring module or box is only one example of an application for, use of switch module 10 of the invention. Generically, the switch module can be used with a variety of switch wiring chassis.

Figure 10 shows a modified assembly wherein only one push button switch actuator 32 is employed. This view simply shows that rear module 56 houses or mounts various wires and terminals 60, along with an

interior substrate or printed circuit board 62. The rear module defines the eventual functions effected by the switch module 10 of the invention. However, Figure 10 also clearly shows how hooked latches 28 project downwardly past peripheral flange 20 of front housing 12 for snapping behind front plate 54 of the rear wiring module to snap-latch the entire switch module 10 onto the rear module.

From the foregoing, it is readily apparent how easy push button switch module 10 is assembled and used. Basically, a first snap-latch means including hooked latches 26 are used to mount printed circuit board 16 to the underside of front housing 12, sandwiching actuator pad 14 between the front housing and the printed circuit board. A second snap-latch means including hooked latches 48 on switch caps 18 are used to interchangeably mount the switch caps to the front housing through apertures 24 therein. Still further, a third snap-latch means including hooked latches 28 are used for readily mounting switch module 10 on a switch wiring chassis, such as rear wiring module or box 56. This entire modular concept greatly reduces the manufacturing costs and implementation costs presently incurred with most push button switch assemblies.

Lastly, although the term "push button" has been used herein and in the claims hereof, it should be understood that the push button actuators can be associated with a variety of different electrical switching means.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

Claims

1. A push button switch module (10) for mounting on a switch wiring chassis (56), comprising:

a front housing (12) unitarily molded of rigid plastic material and including at least one push button aperture (24);
 an actuator pad (14) unitarily molded of elastomeric material and mounted to the rear of the front housing (12), the actuator pad including a flange portion (30) and an integral dome-type, relatively movable switch actuator portion (32) exposed in said aperture (24);
 a printed circuit board (16) mounted to the rear of the actuator pad (14) at the rear of the front housing (12) and including a switch pad (38) operatively associated with the switch actuator;
 a switch cap (18) interchangeably mounted to the front of the front housing (12) at said aperture (24) and movable relative to the housing for engaging the switch actuator portion (32) of

the actuator pad (14);

first snap-latch means (26) on the underside of the front housing (12) for mounting the printed circuit board (16) thereto, sandwiching the actuator pad (14) between the front housing and the printed circuit board; and
 second snap-latch means (48) for removably and interchangeably mounting the switch cap (18) to the front housing (12) through said aperture (24) therein.

2. The push button switch module of claim 1, including third snap-latch means (28) on the front housing (12) for readily mounting the module (10) on the switch wiring chassis (56).
3. The push button switch module of claim 1, including a conductive switch contact (42) on the underside of the switch actuator portion (32) for engaging the switch pad (38) on the printed circuit board (16).
4. A push button switch module (10) for mounting on a switch wiring chassis (56), comprising:

a front housing (12) including at least one push button aperture (24);
 an actuator pad (14) mounted to the rear of the front housing (12) and including a push button switch actuator (32) exposed in said aperture (24);
 a printed circuit board (16) mounted to the rear of the actuator pad (14) at the rear of the front housing (12) and including a switch pad (38) operatively associated with the switch actuator; and
 a switch cap (18) interchangeably mounted to the front of the front housing (12) at said aperture (24) and movable relative to the housing for engaging the push button switch actuator (32),

whereby the entire module (10) can be mounted as a sub-assembly to the switch wiring chassis (56).

5. The push button switch module of claim 4 wherein said front housing (12) is unitarily molded of rigid plastic material.
6. The push button switch module of claim 5, including snap-latch means (28) on the front housing (12) for readily mounting the module on the switch wiring chassis.
7. The push button switch module of claim 4 wherein said actuator pad (14) is unitarily molded of elastomeric material.
8. The push button switch module of claim 7 wherein

said elastomeric actuator pad (14) includes a flange portion (30) and an integral dome-type, relatively movable switch actuator portion (32) forming said push button switch actuator.

9. The push button switch module of claim 8, including a conductive switch contact (42) on the underside of the switch actuator (32) for engaging the switch pad (38) on the printed circuit board (16).

10. The push button switch module of claim 4, including snap-latch means (26) on the underside of the front housing (12) for mounting the printed circuit board (16) thereto, sandwiching the actuator pad (14) between the front housing and the printed circuit board.

11. The push button switch module of claim 4, including snap-latch means (48) for removably and interchangeably mounting the switch cap (18) to the front housing (12) through said aperture (24) therein.

12. A switch module (10) for mounting on a switch wiring chassis (56), comprising:

a front housing (12) including at least one aperture (24);

an actuator pad (14) mounted to the rear of the front housing (12) and including a switch actuator (32) exposed in said aperture (24);

a printed circuit board (16) including a switch pad (38) operatively associated with the switch actuator;

a switch cap (18) for covering the switch actuator (32);

first snap-latch means (26) on the underside of the front housing (12) for mounting the printed circuit board (16) thereto, sandwiching the actuator pad (14) between the front housing and the printed circuit board; and

second snap-latch means (48) for removably and interchangeably mounting the switch cap (18) to the front housing (12) through said aperture (24) therein.

13. The switch module of claim 12, including third snap-latch means (28) on the front housing (12) for readily mounting the module (10) on the switch wiring chassis (56).

14. The switch module of claim 12 wherein said front housing (12) is unitarily molded of rigid plastic material.

15. The switch module of claim 12 wherein said actuator pad (14) is unitarily molded of elastomeric material.

16. The switch module of claim 15 wherein said elastomeric actuator pad (14) includes a flange portion (30) and an integral dome-type, relatively movable switch actuator portion (32).

17. The switch module of claim 16, including a conductive switch contact (42) on the underside of the switch actuator portion (32) for engaging the switch pad (38) on the printed circuit board (16).

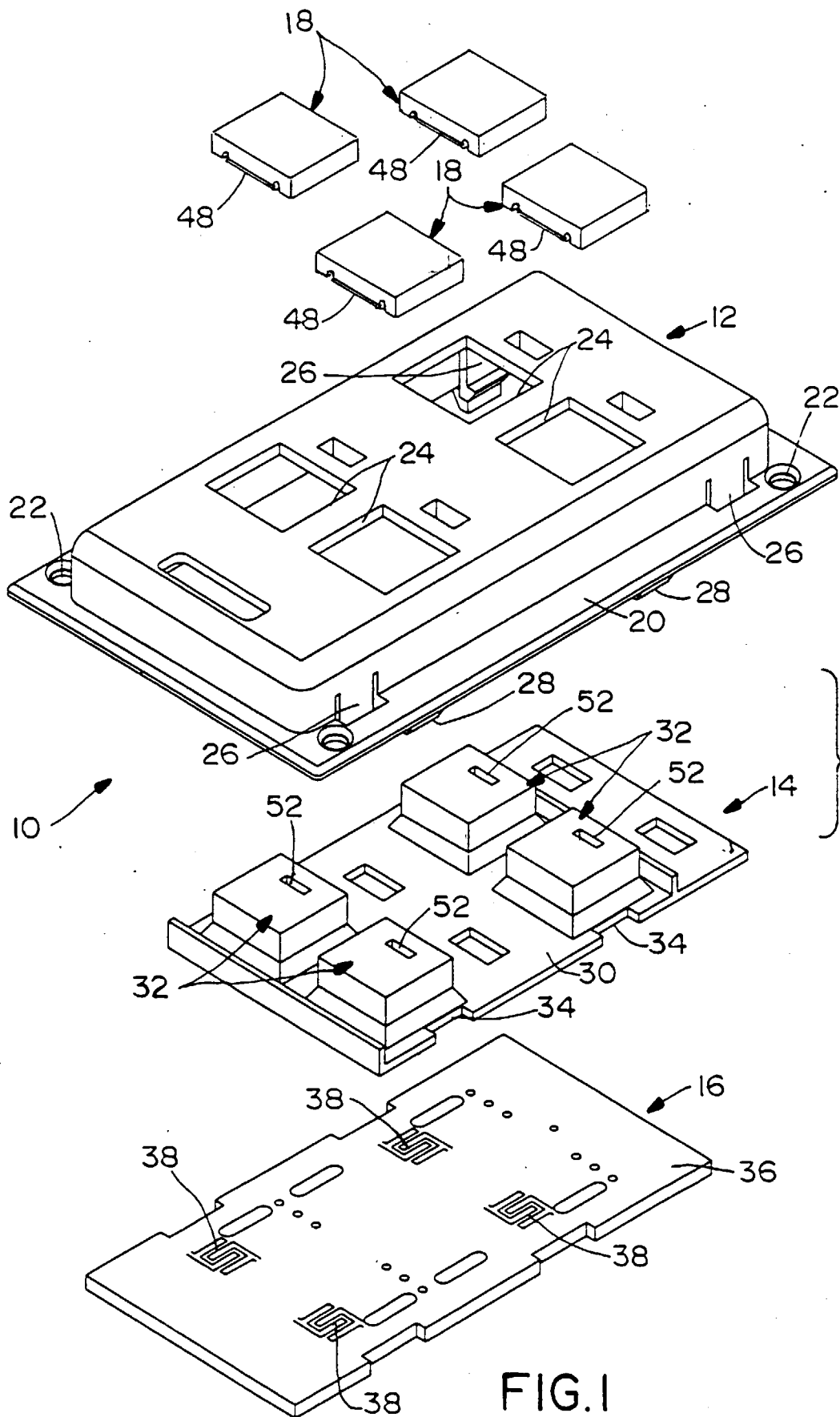


FIG. 1

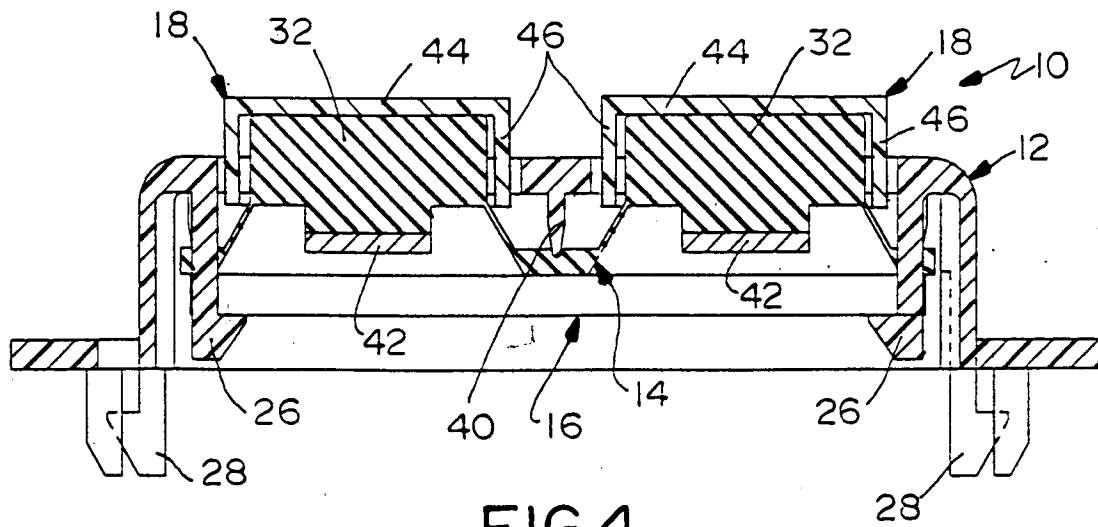


FIG. 4

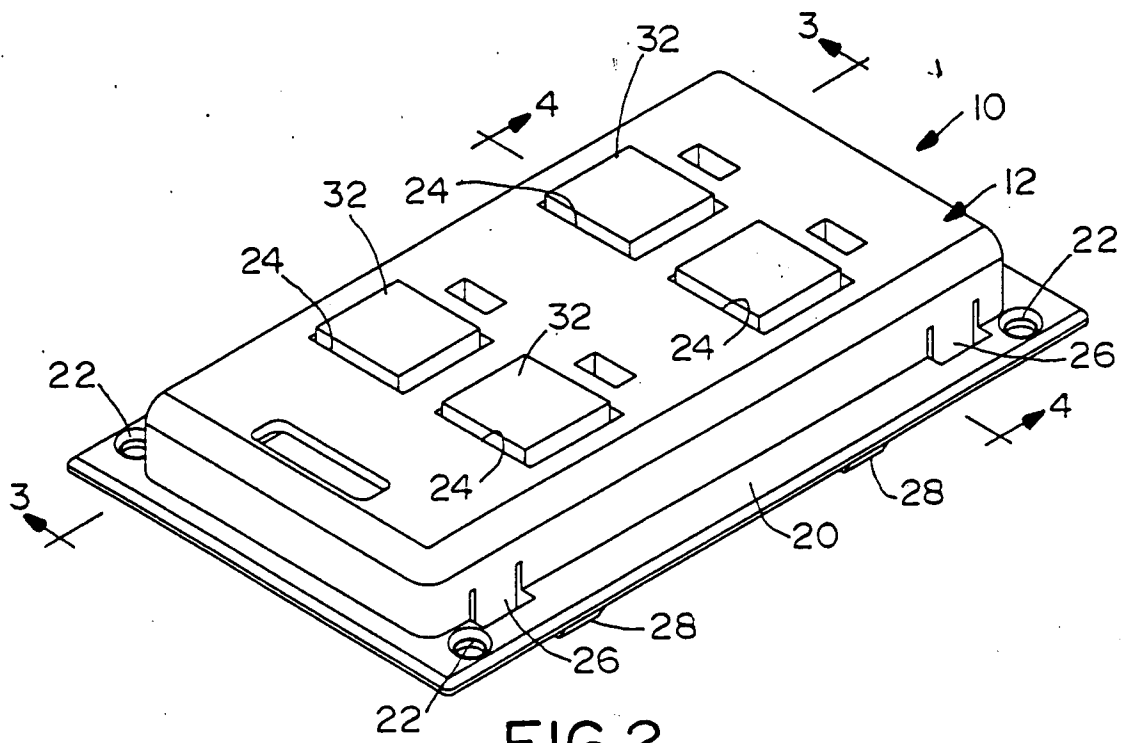


FIG. 2

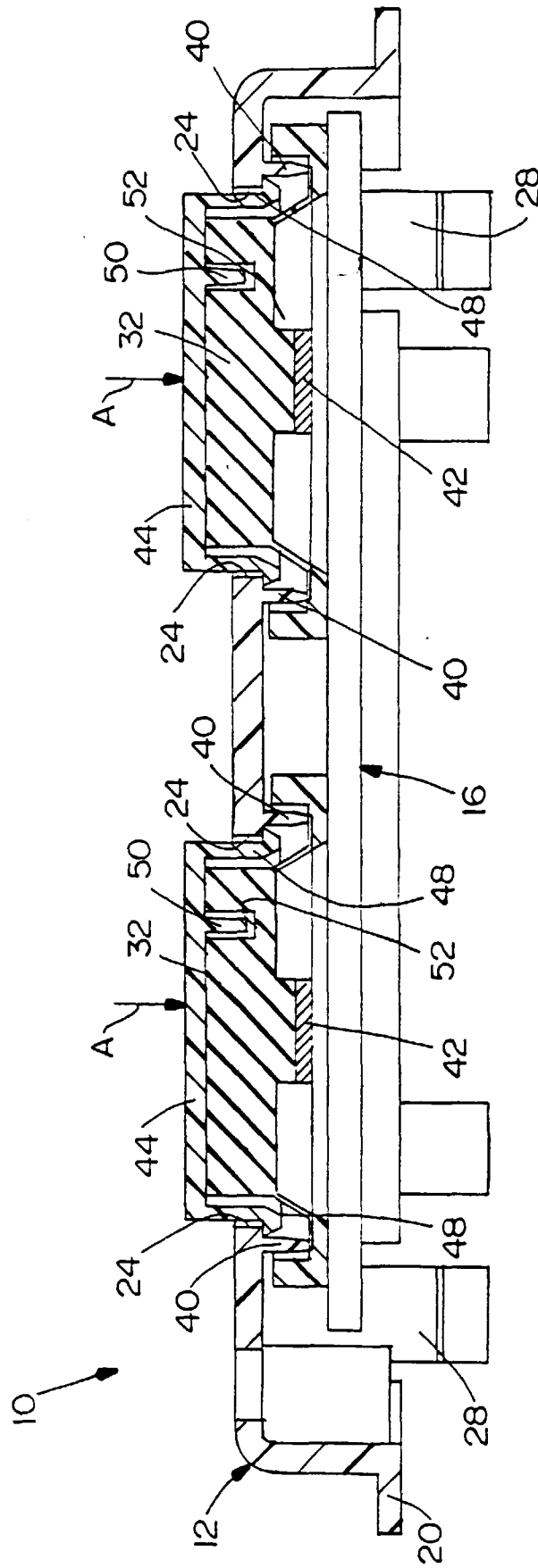


FIG.3

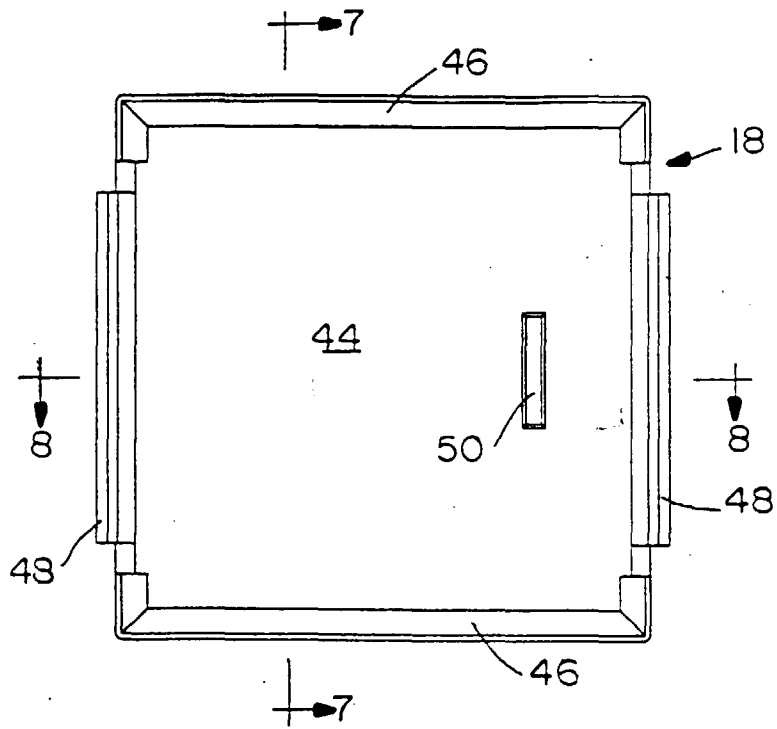


FIG. 5

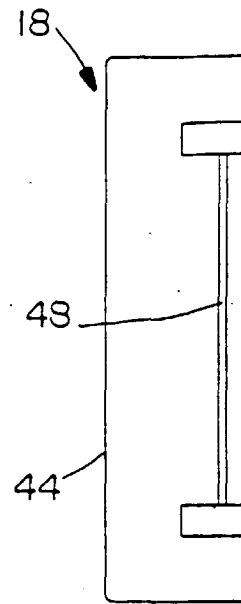


FIG. 6

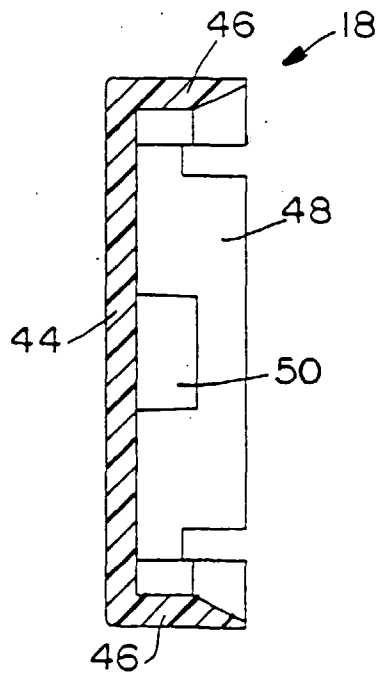


FIG. 7

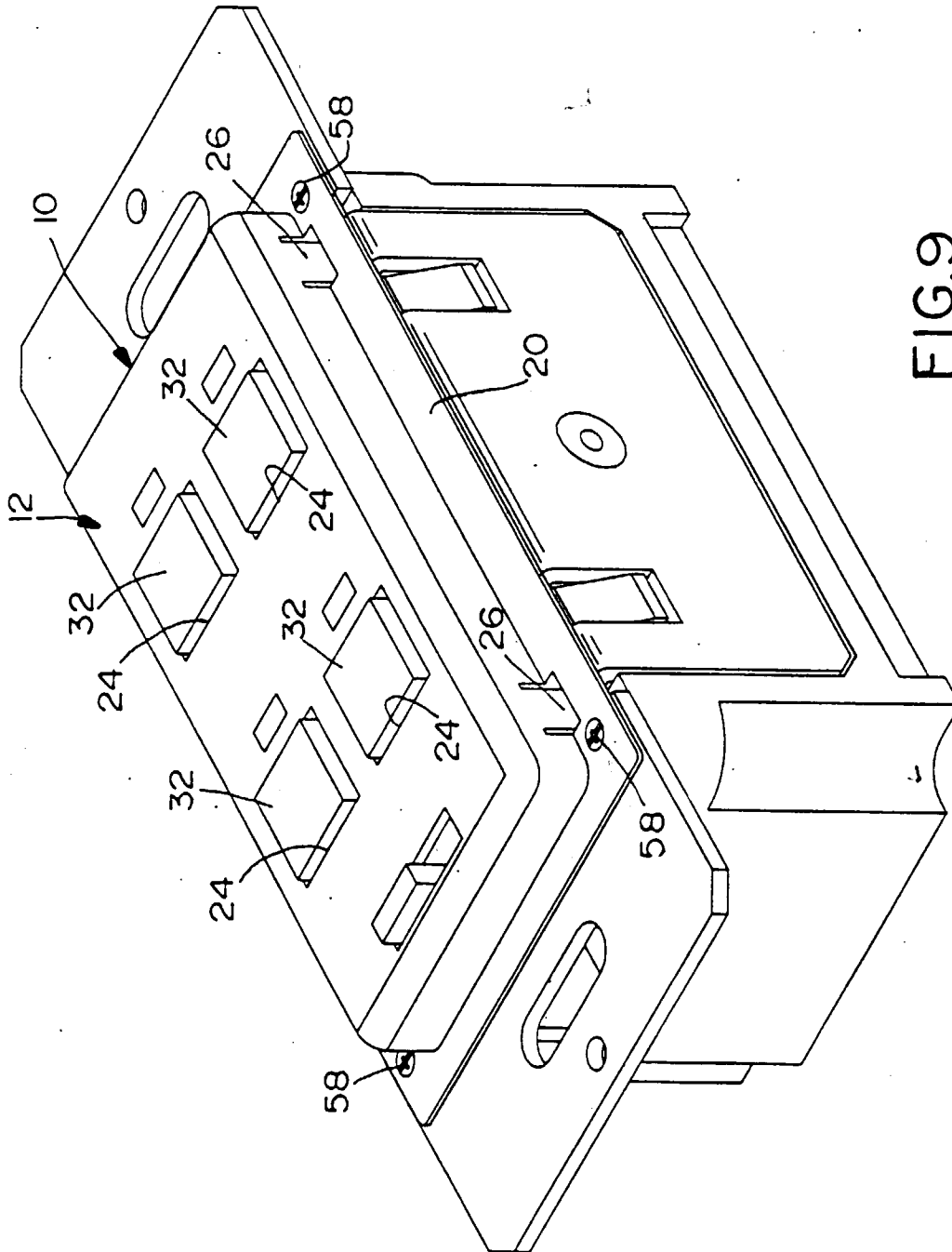


FIG. 9

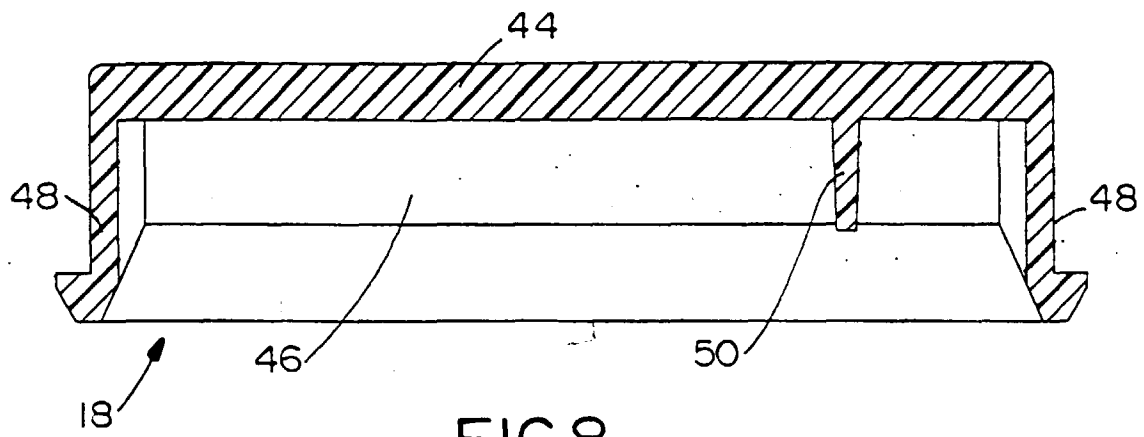


FIG. 8

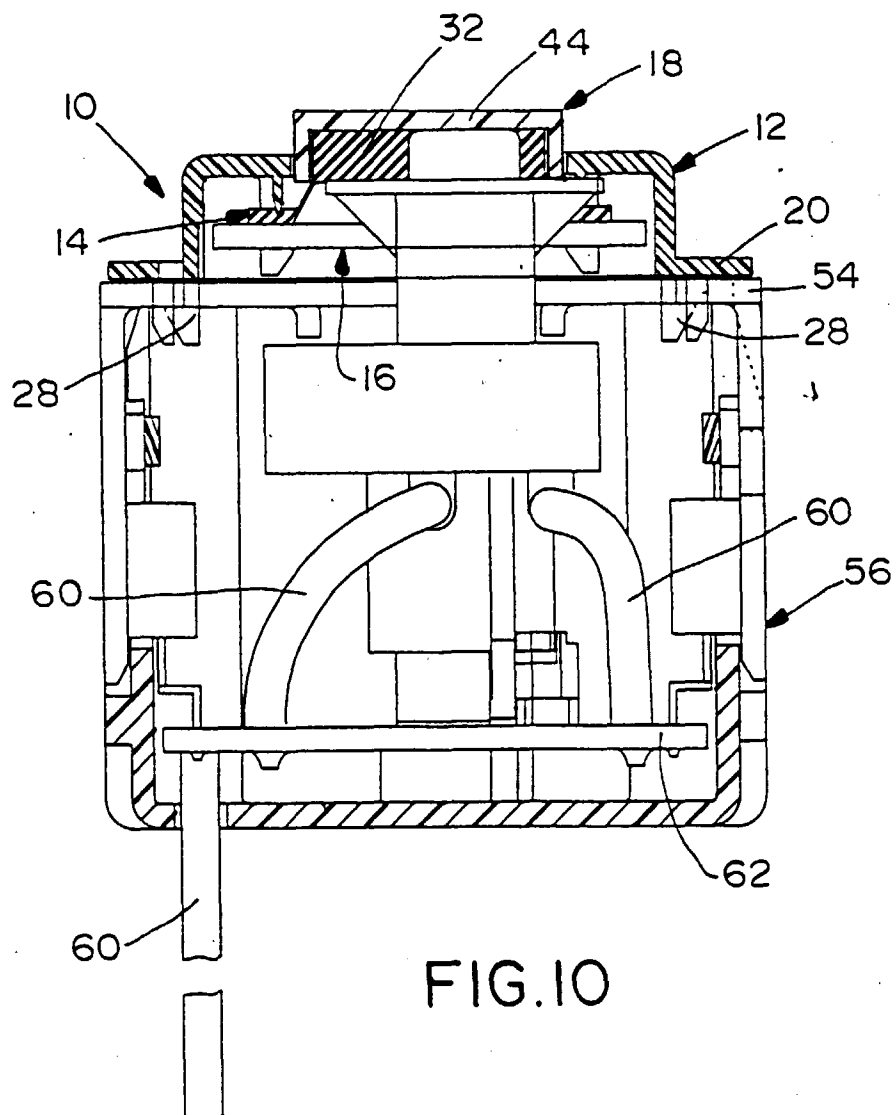


FIG. 10