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S. L. FRANK

3,371,180

MEANS FOR FIXEDLY POSITIONING A SWITCH ON A PANEL

Filed June 24, 1966

FIG.3.

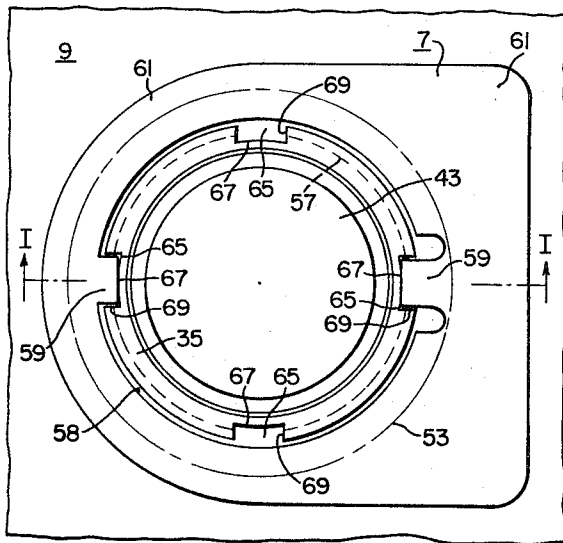


FIG.4.

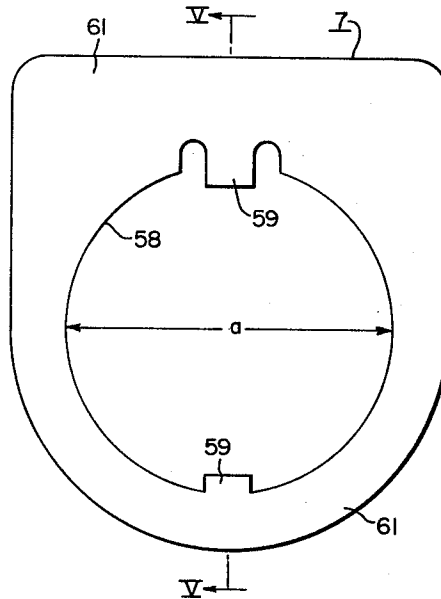


FIG.1.

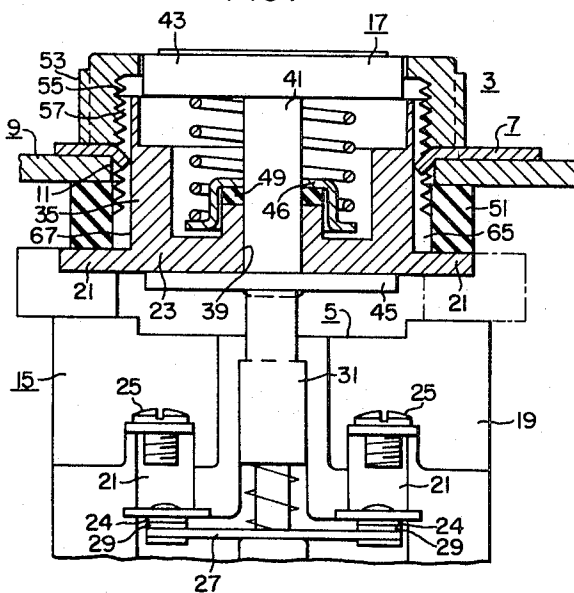


FIG.2.

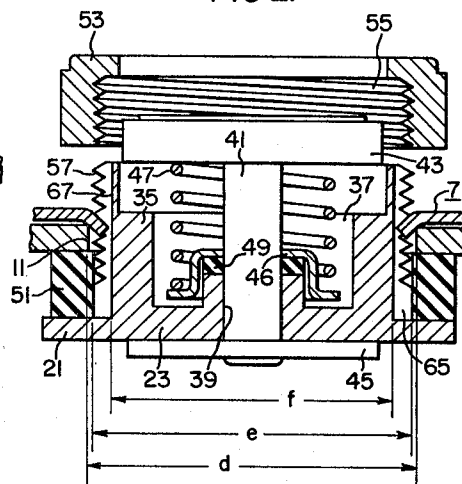
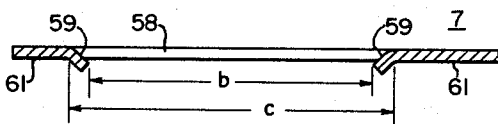


FIG.5.



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1

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MEANS FOR FIXEDLY POSITIONING A SWITCH ON A PANEL

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ABSTRACT OF THE DISCLOSURE

An improved plate is provided for fixedly positioning a switch on a panel. An improved combination comprises a nameplate that cooperates with a switch structure and panel to prevent rotation of the switch structure on the panel.

It is old in the control art to mount a switch on a support panel by passing a tubular threaded inner support member up through an opening in the panel and screwing a clamp ring on the support member to draw a flange part of the support member toward the panel to a supported position. It is old to clamp a front nameplate between the clamp ring and the front of the support panel. At least two different prior-art constructions have been used to prevent rotation of a switch on the panel. In accordance with one prior-art construction a notch was formed in the inner support member and a notch was also formed in the support panel at the periphery of the opening in the support panel through which the inner support member was passed, and the nameplate was provided with two tab parts that projected into the two notches in order to prevent rotation of the switch on the panel. This first prior-art type of construction required an operation forming a slot in the panel at the periphery of the opening in the panel through which the inner support member passed. In accordance with the second prior-art construction, a separate opening was drilled in the panel in proximity to the opening through which the inner support member passed and a dowel pin was formed on the inner support member to fit into the separate opening on the support panel to prevent rotation of the switch on the panel. This second prior-art type of construction required the formation of the dowel pin on the inner support member and also an operation forming the separate hole in the panel. It is desirable to save the control panel builder the time and expense of forming either the slot in the panel of the first prior-art type of construction or the combination dowel pin and separate opening of the second prior-art type of construction.

Accordingly, an object of this invention is to provide improved means for fixedly mounting a switch against rotation on a control panel that is provided, at the switch station, with only a single generally circular opening therein through which part of the switch is passed.

Another object of this invention is to provide an improved front plate for preventing rotation of a switch on a control panel.

Another object of this invention is to provide an improved combination comprising a front plate and a switch structure that can be mounted on a control panel through a generally circular opening in the control panel, which switch structure and front plate will be automatically fixed against rotation when mounted on the panel.

A further object of this invention is to provide an improved combination comprising a control panel, and a switch and front plate combination mounted on the control panel in a fixed position.

Further objects and advantages of the invention will become apparent from the following detailed description

2

when read in conjunction with the accompanying drawing, in which:

FIGURE 1 is a sectional view taken along the line I—I of FIG. 3 with a front clamp ring that is not shown in FIG. 3 being shown in FIG. 1;

FIG. 2 is a view similar to FIG. 1 with the parts being shown in positions reached before the clamp ring is tightened down;

FIG. 3 is a top plan view of the switch of FIG. 1 with the front clamp ring removed;

FIG. 4 is a top plan view of the front nameplate of FIG. 3, which nameplate is rotated 90° in a counterclockwise direction from the position seen in FIG. 3; and

FIG. 5 is a sectional view taken along the line V—V of FIG. 4.

Referring to the drawings, there is shown, in FIG. 1, a control structure 3 comprising a switch 5 and a front nameplate 7, which switch and nameplate are mounted on a panel or supporting plate 9. The supporting plate 9 is a flat generally planar plate member of rigid material such as sheet steel. A circular opening 11 is formed in the plate 9. As can be seen in FIGS. 1 and 2 the plate 9 is provided with a relatively sharp right-angle upper corner around the periphery of the opening 11.

The switch 5 comprises a contact block 15 and a switch operator 17. The contact block 15 comprises a molded insulating housing 19 that is secured to a flange 21 of a metallic inner support member 23 of the switch operator 17 by a plurality of screws (not shown). A pair of conducting straps 21 are suitably supported on the contact block 19. The conducting straps 21 are generally U-shaped members and each is provided with a stationary contact 24 on one leg thereof and a terminal connecting screw 25 on the other leg thereof. The screws 25 are used to connect conductors to the conducting members 21. A bridging conducting contact member 27 is movably supported in suitable slots on the insulating housing 19 of the block. A pair of movable contacts 29 are supported on the opposite ends of the bridging member 27. Suitable means (not shown) bias the conductor 27 in an upward position to the contact-closed position seen in FIG. 1. An insulating operator 31 is supported on the contact block 15 for vertical reciprocal movement. In operation the insulating operator 31 is moved downward to force the bridging contact member 27 downward to open the contacts 24, 29. Upon release of the operator 31, suitable biasing means will force the bridging member 27 and operating member 31 up to the contact-closed position seen in FIG. 1.

The inner support member 23, of the switch operator 17, is a metallic tubular member comprising a flange part 21 and an integral upper cylindrical externally threaded part 35. The upper part 35 of the inner support member 31 is provided with a well-opening 37 open at the front and an opening 39 through the center thereof for receiving a rod portion 41 of a push-button operator 43. The push-button operator 43 is provided with an inner disk shaped plate member 45, at the inner end thereof, that engages the operator 31 of the contact block 15 to operate the operator 31 upon depression of the push-button operator 43. A spring 47 is provided in the well opening 37 of the inner support member 23. The spring engages the top portion of the push-button 43 at the upper end thereof and a spring support 47 at the lower end thereof. A sealing gasket 49 is provided on the inner support member 23 between the support member 23 and spring support 47 to prevent the passage of oil into the switch at the installation. The spring 47 biases the push-button 43 to the upper position seen in FIG. 1. A sealing gasket 51 is provided between the flange 21 of the inner support member 23 and the lower surface of the support plate 9. A clamp ring 53 is provided with an internally threaded por-

tion 55 that cooperates with the external threads 57 of the inner support member 23.

When it is desired to mount the switch 5 on the panel or support plate 9 the switch, with the clamp ring 53 removed, is moved up through the opening 11 in the support plate 9. Thereafter, the nameplate or front plate 7 is moved axially down over the upper threaded tubular part 35 of the inner support member 23 to engage the front of the support plate 9. The clamp ring 53 is then screwed onto the upper part 35 of the inner support member 23 to draw the support member 23 upward squeezing the O-ring 51 between the flange 21 and the undersurface of the support plate 9 and squeezing the front plate 7 downward into engagement with the front surface of the support plate 9. When the clamp ring 53 is tightened the switch 5 is fixedly supported on the support plate 9 with the gaskets 49, 51 providing an oil tight seal to prevent the passage of oil into the panel structure.

Improved means is provided for preventing rotation of the switch 5 on the panel or support plate 9 during the mounting operation when the clamp ring 53 is rotated to the tightened position and for fixedly maintaining the switch 5 on the panel 9 against rotation when the clamp ring 53 is in the tightened position. Referring to FIGS. 4 and 5 it will be noted that the nameplate or front plate member 7 is a flat planar member having circular opening 57 therein. The diameter of the opening 57 is a dimension a . The plate 7 is a member of metal softer than the metal of the support plate 9. In one successfully used application the member 7 is an aluminum member and the member 9 is a rigid steel member. The front plate 7 is formed with two tabs 59 that extend within the periphery of the circular opening 57 and that are bent over from the flat planar main body part 61 of the plate 7 at a 45° angle from the plane of the main body part 61. As can be seen in FIG. 5, the dimension between the closest edges of the tabs 59 is a dimension b . The dimension between the parts of the lower flat surface of the main body part 61 where the tabs 59 are bent over (the inner corners as seen in FIG. 5) is a dimension c . As can be seen in FIGS. 1-3 (the clamp ring 53 is not shown in FIG. 3) the upper tubular threaded part 35 of the inner support member 23 is provided with four slots 65 which are cast into member 49 before machining of the threads 57. The slots 65 extend vertically in the direction parallel to the axis of the tubular member 23. As can be seen in FIG. 3, each of the four slots 65 comprises a back wall 67 and two side walls 69. Each of the slots is open at the top or front. As can be seen in FIG. 2, the circular opening 11 in the support plate 9 is provided with a dimension d and the opening is cut such that there is a sharp right angle corner around the front periphery of the opening. It is also to be noted that in FIG. 2 that the dimension or diameter of the inner support member 23 between the apexes of the threads 57 is a dimension e . The diameter or dimension between the back wall 67 of each pair of opposite slots 65 is a dimension f .

As was previously set forth, when the switch 5 and front plate 7 are mounted on the supporting plate 9 the inner support member 23 is moved up through the opening 11 in an axial direction from the underside of the panel 9. The dimension d (FIG. 2) of the opening 11 is larger than the dimension e of the inner support member 23 so that the member 23 can be freely moved upward in an axial direction into the opening 11. Thereafter, the front plate 7 is moved axially down over the tubular threaded part 35 of the inner support member 23 to the position seen in FIG. 2. The dimension a (FIG. 4) of the front plate 7 is larger than the dimension e (FIG. 2) of the inner support member 23 so that the front plate 7 can be freely moved axially down into the position seen in FIG. 2. The tab parts 59 of the front plate 7 move within two opposite slots 65 of the inner support member 23 when the front plate 7 is moved onto the inner support member 23. The dimension b (FIG. 5) of the front plate

7 is greater than the dimension f (FIG. 2) of the inner support member 23 so that the tabs 59 can move down in the slots 65. The dimension b (FIG. 5) of the front plate 7 is less than the dimension e (FIG. 2) of the inner support member 23 so that the tabs 59 will engage the side walls 69 of the opposite slots 65 to prevent relative rotational movement between the front plate 7 and the switch 5. The dimension c (FIG. 5) of the front plate 7 is greater than the dimension d (FIG. 2) of the opening 11 of the support plate 9 so that the upper corner around the periphery of the openings 11 will engage the tabs 59 at the slanted angle parts of the lower surfaces of the tabs 59 (FIG. 2) to prevent the front plate 7 from settling down flatwise on the front of the support plate 9 when the front plate 7 is moved to the position seen in FIG. 2. It will be seen in FIG. 2 that if further pressure is applied to the front plate 7 the upper corner of the periphery of the opening 11 of the rigid steel supporting plate 9 will tend to force the tabs 59 to a straightened position. It is to be noted, however, that the dimension f between the back walls 67 of the opposite slots 65 is large enough, relative to the dimension b between the tabs, that the closest corners or edges of the tabs 59 will engage the back walls 67 to prevent straightening of the bent over tabs 59. Thus, as the clamp ring 53 is tightened down against the front plate 7 the upper corner of the rigid steel support plate 9, at the periphery of the opening 11, will dig into the relatively soft aluminum of the tabs at the lower slanted surfaces of the tabs 59 causing the aluminum metal to flow to provide a tight frictional engagement between the front plate 7 and the support plate 9 in the position seen in FIG. 1. This frictional engagement between the front plate 7 and the support plate 9 with the front corner, at the periphery of the opening 11, of the supporting plate 9 cutting into the lower slanted surfaces of the tabs 59 of the front plate 7 will prevent relative rotation between the front plate 7 and the supporting plate 9 as the clamp ring 53 is rotated to a tightened position, and this engagement will prevent relative rotation between the front plate 7 and supporting plate 9 after the clamp ring 53 is in the tightened position. With the tabs 59 serving to prevent relative rotation between the switch 5 and the front plate 7, and with the tabs 59 serving to prevent relative rotation between the front plate 7 and the support plate 9, it can be understood that the tabs 59 serve to prevent relative rotation between the switch 5 and the support plate 9. Thus, the switch 5 is fixedly mounted on the panel 9 against rotation in a circular opening 11 on the panel 9. The main body part 61 of the nameplate or front plate 7 in practice can be marked with suitable indicia such as "start" and "stop." Moreover, the trademark of the switch or other information can be printed on the nameplate or front plate 7. As can be seen in FIGS. 1 and 3, part of the main body part 61 of the front plate 7 is outside the front elevational view dimensions of the switch 5 where indicia, that may be printed thereon, will be visible from the front of the control panel.

The push-button 5 shown in the drawings is operated by depressing the part 43 of the operator 17 against the bias of the spring 47 to move the operator 31 and bridging contact member 27 downward opening the contacts 23, 29. Upon release of the push-button 43 the spring 47 moves the push-button operator 17 upward to the position seen in FIG. 1 and the suitable biasing means (not shown) returns the operator 31 and the bridging contact member 27 upward to the contact-closed position seen in FIG. 1. The switch 5 can be any of a number of standard types of switches. For some applications, the switch can comprise a rotatable operator. For example, the switch 5 could be a rotary switch of the type disclosed in the patent to S. L. Frank et al. Patent No. 2,798,908, issued July 9, 1957. Another type of switch that could be readily used in the improved combination is a rotary selector push-button switch of the type disclosed in the patent to

J. H. Mullen, Patent No. 3,170,995, issued February 23, 1965.

From the foregoing, it can be understood that there is provided by this invention improved means for fixedly mounting a switch on a support plate. The inner support member of the switch is passed through a circular opening in the support plate and a clamp ring is screwed onto the inner support member at the front side of the support plate to sandwich a front plate between the clamp ring and the front side of the support plate. The front plate cooperates with the switch and support plate to prevent relative rotation between the switch and support plate.

Since changes may be made in the above-described construction, and because different embodiments of the invention may be made without departing from the spirit and scope of the invention, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In combination,
 - a switch operator comprising an inner support member and a front clamp ring, said inner support member comprising a tubular externally threaded part and an inner flange part, said tubular externally threaded part of said inner support member having a notch at the external part thereof open at the upper part of said tubular externally threaded part which notch provides a gap in the threads of said externally threaded part,
 - a front plate for fixedly positioning said switch operator on a support plate, said front plate comprising a generally flat generally planar main body part having a front side and a back side, said main body part having an opening therein, said front plate comprising a tab part bent over inward from said main body part at said opening at an angle less than 90° from the front plane of said main body part, said front plate being constructed with said opening of such dimension relative to the diameter of said externally threaded part to permit said front plate to be moved axially onto said tubular externally threaded part with said tab part moving in said notch, said front clamp ring having internal threads for cooperating with said tubular externally threaded part,
 - said front plate and said inner support member being constructed and arranged such that when said inner support member is passed up through an opening in a support plate and when said front plate is moved into the mounted position on the front end of said inner support member and when said clamp ring is thereafter screwed onto the front of said inner support member to sandwich said front plate between said clamp ring and said support plate and to draw said flange part up toward said support plate to thereby mount said switch and front plate on said support plate said tab part will engage said back wall of said notch to prevent straightening of said tab part whereby a slanted surface of said tab part will be forced against a corner of said support plate at the periphery of the opening in said support plate to provide an engagement between said front plate and said support plate that will prevent rotation of said front plate relative to said support plate,
 - and said tab part in said notch preventing relative rotation between said inner support member and said front plate whereby when said switch and front plate are mounted on said support plate said front plate will prevent relative rotation between said switch and said support plate.
2. The combination according to claim 1, and said tab part extending inward from the plane of said main body

part of said front plate at an angle of between 10° and 80° from the front plane of said main body part.

3. The combination according to claim 2, said inner support member having a pair of said notches therein, said front plate having a pair of said tab parts cooperating in said notches and adapted to cooperate with said support plate to prevent relative rotation between said switch operator and said support plate, and each of said tab parts extending inward from the plane of said main body part of said front plate at an angle of between 30° and 60° from the front plane of said main body part.

4. The combination according to claim 1, a support plate having an opening therein and supporting said front plate and switch operator at said opening, said front plate comprising a member of material that is softer than the material of said support plate, said front plate, said switch operator and said support plate being constructed and arranged such that with said clamp ring screwed down on said tubular externally threaded part of said inner support member an edge of said support plate at the periphery of said support plate opening engages the lower slanted surface of said tab part and digs into the lower slanted surface of said tab part to prevent relative rotation between said front plate and said support plate.

5. The combination according to claim 4, and said tab part extending inward from the plane of said main body part at an angle of between 10° and 80° from the front plane of said main body part.

6. The combination according to claim 4, said inner support member having a pair of said notches therein, said front plate having a pair of said tab parts cooperating in said notches and with said support plate to prevent relative rotation between said switch operator and said support plate, and each of said tab parts extending inward from the plane of said main body part of said front plate at an angle of between 30° and 60° from the front plane of said main body part.

7. The combination according to claim 6, and said front plate comprising an indicia-receiving identification part at the front surface of the main body part thereof which indicia-receiving identification part is outside of the front-elevation-view dimensions of said switch operator.

8. A combination according to claim 1, said opening in said main body part being a generally circular opening, and said tab part extending within the periphery of the circle of said opening and inward from said main body part at an angle of between 20° and 70° from the front plane of said main body part.

9. A combination according to claim 8, a support plate having an opening therein and supporting said front plate and switch operator at said opening, said front plate comprising a member of material that is softer than the material of said support plate, said front plate said switch operator and said support plate being constructed and arranged such that with said clamp ring screwed down on said tubular externally threaded part of said inner support member an edge of said support plate at the periphery of said support plate opening engages the lower slanted surface of said tab part and digs into the lower slanted surface of said tab part to prevent relative rotation between said front plate and said support plate.

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