# United States Patent [19]

**Rico**

[11] **3,809,841**

[45] **May 7, 1974**


[54] **BUTTON FOR ELECTRICAL SWITCH OR THE LIKE**


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[22] Filed: **June 27, 1973**

[21] Appl. No.: **374,258**

[52] **U.S. Cl.** ..... **200/329,** 403/354, 403/365

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

[58] **Field of Search** ..... 200/172 R, 159 R; 403/354, 403/365, 372; 16/121, 43; 29/622



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*Primary Examiner*—Robert K. Schaefer
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*Attorney, Agent, or Firm*—Cooper, Dunham, Clark, Griffin & Moran



[57] **ABSTRACT**

For use with an electrical switch having a manually movable actuating blade, a button comprising a solid metal block having a slot in one end for receiving the blade, and cylindrical nylon insert members press-fitted into recesses formed in the block along the sides of the slot for engagement with the side edges of the blade, the insert members being compressed by the blade so as to hold the button securely on the blade.


**6 Claims, 8 Drawing Figures**

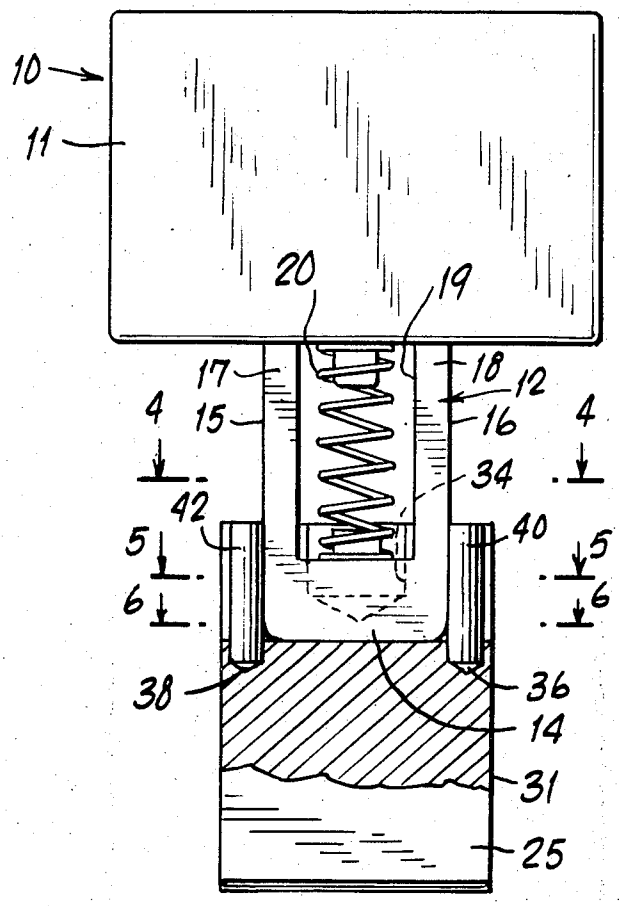


Fig. 1.

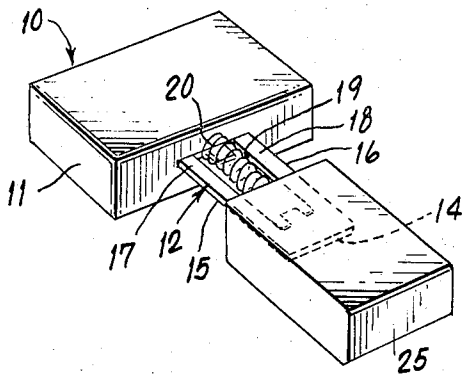



Fig. 2.

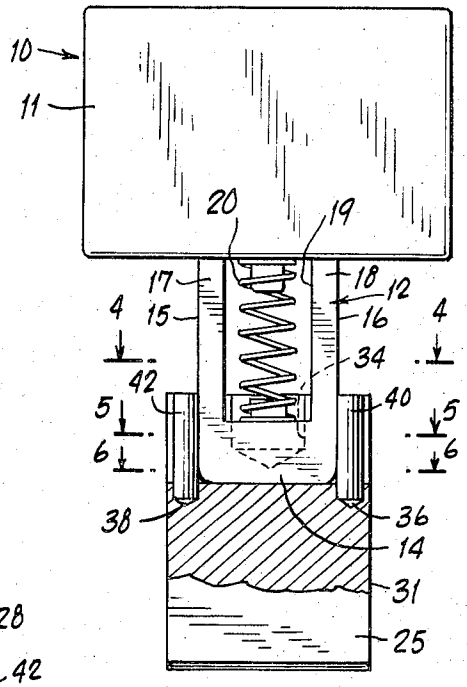



Fig. 3.

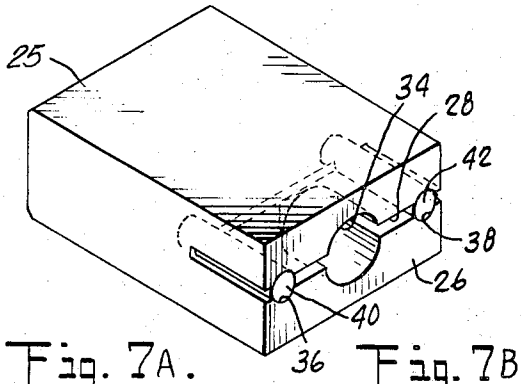



Fig. 4.

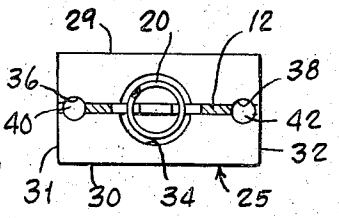



Fig. 7A.

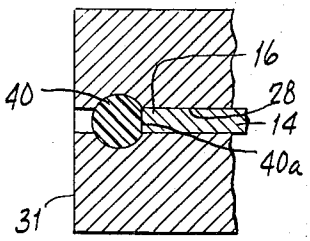
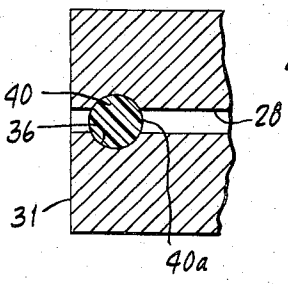



Fig. 7B.



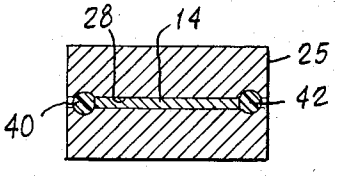




Fig. 6.

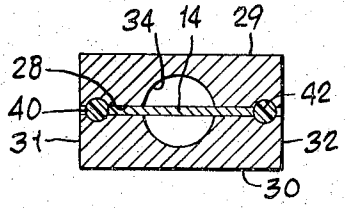



Fig. 5.

# BUTTON FOR ELECTRICAL SWITCH OR THE LIKE

## BACKGROUND OF THE INVENTION

This invention relates to handles or buttons for electrical switches and the like. Specifically, it relates to switch buttons of the press-on type.

Many electrical switches include a manually movable actuating member, typically in the form of a free-ended, axially rectilinear blade having two or more lateral flanges with parallel side edges, over which a button is fitted to facilitate manual operation of the member as well as to provide an attractive or decorative appearance. For example, in a pushbutton switch, the actuating member is a reciprocable blade projecting from the body of the switch; a button is fitted over the free end of the blade to be engaged and pushed by a finger of a human operator.

One type of button structure widely used with electrical switches is a so-called "press-on" button, i.e. a button (having an appropriately shaped slot or recess) which is simply pressed or pushed over the free end of a switch blade in a direction parallel to the blade axis. An advantage of this type of button is that it may be easily and rapidly installed, without use of tools, after the switch is mounted within a housing structure; commonly, the switch blade is arranged to project through a relatively small opening in a housing, and in such case, it is not practicable to fixedly secure a button to the blade prior to mounting of the switch.

Desirably, a press-on button should be structurally simple, and capable of being removed and remounted e.g. incident to repair or other disassembly of the apparatus in which the switch is incorporated; yet it should also be firmly secured to the blade so that it will not become accidentally detached from the blade during use. Heretofore, it has been difficult to achieve ensured adequately secure engagement between press-on buttons and switch blades without sacrifice of structural simplicity, ease of installation, and/or removability of the button.

## SUMMARY OF THE INVENTION

An object of the present invention is to provide a new and improved press-on button which is simple and durable in structure, readily installed, easily removed and remounted, and which affords enhanced security of engagement with a switch blade when mounted thereon.

To this and other ends, the invention broadly contemplates the provision of button structure comprising a solid metal body having an axially rectilinear slot formed in one end for receiving a free end of a switch blade with a clearance fit when the button body is pressed or pushed in an axial direction over the blade free end, each side of the slot being enlarged to form a recess axially parallel to the slot; and a plurality of resiliently compressible insert members respectively press-fitted into these recesses for lateral engagement with the parallel side edges of the blade when the blade is received within the slot. The disposition of the recesses is such that the blade edges laterally compress the insert members, and in consequence the insert members exert opposing forces on the blade, in directions perpendicular to the direction of axial movement of the blade into and out of the slot; these forces effectively



clamp the blade within the slot, thereby securely holding the button on the blade.

The aforementioned recesses, and also the insert members (which are preferably fabricated of nylon) may be of cylindrical configuration. As a specific feature of the invention, the recesses extend into the metal body to a depth greater than that of the slot, so that the inner extremities of these recesses constitute fully laterally enclosed sockets for receiving and securely holding the bases of the insert members. The recesses and the slot open outwardly through a common end face of the metal body, through which the insert members are introduced to the recesses in an axial direction. The metal body is sufficiently thick, on each side of the slot, as to be essentially rigid.

In a broad sense, the button structure of the invention may be adapted for use with a switch blade having two, three or more radial flanges, the slot being shaped to conform to the cross-sectional configuration of the blade and having an insert-member-holding recess disposed for register with the lateral edge of each flange of the blade. The forces exerted by the insert members on the flange edges are directed radially inwardly, i.e. toward the axis of the blade. Again stated broadly, a button embodying features of the invention may be adapted for use with a switch blade of reciprocating (push-button), rotary or other type. It will be understood that the term "switch blade" as herein used refers to a free-ended projecting member which is manually movable to actuate an electrical switch.

The invention in one specific embodiment, adapted for use with a flat reciprocating switch blade having opposed parallel side edges (wherein the opposite side edge portions of the blade are herein considered as constituting a pair of opposed radial flanges integral with the blade, which may be a unitary flat metal member), comprises a rectangular solid metal body having a blade-receiving slot in one end with axially parallel cylindrical recesses formed along opposite sides of the slot, and a pair of cylindrical nylon insert members press-fitted therein. The slot may also include an enlarged central bore portion for accommodating the end of a helical return spring incorporated in the switch blade structure. The nylon insert members, when compressed radially by the opposite side edges of the blade within the slot, exert opposed forces on the blade, securely clamping the blade between them.

Further features and advantages of the invention will be apparent from the detailed description hereinbelow set forth, together with the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a button structure embodying the present invention in a particular form, as mounted on a switch of the push-button type;

FIG. 2 is an enlarged plan view, partly in section, of the button and switch of FIG. 1;

FIG. 3 is an enlarged perspective view of the button of FIG. 1;

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 2;

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 2;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 2; and

FIGS. 7A and 7B are enlarged fragmentary sectional views similar to FIG. 6 respectively illustrating the

cross-sectional shape of one of the insert members of the FIG. 1 button structure when the blade of a switch is present in and absent from the slot of the button.

## DETAILED DESCRIPTION

For purposes of specific illustration, the present invention will be described as embodied in a button structure adapted for use with a push-button electrical switch of the type shown at **10** in FIGS. **1** and **2.** This switch, which may be generally conventional in character, includes operative mechanism (not shown) for making and breaking an electrical circuit, enclosed within a housing structure **11.** An axially reciprocable actuating blade **12,** having a free end **14,** projects through an opening in a side wall of the housing **11** and is connected to the aforementioned operative mechanism in such manner that reciprocating movement of the member **12** causes an electrical circuit to be opened or closed.

The blade **12** as shown is a flat metal member having opposed parallel side edges **15** and **16.** The side portions **17** and **18** of the blade may be considered as constituting opposed coplanar radial flanges, i.e. flanges extending laterally of the blade in opposite directions from the rectilinear axis thereof. A central opening **19** is formed in the blade to accommodate a helical spring **20** disposed in coaxial relation to the blade; this spring, under compression between the blade and fixed structure, urges the blade in an axial direction away from the housing **11.** The structure and operation of a push-button electrical switch blade of the described type are well known in the art and accordingly need not be described in further detail.

As adapted for use with the aforementioned blade **12,** the button structure of the invention in its illustrated embodiment comprises a rectangular solid metal body **25,** e.g. fabricated of aluminum, having in one end portion **26** a slot **28** (FIG. **3**) for receiving the free end portion **14** of the blade **12.** Slot **28** longitudinally bisects the end face of the body **25** at **26** and extends therefrom into the body, e.g. for a distance equal to about one-third the length of the body, intermediate and parallel to the opposite major surfaces **29** and **30** of the body. Conveniently the slot **28** may be formed by making a saw cut through the end portion **26** of the body, so that the slot opens through the end face of the body and extends from side to side thereof, opening also through adjacent portions of the side surfaces **31** and **32** of the body. The dimension of the body **25** between sides **31** and **32** is substantially greater than the width of the switch blade **12;** hence the corresponding dimension, or width, of the slot **28** thus formed is similarly greater than the width of blade **12.** It will be understood that the openings of the slot through the sides of the body **25** occur incident to formation of the slot by a saw cut, and that the slot may alternatively be formed in other ways wherein no openings are made in the sides of the body.

The transverse dimension of the slot **28,** i.e. in a direction perpendicular to surfaces **29** and **30,** is at least slightly greater than the thickness of blade **12** to provide a clearance fit between the blade and the slot walls when the blade is inserted in the slot. At the central portion of its opening through the end face of the body at **26,** the slot **28** may be enlarged by a bore **34** to accommodate the end of spring **20** engaging blade **12,** as best seen in FIG. **4.** The axis of this bore may be coincident with the longitudinal axis of the body **25,** which is also the axis of symmetry of slot **28** to which reference will hereinafter be made as the slot axis.

At each side of the body **25,** but inwardly of the side surfaces thereof, the slot **28** is enlarged to form a pair of cylindrical recesses **36** and **38** which open through the end face of the body at **26** and extend therefrom into the body in axially parallel relation to each other and to the slot. These recesses, which have equal diameters greater than the aforementioned transverse dimension of the slot **28,** are spaced apart by a distance slightly less than the width of the blade **12.** As shown in FIGS. **2** and **3,** the two recesses **36** and **38** extend into the body to a depth somewhat greater than the depth of slot **28** so that the inner extremities of the recesses constitute fully laterally enclosed sockets.

A pair of resiliently compressible cylindrical insert members **40** and **42** are respectively press-fitted into the recesses **36** and **38,** being introduced through the end face of the body at **26.** These insert members in unstressed condition have a diameter slightly greater than the diameter of the recesses **36** and **38** so that they fit snugly within the recesses and are of such length that they seat in the aforementioned sockets at the inner ends of the recesses while their outer ends are substantially flush with the end face of the body at **26.** When the insert members are received within the recesses **36** and **38,** longitudinal surface portions of the insert members face each other across the slot **28** and effectively constitute side walls of the slot, being spaced apart by a distance slightly less than the width of the blade **12.**

The described insert members **40** and **42** may be fabricated of a suitably durable, wear-resistant plastic material somewhat more readily compressible than the metal of the body **25,** yet nevertheless relatively resistant to compression. One especially suitable and presently preferred material for these insert members is nylon; i.e. in the illustrated embodiment, members **40** and **42** are short solid nylon rods.

The use of the described button structure may now be readily explained. Body **25** is held e.g. manually with the end portion **26** facing blade **12** of the switch **10,** and the blade is then inserted in the slot **28** between the insert members **40** and **42** by manually pressing the button onto the blade as far as it will go in a direction parallel to the axis of the blade, i.e. until the free end **14** of the blade seats against the inner extremity of slot **28.**

Since the distance between the facing surface portions of insert members **40** and **42** within the slot is slightly less than the width of the blade **12,** the side edges **15** and **16** of the blade respectively press against and compress the insert members **40** and **42** as the blade is inserted in the slot. This compression is illustrated in FIGS. **7A** and **7B,** which show the change in cross-sectional configuration of the member **40,** especially at surface portion **40***a* (facing the interior of the slot) produced by insertion of the blade within the slot. This compression occurs in a lateral direction, i.e. radially outwardly with respect to the axis of the blade **12.**

When thus compressed, the insert members **40** and **42** (being substantially resistant to compression) respectively exert opposed forces on the blade **12,** these forces being directed laterally of the blade, i.e. toward the axis thereof from opposite directions perpendicular

to the axis, with the result that the blade is strongly clamped within the slot between members **40** and **42.**

In this way, secure attachment of the button body **25** to the blade **12** is achieved without use of tools or auxiliary fastening means such as set screws. It is found that the clamping action resulting from the compression of the insert members **40** and **42** is fully effective to prevent accidental dislodgement of the button from the blade, although the button may be removed from the blade if desired by exerting a strong pulling force on the button in an axial direction away from the blade. Ordinary pulling forces such as may be exerted on the button to displace the button outwardly relative to the switch, i.e. incident to use of the switch, do not dislodge the blade.

The insert members **40** and **42** are securely held in the socketed recesses **36** and **38** even when the button is pulled off the blade. It may be explained that the rigid metal body **25** is of sufficient thickness, on each side of the recesses **36** and **38,** to be essentially free from deformation incident to insertion and removal of the blade. This rigidity of the metal body cooperates with the insert members in maintaining strong and secure attachment of the button to the blade.

In a specific example of construction of the described embodiment of the invention, with a metal body having a thickness of 0.375 inch (between surfaces **29** and **30**) and a width of 0.680 inch (between surfaces **31** and **32**) and a slot having a transverse dimension of 0.043 inch and a depth of 0.312 inch, recesses **36** and **38** (0.375 inch deep and spaced apart 0.560 inch on centers) have a diameter of 0.093 inch; thus the thickness of the aluminum body, on each side of each recess (i.e. between the recess and the adjacent surface **29** or **30**) is about 0.141 inch, i.e. substantially greater than the recess diameter. In this example, each of the nylon inserts **40** and **42** is compressed 0.008 inch by insertion of the switch blade within the slot. This extent of compression is found to afford highly secure attachment of the button to the blade.

It is to be understood that the invention is not limited to the features and embodiments hereinabove specifically set forth but may be carried out in other ways without departure from its spirit.

I claim:

**1.** For use with a switch including a manually movable actuating blade having an axially rectilinear free end portion and at least two lateral flanges with side edges parallel to the axis of the free end portion, button structure comprising

a. a rigid solid body having a slot formed in one end thereof for receiving the free end of the blade with clearance, said slot having sides corresponding in number and disposition to the sides edges of the flanges of the blade, each of said slot sides being enlarged to form a recess axially parallel to the slot and opening through said one end of said body; and

b. a plurality of resiliently compressible insert members respectively press-fitted into said recesses for lateral engagement with the side edges of the blade when the blade is received within the slot;

c. said insert members being disposed for lateral compression by the blade edges in such respective directions that the insert members exert opposing forces on the blade directed toward and perpendicular to the blade axis for clamping the blade within the slot.

**2.** Structure as defined in claim **1** wherein said recesses and said insert members are substantially cylindrical.

**3.** Structure as defined in claim **2** wherein said recesses extend into said body to a depth greater than the depth of said slot such that the inner ends of the recesses are fully laterally enclosed sockets for receiving the inner ends of said insert members.

**4.** Structure as defined in claim **1** wherein said insert members are fabricated of nylon.

**5.** For use with an electrical switch including a blade having an axially rectilinear free end with opposed parallel side edges, button structure comprising

a. a solid metal body having an end face and a slot opening through said end face and extending into said body for receiving the blade with clearance, opposite sides of the slot being enlarged to form cylindrical recesses axially parallel to the slot; and

b. a pair of cylindrical nylon insert members respectively press fitted into said recesses for lateral engagement with the opposite side edges of the blade when the blade is received within the slot;

c. said insert members being disposed for lateral compression by the blade in opposite directions such that the insert members exert opposing forces on the blade directed toward and perpendicular to the axis of the blade for clamping the blade within the slot.

**6.** Structure as defined in claim **5** wherein said body has a thickness, on each side of each of said recesses, greater than the diameter of the recess.

* * * * *

# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,809,841 Dated May 7, 1974

Inventor(s) Luis Edgar Rico

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Cover Sheet, Column 1, line 3, change "[76]" to -- [75] --.

after line 5 insert the following -- [73] Assignee: The Sequerra Co., Inc., Woodside, New York --.

Signed and sealed this 19th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334