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Schadow

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[54] **PUSH BUTTON SWITCH POSITION INDICATOR**

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June 15, 1971 Germany ..... P 21 29 688.8

[52] **U.S. Cl.** ..... **200/167 R**
[51] **Int. Cl.** **H01h 9/16**
[58] **Field of Search** ..... 200/167 R, 167 A

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Primary Examiner—H. O. Jones
Attorney—Ralph F. Merchant et al.

[57] **ABSTRACT**

A push button switch having a switch operation indicating means comprising a signal face arranged behind a window in the push button head. When the push button of the switch is depressed the signal face lies adjacent the window and when it is not depressed it is removed from it. The switch is provided with at least one covering shutter in the push button head and this shutter is arranged to pivot about an axis which is perpendicular to the axis of the switch. The covering shutter has a limb extending approximately perpendicularly from the shutter. The covering shutter is swung open by the signal surface carrying means on depressing the push button head. On the return of the push button head the limb is so swung from the rear side of the signal face carrier that the covering shutter is swung back over the signal surface.

19 Claims, 11 Drawing Figures

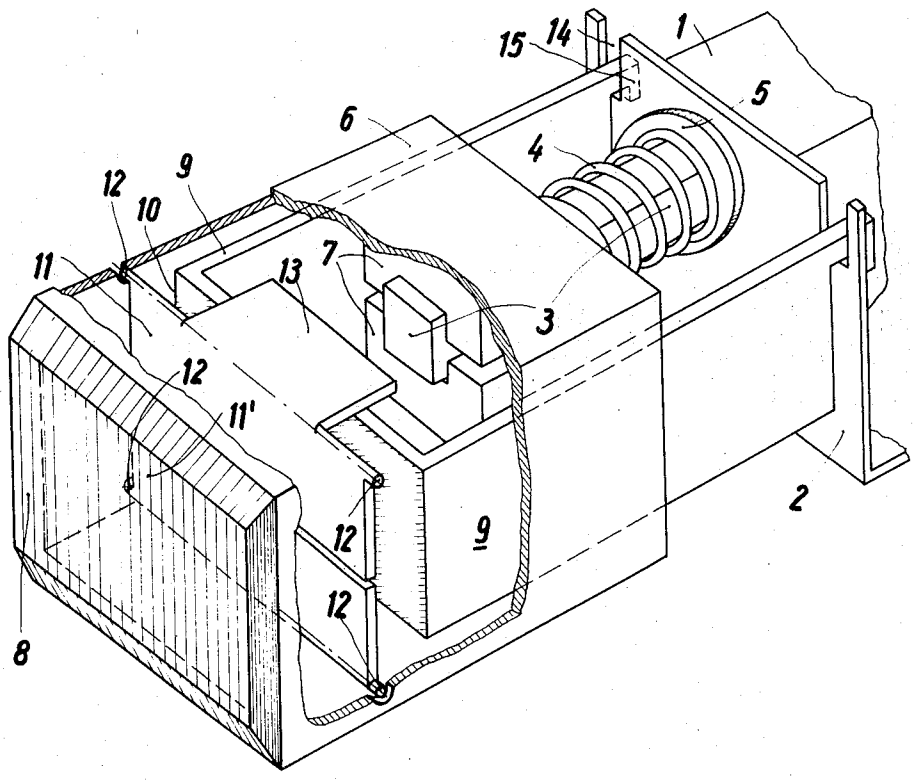

Fig. 1

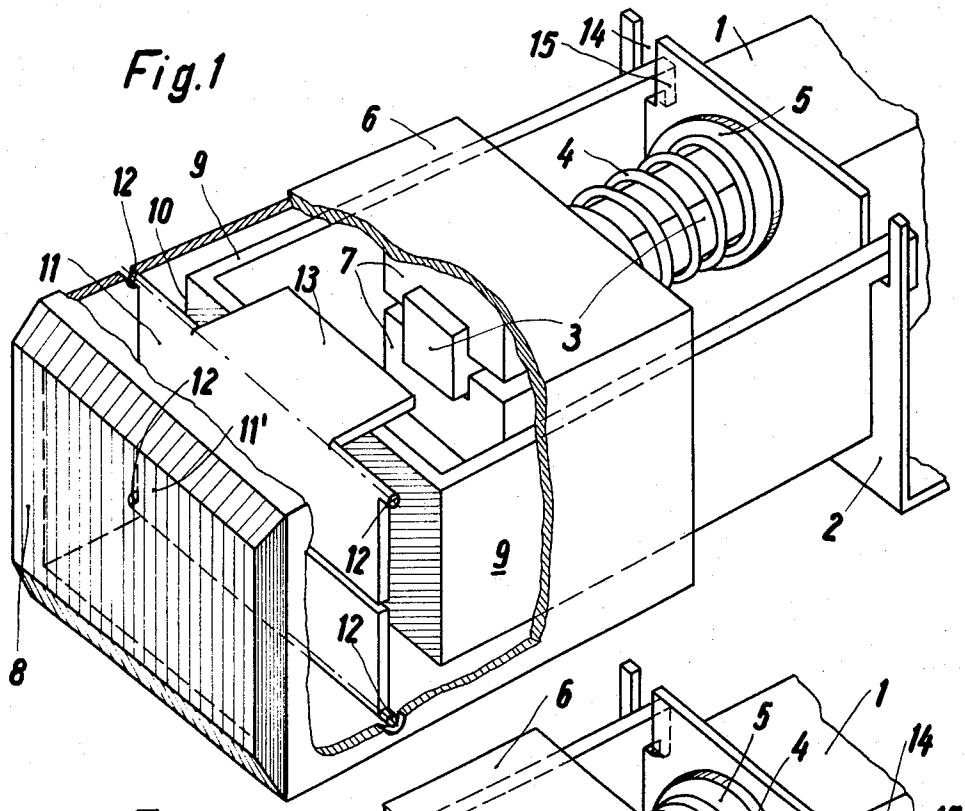
15
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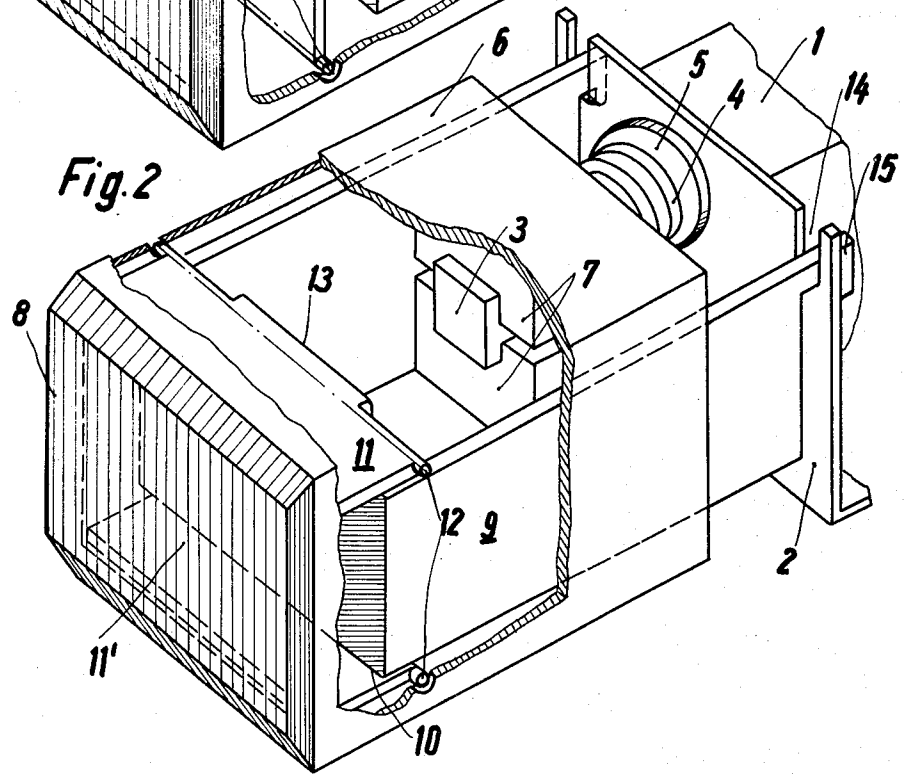
Fig. 2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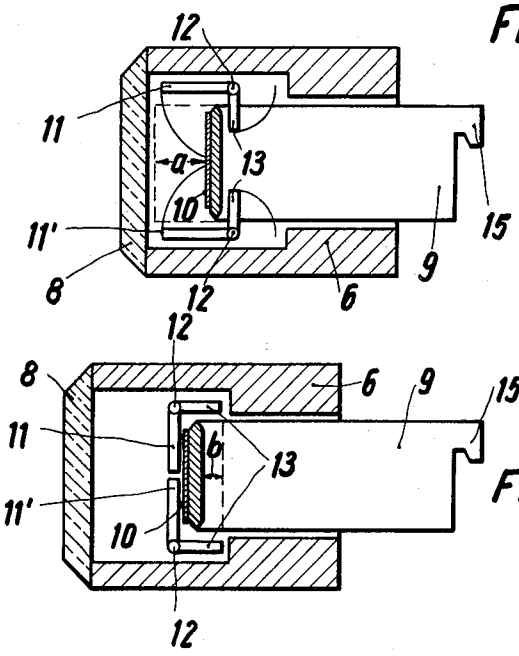

Fig.3

Fig.4

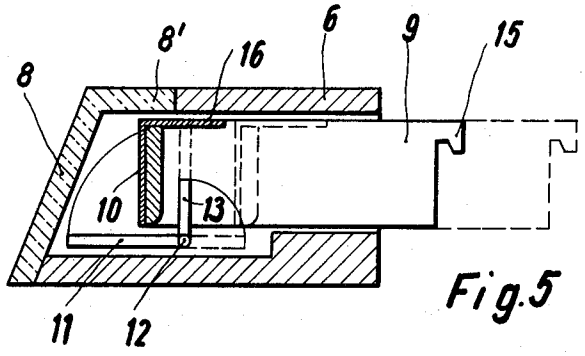

Fig.5

Fig. 6

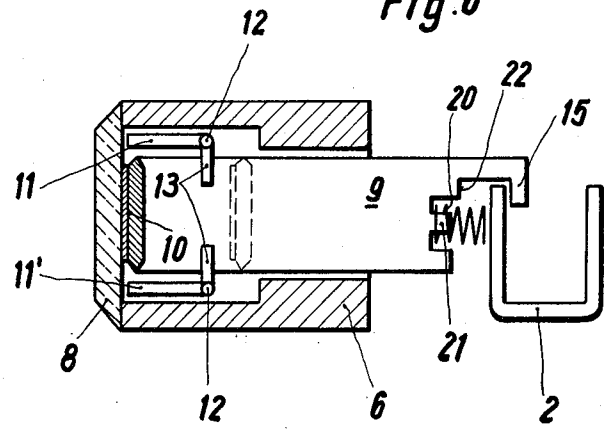
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Fig. 7

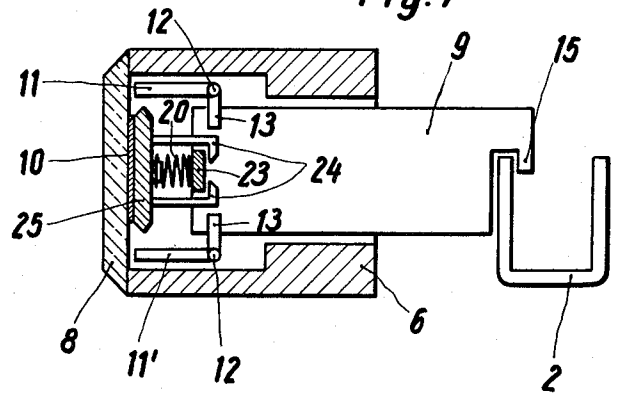
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Fig. 8

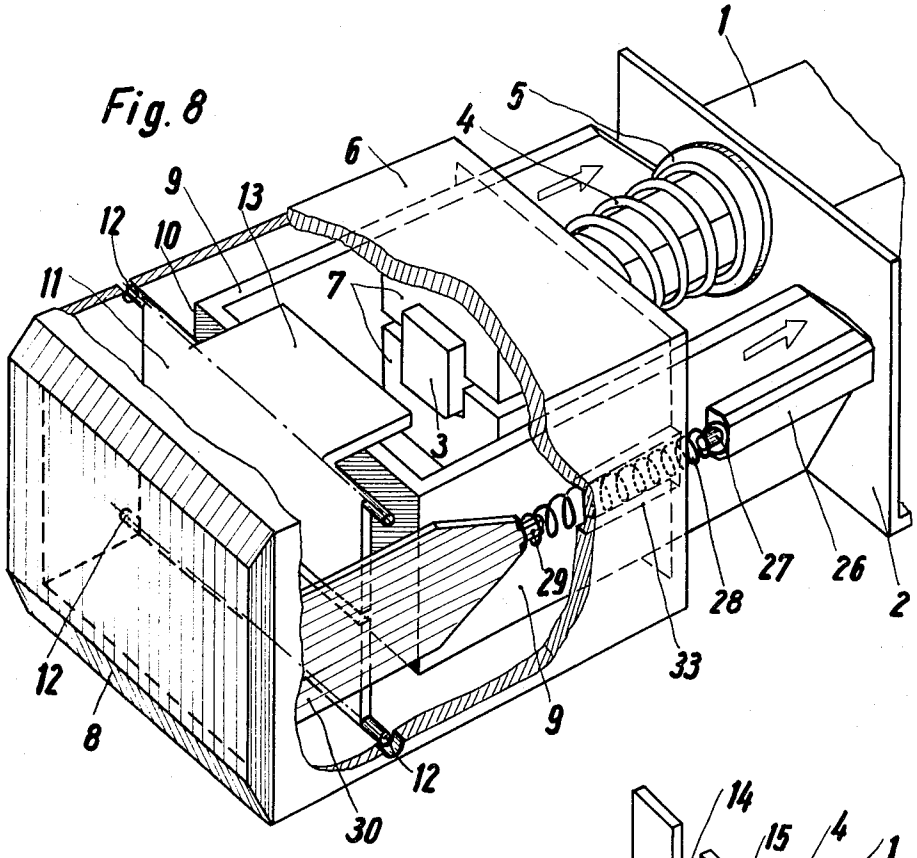
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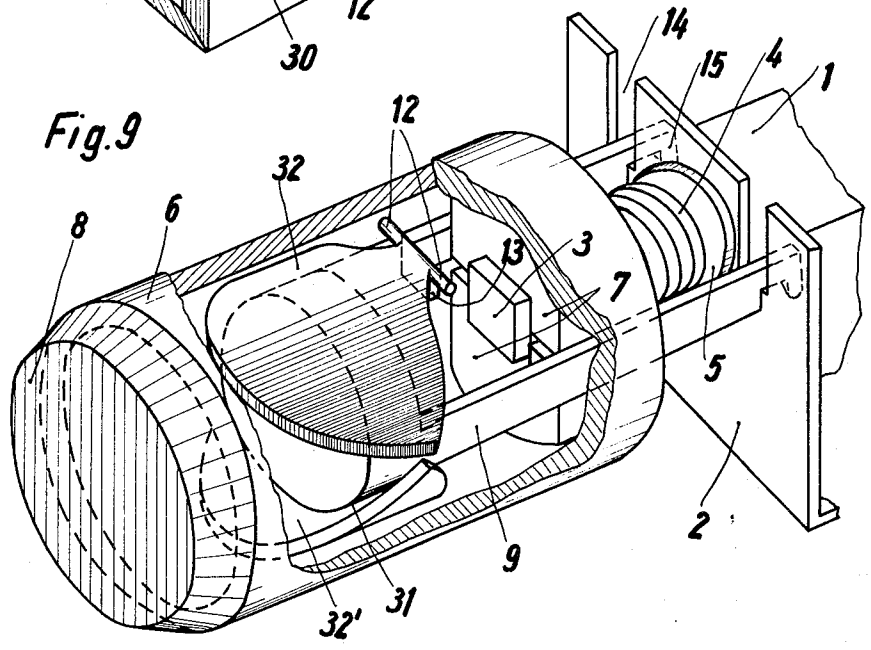
Fig. 9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32'
31

Fig. 10

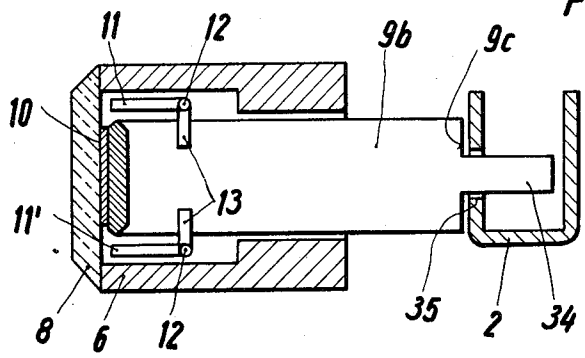
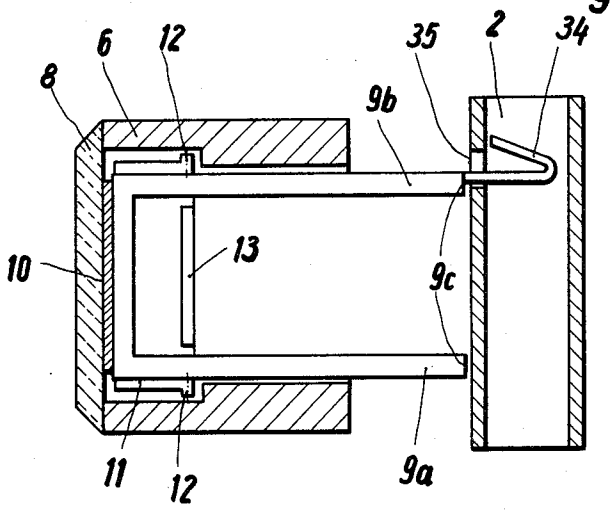


Fig. 11



PUSH BUTTON SWITCH POSITION INDICATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to push button switches, and more particularly to a push button switch with a switch position indicating means in the form of a reflecting signaling surface arranged behind a window in a push button head and fixed to the button frame by means of support arms, the signaling surface being located adjacent to the window when the push button is depressed and behind the window a certain distance when the push button is not depressed.

2. Description of the Prior Art

Switch position indicating means are intended to indicate the switched-on position of a push button from the outside without it being necessary to observe the position of the push button head, that is to say whether it is in the depressed or non-depressed position.

In the case of the closest known prior art, U.S. Pat. No. 3,327,591, the window is constructed as a viewing surface which is only partly translucent, i.e., only a number on the viewing surface is translucent, behind which a light emitting surface is arranged in a fixed manner at a distance approximately corresponding to the push button stroke, and when the push button is depressed the light emitting surface lies against the inside surface of the window. A disadvantage of such a push button arrangement resides in that the viewing surface may be only partly translucent and therefore it absorbs a large quantity of light so that recognition of the depressed condition of the signal surface is impaired.

SUMMARY AND OBJECTS OF THE INVENTION

According to the present invention, a push button switch is provided which includes a push button head adapted for movement along a longitudinal axis with respect to a carrier. The head includes a window through which a reflecting signal surface carried by the carrier may be viewed when the carrier is in a particular position with respect to the head. At least one covering shutter is attached to the head for rotation about an axis perpendicular to the longitudinal axis of the head. The covering shutter is swung out of sight by the carrier on depressing the push button head with respect to the carrier and the covering shutter is swung back over the signal surface by movement of the head to a second position with respect to the carrier.

Accordingly, it is an object of the present invention to provide a push button switch which makes possible the use of a mechanism which is simple to produce and to assemble and also guarantees a reliable and clear indication of the respective switch condition.

It is a further object to provide an arrangement wherein the signal surface is invisible in the non-depressed condition of the button, while in the case of the prior art the signal surface remains visible under certain reflection conditions giving rise to errors in switching operations. The arrangement in accordance with the invention provides a clear indication of the switch position since the window can be constructed so as to be crystal-clear and completely transparent with the result that the signal surface is clearly recognizable even when it does not lie against the window but instead lies some distance behind the window.

It is a further object to provide a viewing shutter that can be in the form of a flap or a pair of flaps of which each is journalled for pivotal movement about an axis perpendicular to the axis of the push button switch and the pivoting movement is brought about by a relative movement between the signal surface carrier and the push button head housing. With the shutter provided with a control limb both the movement into position and the movement out of position can be brought about by a positive engagement or drive. However, it is also possible to bring about only one direction of movement of the shutter by the switching operation while the other movement is brought about by a spring force or the force of gravity.

It is a further object to provide jaw-like or hood-like shutters which are subjected to similar pivotal movements as a flap-like shutter.

It is still a further object to provide a switch wherein the viewing surface of the shutters which are visible through the window when the push button is not depressed are constructed to provide a colored reflecting signal surface (though distinct from the signal surface behind it) or are constructed to carry lettering.

It is a still further object to provide a switch wherein at least one of the arms carrying the signal surface is provided with a resilient counter-hook which snaps into position underneath the frame of the switch and supports the arm from behind in a positive manner, the arm being supported from the front by a check abutment in a positive manner also. This counter-hook construction also makes possible a simple taking apart of the push button switch.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a push button head in the switched-off position;

FIG. 2 shows the push button head in accordance with FIG. 1 in the depressed switched-on position;

FIG. 3 is a diagrammatic representation of a push button head with a two-part shutter in side view in the switched-on position;

FIG. 4 shows the push button head in accordance with FIG. 3 in side view in the switched-off position;

FIG. 5 is a diagrammatic representation of a push button head with a single piece shutter in side view in the switched-on position;

FIG. 6 is a sectional view of a push button head with resilient means for allowing for movement beyond the normal stroke;

FIG. 7 shows another embodiment with means for allowing for an excessively large stroke;

FIG. 8 is a perspective view of a switch head with an indicating means mounted resiliently on it;

FIG. 9 is a perspective view of a push button head with jaw-like shutters;

FIG. 10 is a diagrammatic side view of a push button head in accordance with the invention, the switch frame being cut away; and

FIG. 11 is a plan view of the push button head in accordance with FIG. 10.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 1 and 2, a push button switch 1 is shown located in a frame or housing 2, from which

a push button plunger 3 projects. The plunger 3 is connected via suitable brace means 7 in a fixed manner to the push button head housing 6. A compression spring 4, required for return movement of the push button head 6, surrounds the push button plunger 3 and rests on the one hand against the push button head housing 6 and on the other hand against the switch frame 2. A disc or washer 5 is placed between the spring 4 and the housing 2.

In the push button head housing 6 there is a longitudinally sliding signal surface carrier 9, which at its rear end has hooks 15 which hook into slots 14 of the switch frame 2. Two covering shutters 11 and 11', which can be pivoted about the bearing 12, within push button housing 6, are provided. The shutters 11 and 11' can be viewed through a transparent covering cap 8 as long as the surface carrier 9 is in the switched-off position as indicated in FIG. 1, thus holding a pair of rectangularly bent control limbs 13 apart.

If, as shown in FIG. 2, the push button is depressed, the shutters 11 and 11' move towards a signal surface 10 and they are then tilted over. The shutters 11 and 11' then lie internally against the upper and lower walls of the push button head 6 and expose the signal surface 10 to view, while the control limbs 13 now lie behind the signal face 10. In this position the plunger 3 is pushed backwards in the switch for causing electrical contact and the plunger 3 may be held in this position. The reverse occurs on switching off the push button switch, for example on renewed pressure on the button causing a release of plunger 3, so that the back side of the signal face 10 tilts the control limbs 13 back into the starting position.

The advantage of this arrangement resides more particularly in the fact that the switching-over of the signal occurs relatively abruptly during a very short switching displacement, and, as shown in FIGS. 3 and 4, a sufficiently long displacement path *a* is available both for the switched-on signal indication and also there is a longer displacement path *b* for the switched-off signal indication.

FIG. 5 shows a one-sided covering shutter 11, which is particularly advantageous in the case of large push button strokes. In this case it is possible by means of an oblique cover 8 having a portion 8' to permit inspection from the front side of cover 8 and also from the top side 8 of portion 8' remote from the shutter bearing means 12. The signal face 10 can also have the oblique form of the covering shutter.

Furthermore, by the suitably angular construction of the cover 8 and portion 8', there is the possibility of providing for better visibility from above not only of the signal surface 10 but also of a signal surface 16, set at an angle to surface 10 after pivoting movement of the shutter 11.

The interior of the covering shutter 11 or the whole shutter arrangement can be given a mirror finish so that it reflects and provides a further improvement for the indicating action with a bright reflecting action.

The shutters 11 can be provided with an indicating color in accordance with the signal face 10 or a different color can be used. It is also possible to have lettering on the signal surface 10 and/or on the shutter 11, in the latter case on the inside or on the outside. And as an alternative, the covering cap 8 can be inscribed behind which the on and off positions simply change color.

It should be noted that rather than using limb 13, the shutters 11 could be spring or gravity biased into the closed position and movable to the open position by contact with the carrier 9.

It is also possible to provide more than two covering shutters 11, something which is to be particularly recommended in the case of large viewing surfaces, because otherwise the distance between the closed shutter arrangement and the covering cap 8 would be too great. Several shutters 11 are then pivoted one horizontally under the other at bearing pins 12, and a correspondingly higher indicating slide is provided with a slit viewing surface 10 at the same level as each of the bearing positions. The shutters 11 can disappear in the slots when the push button 6 is depressed. In order to make the slots as inconspicious as possible, the narrow edges, which are still visible, of the shutters 11 can have the same color as the viewing face 10. In the switched-off position the shutters 11 are then closed and the colored edges are no longer recognizable.

If it is desired to ensure that the viewing surface 10 always lies close to the front covering cap in the switched-on position, the displacement path *a* indicated in FIG. 3 can be eliminated by use of a spring 20 as shown in FIG. 6. The spring 20 which compensates for the overstroke of the carrier 9 rests on the one hand against the pin 21 of the carrier 9 and on the other hand against the switch housing 2, and the abutment 22 appropriately limits the displacement path.

The spring 20 can also, as shown in FIG. 7, be arranged at the head end of the face carrier 9. The carrier 9 then has a narrow cross piece 23, behind which the enveloping arms 24 of a separate indicating part 25 extend, and they include a compression spring 20, which spring could also be constructed in the form of a plate spring.

If push buttons of the described type are not fixed components of a push button switch, that is to say if they are to be made so as to be interchangeable, the fixation of the face carrier 9 should be carried out not by means of a hook 15 but by means of spring pressure directed towards the switch housing 2. Especially in the case of small push strokes the resulting reduction in the movement play is advantageous for indication. FIG. 8 shows an embodiment of the invention which affords space economy with small push button heads and does not hinder the return spring 4. The two shanks of the face carrier 9 which project to the rear from the push button housing 6 are equipped on the outside with longitudinal ribs 26 with spring receiving pins 27. The helical springs 28 bringing about the pressure on the switch housing rest on the one hand against the rib 26 and on the other hand against a side arm 30 of the transparent covering cap 8 connected with the push button head housing 6. To facilitate later installation of the spring 28, longitudinal grooves 33 are provided in the lateral walls of the push button head 6 and the side arms 30 possess spring receiving pins 29. If the push button 6 is depressed, the spring 28 is compressed, while the indicating carrier 9, with the signal face 10 passes through the shutters 11.

A covering shutter suitable for a round push button shape is shown in FIG. 9. For the parts which are

generally the same, such as the push button housing **6**, the push button plunger attachment means **7** or the transparent covering cap **8**, the same reference numerals have been used. The signal surface **31** moved by the indicating carrier **9** is in this case, however, a round disc and the shutters **32** and **32'** have the form of hollow paraboloids.

FIGS. **10** and **11** show a particularly suitable and easily assembled switch construction. FIGS. **10** and **11** show the switch in the depressed condition, the signal surface **10** lying at a distance from the rear surface of the window **8** which is determined by the overstroke of the switch. If no overstroke is to be allowed for, the signal surface can also lie directly against the window on the inside.

The signal face **10** is carried by two arms **9***a* and **9***b*, which run to the sides of the push button plunger in the push button head housing and their ends are supported in a positive manner on the switch frame **2**. In accordance with the embodiment of the invention the one arm **9***b* is provided with a counter-hook **34**, which can be inserted through an opening **25** in the switch frame and is supported to the rear positively on the switch frame as soon as it makes resilient contact. The positively fitting front support arrangement is brought about by limiting or check abutments **9***c* of the arms **9***a* and **9***b*. As a shutter two covering shutters **11** are provided in the case of the embodiment shown, which are carried by a pivoting bearing **12** on the push button head housing and are provided with control limbs **13**, which are driven positively by the signal surface **10**.

What is claimed is:

1. A push button switch position indicator having a longitudinal axis, comprising:

a. a push button head;

b. said head having a window;

c. a carrier mounted for longitudinal movements toward and away from said window;

d. a signal surface carried by said carrier; and

e. a shutter-like member attached to said head, said shutter-like member being responsive to longitudinal movements of said carrier with respect to said head for movement between two positions, said shutter-like member in its first position providing visual detection of said signal surface through said window, and said shutter-like member in its second position preventing detection of said signal surface through said window.

2. A push button switch position indicator having a longitudinal axis, comprising:

a. a push button head;

b. said head having a window;

c. a carrier mounted for longitudinal movements toward and away from said window;

d. a signal surface carried by said carrier;

e. a shutter-like member attached to said head and movable between two positions, said shutter responsive to said carrier being located in a first position with respect to said head for movement to a first position providing visual detection of said signal surface through said window; and

f. means responsive to said carrier being located in a second position with respect to said head for movement of said shutter to a second position thus bringing said shutter over said signal surface and preventing detection of said signal surface through said window.

3. The push button switch position indicator of claim **2** wherein said means responsive to said carrier being located in a second position with respect to said head includes a limb attached to said shutter and extending generally perpendicularly thereto, whereby, when said carrier is moved to a second position with respect to said head, said carrier will contact said limb and cause said shutter to rotate about said axis thus bringing said shutter over said signal surface and preventing detection of said signal surface through said window.

4. A push button switch position indicator having a longitudinal axis, comprising:

a. an elongated push button head;

b. said head having a window at one end thereof;

c. a carrier mounted for longitudinal movements within said head toward and away from said window, said carrier having a front face and a rear face;

d. a signal surface carried by said carrier on said carrier's front face;

e. a pair of shutters attached to said head and rotatable about axes perpendicular to said longitudinal axis; and

f. a limb attached to each of said shutters and extending generally perpendicularly thereto,

g. whereby, when said carrier is moved to a first position with respect to said head said carrier's front face will contact said shutters and rotate said shutters about said axes providing visual detection of said signal surface through said window, and when said carrier is moved to a second position with respect to said head, said carrier's rear face will contact said limb and cause said shutters to rotate about said axes thus bringing said shutters over said signal surface and preventing detection of said signal surface through said window.

5. A push button switch position indicator in accordance with claim **1**, wherein said shutter-like member comprises one pair of shutters which are journalled on two opposite sides.

6. A push button switch position indicator in accordance with claim **1**, in which said shutter-like member is constructed in the form of a pair of hollow paraboloids.

7. A push button switch position indicator in accordance with claim **1**, in which said shutter-like member is a single shutter-like member covering the whole field of view and said window is arranged so as to extend obliquely.

8. A push button switch position indicator in accordance with claim **7**, in which said signal surface has the same oblique configuration as said window.

9. A push button switch position indicator in accordance with claim **1**, in which the inside surface of said shutter-like member is given a mirror finish.

10. A push button switch position indicator in accordance with claim **1**, in which the inside surface of said shutter-like member is coated with a signal color corresponding to the signal surface.

11. A push button switch position indicator in accordance with claim **1**, in which said carrier has hooks at its rear end, which hook into slots in a switch frame.

12. A push botton switch position indicator in accordance with claim 11, in which behind the hook a recess terminated by an abutment is provided with which said carrier can be so moved on said switch frame with a corresponding play that despite the displacement which is due to an overstroke of the switch said signal surface lies directly against the window in the switched-on position, a spring being provided to allow for the overstroke.

13. A push button switch position indicator in accordance with claim 12, in which said carrier has a narrow cross piece, behind which the encompassing arms of an indicating part extend.

14. A push button switch position indicator in accordance with claim 1, in which said carrier is fixed by resilient pressure between said carrier and said head.

15. A push button switch position indicator in accordance with claim 14, in which limbs, extending out of the head towards the rear, of the carrier have longitudinal ribs with spring attachment pins.

16. A push button switch position indicator in accordance with claim 2, in which said shutters include bearing pins which are journalled in holes or recesses in the push button housing.

17. A push button switch position indicator in accordance with claim 1, wherein said shutter-like member comprises at least two covering shutters arranged underneath one another, said signal surface is multiply interrupted and said shutters are so journalled that they extend into the interruptions when said switch is in said first position.

18. A push button switch position indicator in accordance with claim 17, in which the edges of said shutters, which terminate the interruptions in said signal surface have the same color as said signal surface.

19. A push button switch position indicator in accordance with claim 1, in which at least one arm located on said carrier is provided with a resilient counter-hook, which hook snaps into position behind a switch frame and holds said arm from behind in a positive manner, said arm also being supported from the front by a checking abutment in a positive manner.

* * * * *