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Hinze

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[54] **INDICATING PUSH BUTTON FOR PUSH BUTTON SWITCHES**

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[30] **Foreign Application Priority Data**

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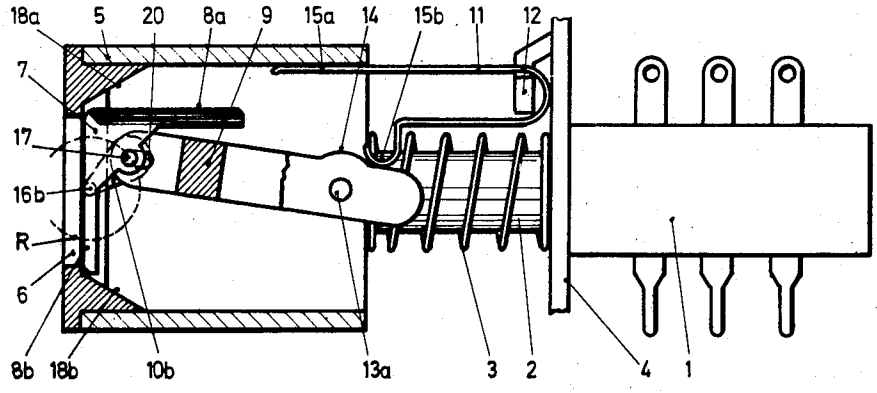
[52] **U.S. Cl.** ..... **116/124 R,** 200/167 A
[51] **Int. Cl.** **G09f 9/00**
[58] **Field of Search** ..... 116/114, 124 R, 124 L, 116/129 R, 135, DIG. 28; 200/67, 167, 167 A; 340/378; 337/163; 40/65, 331

Primary Examiner—Louis J. Capozi
Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb & Soffen

[57] **ABSTRACT**

The specification describes an indicating push button for a push button switch with a window at the front end, behind which two pivotally mounted indicating surfaces, indicating two switch settings or positions, are visible alternately. The invention which aims at improving visibility provides that each indicating surface in the switch setting defined by it is placed from behind immediately adjacent to the front end window by a drive mechanism. The latter is adapted to be switched over by pressure on the button and displaces the pivot axis as a result to the rear.

10 Claims, 14 Drawing Figures



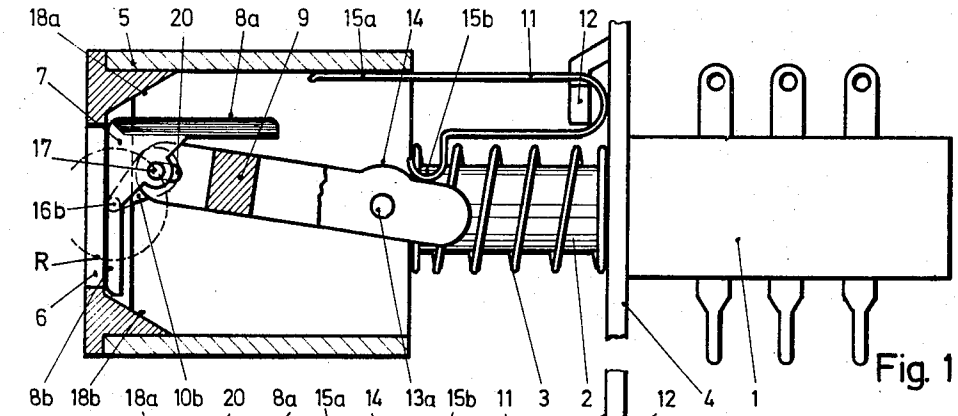


Fig. 1a

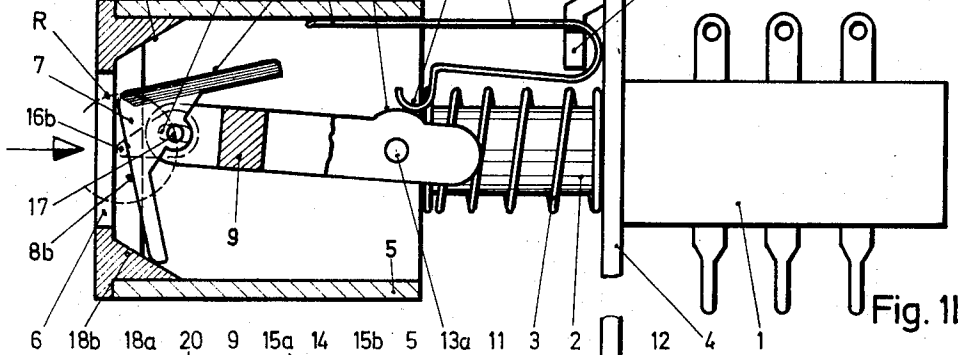


Fig. 1b

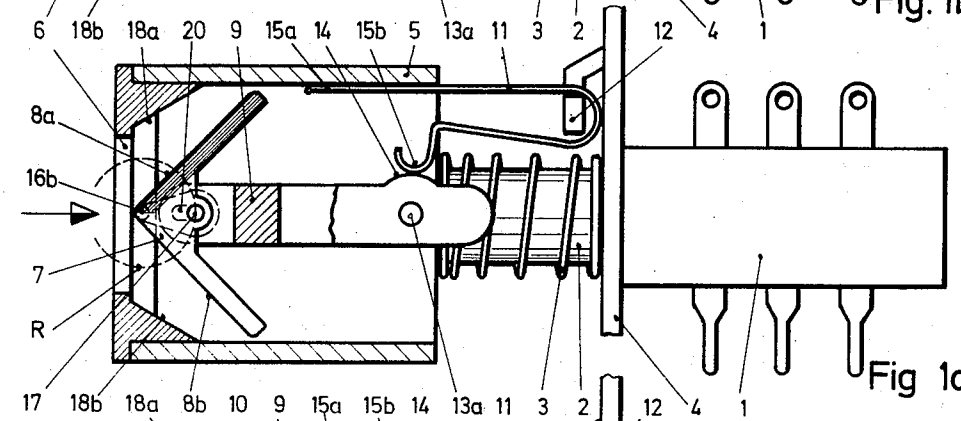


Fig 1c

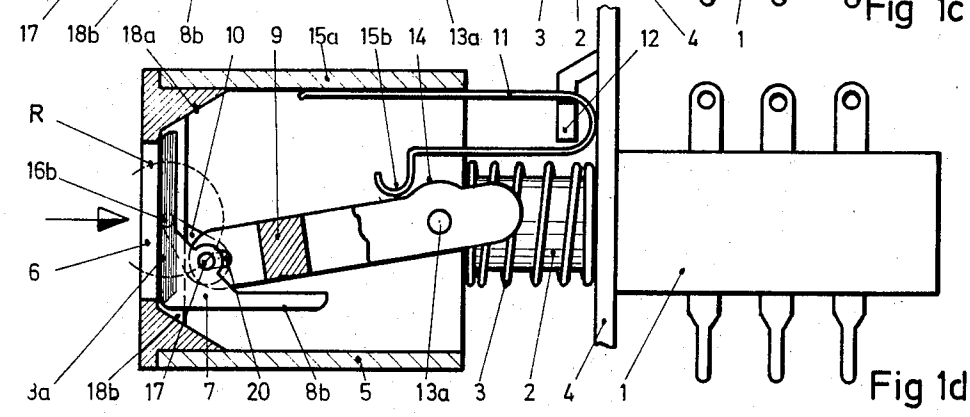


Fig 1d

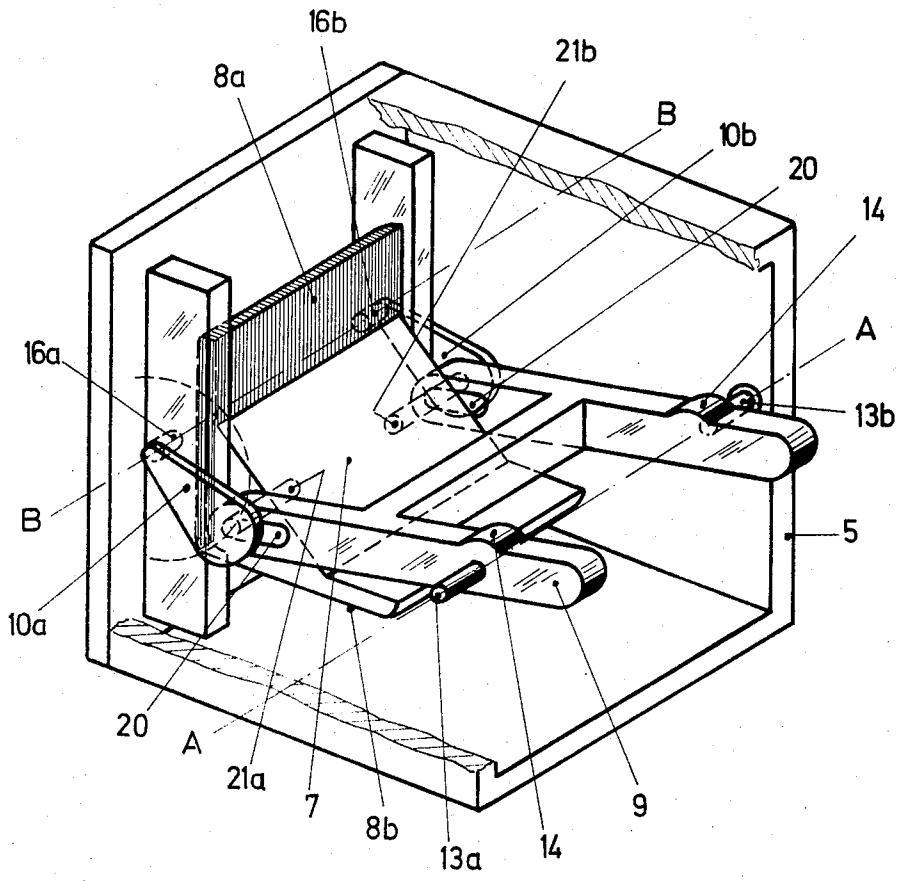


Fig. 2

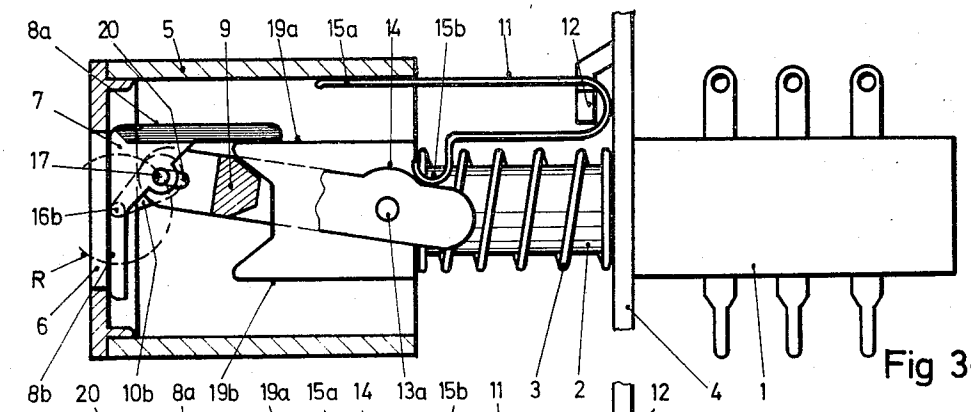


Fig 3a

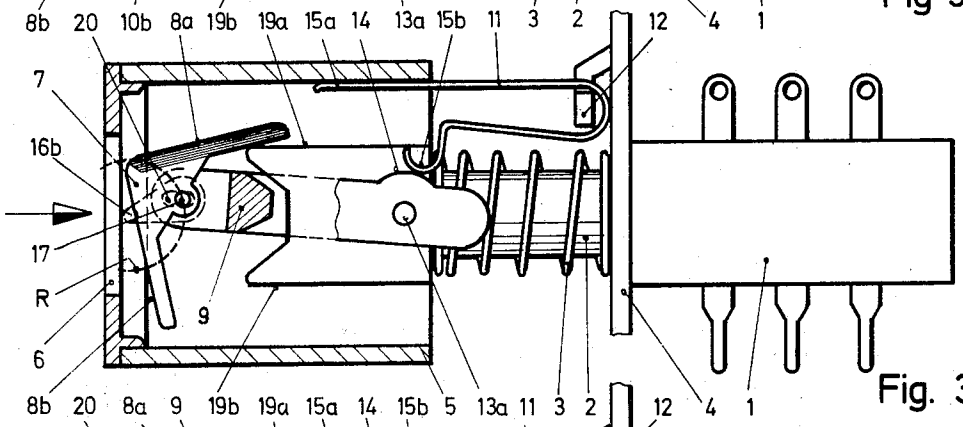


Fig. 3b

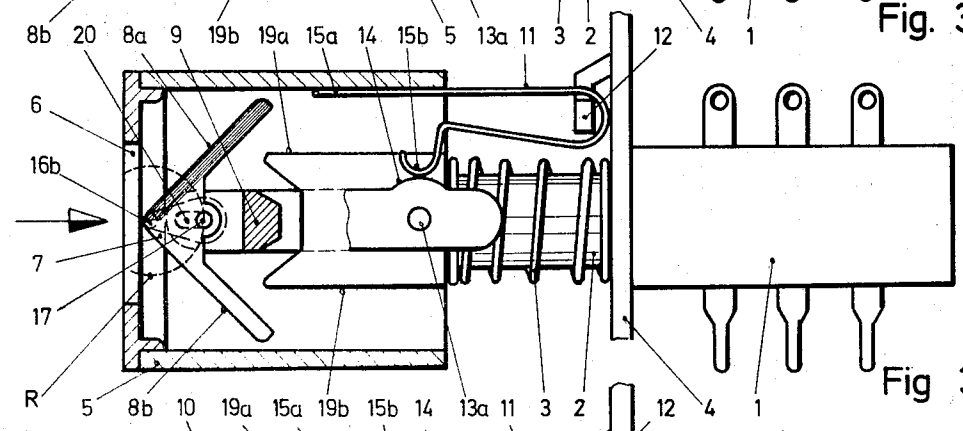


Fig 3c

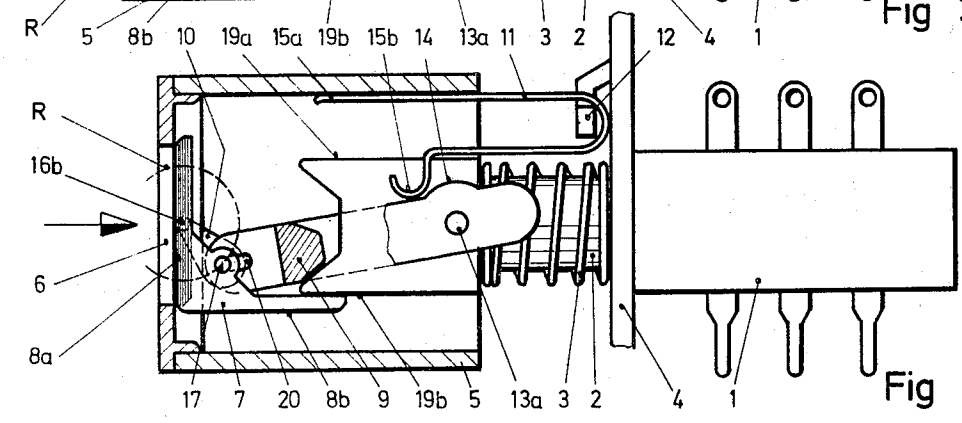


Fig 3d

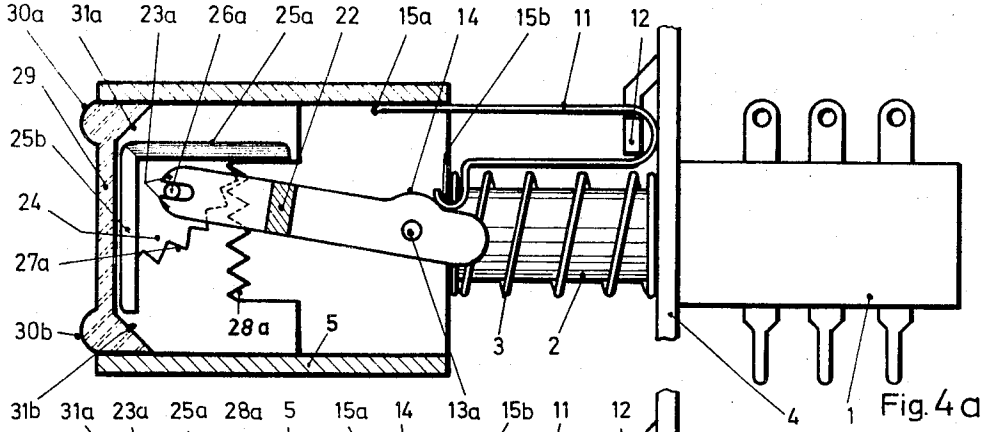


Fig. 4a

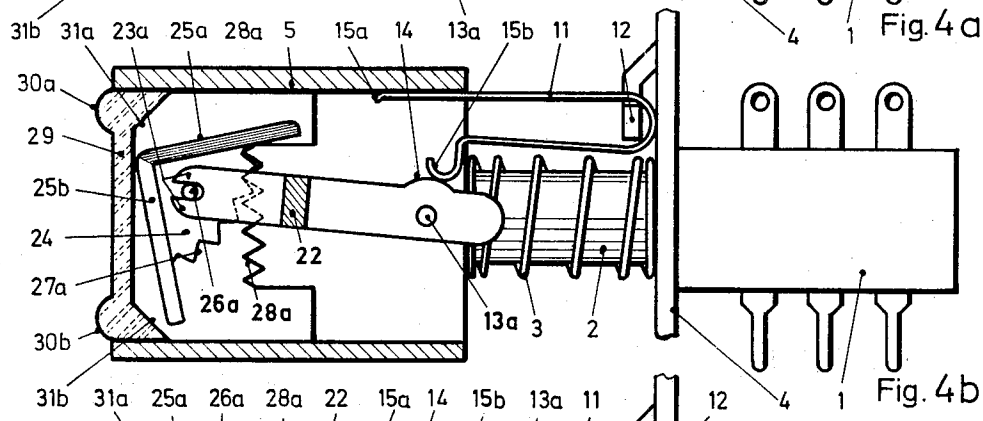


Fig. 4b

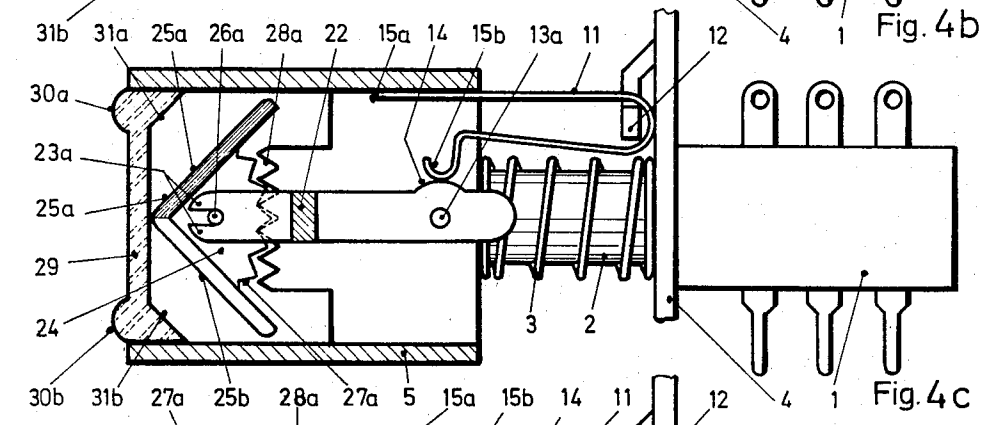


Fig. 4c

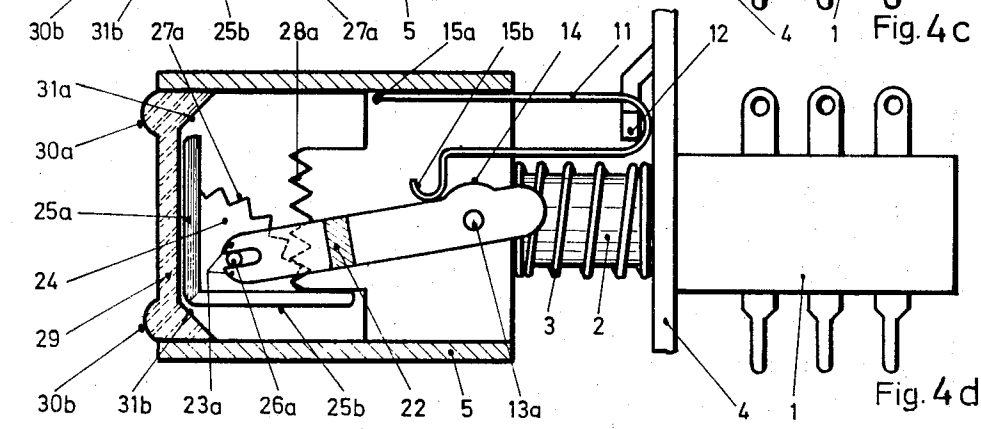


Fig. 4d

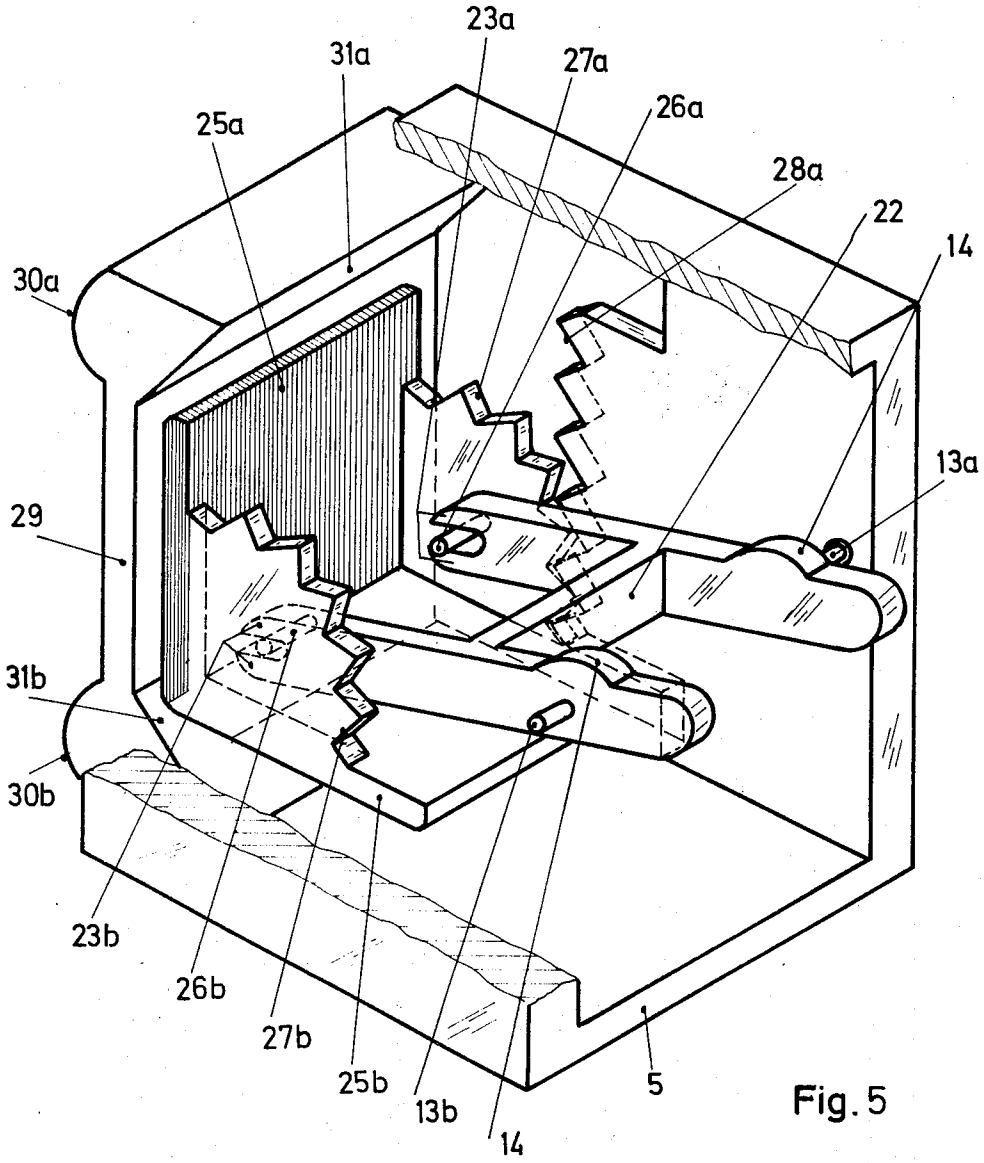

23a
31a
27a
26a
25a
28a
22
14
30a
13a
29
31b
30b
23b
26b
27b
25b
13b
14
5

Fig. 5

INDICATING PUSH BUTTON FOR PUSH BUTTON SWITCHES

BACKGROUND OF INVENTION

1. Field to Which Invention Relates

The invention relates to an indicating push button for push button switches with a window at the front end, behind which two pivotally mounted indicating surfaces, defining the two switch settings or positions, are visible alternately.

2. The Prior Art

In accordance with a previously proposed construction use was made of an indicating slide with a reflecting indicating surface, which in the case of the depressed state of the push button lies close to the window and in the case of the non-depressed state of the botton is covered by a shutter provided with a further indicating surface. Owing to the mechanism for swinging the shutter it is, however, necessary in the case of such switches to leave a certain distance between the viewing disc and the indicating surface, something which may make it difficult to recognize the position of the switch when the push botton is looked at almost from the side, that is to say with a large oblique angle.

In the case of a further previously proposed construction a rotary member with four edges was to be provided which was to be turned through 90° on each actuation of the switch. In this case the two indicating surfaces lie a substantial distance behind the viewing window in the case of the viewing position defined by them, while during switching over the edges of the rotary member must move past the window.

SUMMARY OF INVENTION

One aim of the present invention is to provide for better visibility of the indications of the switch position or setting by arranging the indicating surface closer to the window than was previously possible.

In accordance with the invention this aim is achieved in the case of an indicating push button of the above-mentioned type in that each indicating surface in the switch setting defined by it is placed from behind immediately adjacent to the front end window by a drive mechanism which is adapted to be switched over by pressure on the button and displaces the pivot axis as a result to the rear. In this respect the indicating surface can come to lie behind a transparent window or can be laid directly in the window frame. In this respect a sealing or closing action can at the same time be provided for by the indicating surfaces. In this manner the respective indicating surfaces in the viewing position can be clearly seen for a considerable distance and even in the case of looking at them obliquely from the side.

In accordance with a preferred form of the invention the indicating surfaces are arranged to be driven in a positive manner via positive drive means of the drive mechanism and for this purpose a slide guide means can be arranged on both sides of the window and a pin of the indicating element fits into the slide means.

In lieu of this it is also possible to provide for spring biasing into the two switching positions and the positive drive arrangement only needs to be used for displacement of the pivot axis in relation to the push button towards the rear.

In accordance with a preferred embodiment of the invention the indicating element consists of two indicating surfaces arranged at an angle to each other, which are journalled on a pair of swinging levers, whose pivot point is located on both sides of the window at the front end of the push botton.

In accordance with a further development of the invention the drive or control mechanism has at least two tooth sections which mesh together on switching over and are fixed on the one hand on the push botton head and on the other hand on the indicating surfaces. These tooth sections can be molded in a very simple manner on the indicating surfaces or on the push botton head respectively, so that production is facilitated. The shape of the two mutually meshing tooth sections can be selected in accordance with the desired transition curves of the corner edge of the indicating element consisting of two indicating surfaces. In accordance with a preferred embodiment of the invention in the case of a corner edge which is displaced linearly in front of the window, of the indicating element the latter is provided with a pair of tooth segments, whose center point coincides with the corner edge which can be moved past the viewing surface. The cooperating tooth means is then formed by linear tooth sections, which are preferably molded on the side walls of the push button housing. This leads to a very simple assembly and to a low space requirement with a clear indication of the state of the switch.

LIST OF SEVERAL VIEWS OF DRAWINGS

In what follows three embodiments of the invention will be described with reference to the drawings.

FIGS. **1***a* and **1***d* show a sectional view of an indicating push botton head in four switching phases extending from the non-depressed initial position *a* to the fully pressed-in push button position *d*.

FIG. **2** shows a perspective view of the switching over mechanism without a push button switch, switch springs, and cams.

FIGS. **3***a* and **3***d* show a sectional view of a second embodiment in four different switching phases.

FIGS. **4***a* to **4***d* show sectional views of a third embodiment of the invention in four switching phases beginning with the non-depressed starting position in FIG. **4***a* and extending to the fully depressed push button position in accordance with FIG. **4***d*.

FIG. **5** shows a perspective and partly broken away view of a push button.

DESCRIPTION OF PREFERRED EMBODIMENTS

In FIGS. **1, 3,** and **4** the push button switch **1** is shown mounted in a frame **4** and the push button housing **5** is connected in a fixed manner with the push button plunger **2.** The rest position is determined by the push button return spring **3** and the detent position is determined by conventional detent means.

FIGS. **1***a*, **3***a*, and **4***a* show the indicating push button in the non-depressed position. The pivoting levers **10***a*, **10***b* are on the one hand arranged with their pin **16***a*, **16***b* adjacent to the window for swinging movement about the axis B (FIG. **2**) and on the other hand their bearing pins **21***a*, **21***b* are fitted into holes **17** in the indicating element **7.** The switching lever **9** has two limbs with pins **13***a*, **13***b*, which are journalled in the push button housing **5** at pivot point A (FIG. **2**); on the other side the switching lever has two longitudinal holes or

slots **20** or a corresponding fork for fitting around the bearing pins **21***a*, **21***b* generally between the indicating element **7** and the swinging lever **10***a*, **10***b*.

The switch spring **11** fixed by the hook **12** on the switch frame **4** has its limb **15***a* resting against the push button housing **5** on the one hand and holds the switch lever **9** by means of the molded on spring limb **15***b* in its defined outer position. In this switch position the reflecting indicating surface **8***b* of the indicating element **7** lies in a positive manner against the window. If the push button is depressed (FIGS. **1***b*, **1***c* and FIGS. **3***b*, **3***c*) the spring limb **15***b* slides over the cam **14** and moves the switching or operating lever **9** into the opposite position and as a result owing to the bearing pin **21***a*, **21***b* located in the slots **20** of the operating lever **9** the pair **10***a*, **10***b* of swinging levers is moved over into its other position and the indicating element **7** is swung an amount as indicated by a radius R (shown in broken lines in the drawing). The cams shown in FIGS. **1***a* to **1***d* on the housing frame and produced by molding or the driving lands **19** *a*, **19***b* arranged in the push button housing **5** necessarily lead to an additional rotation of the switch element **7** as the mechanism changes over from one state to the other so that in accordance with FIGS. **1***d* and **3***d* in the end position of the switch the second reflecting indicating surface **8***a* lies in a positive manner against the window **6.**

It would be possible to dispense completely with the swinging levers **10***a*, **10***b* if the radius R of swinging could be arranged in the housing walls on both sides of the bearings of the indicating element as a groove, in as far as this radius is required for the purpose described (FIGS. **1***a* and **3***a*, respectively, show the upper limit, and FIGS. **1***d* and **3***d*, respectively, show the lower limit). The indicating element then comprises pins guided in the groove.

Instead of the groove it would also be possible to arrange a raised cam on the front end corresponding to the radius R, on both sides and in this case the bearing pins of the indicating element would be held by spring means against the cam. The spring for this purpose should preferably be accommodated in the operating lever **9** and would have to exert a pressure directed towards the cam or the window **6** on the pins of the indicating element.

The use of a pair of swinging levers **10***a*, **10***b* shown in FIGS. **1** to **3** or the guidance of the pins in grooves on both sides with the radius R shear the advantage that no additional spring is required and the indicating element can be caused to rock very easily.

The window **6** can be in the form of a transparent plastic insert as is conventional with indicating push buttons. Owing to the positive engagement of both indicating surfaces **8***a*, **8***b* in the end positions there is, however, also a dust-proof closed front view of the push button, when the window **6** is open.

The two indicating surfaces **8***a*, **8***b* can have contrasting colors and/or lettering. It is convenient and more rational to make the indicating element **7** of two indicating plates which have the same shape but differ as regards color or the lettering.

In the case of the embodiment of the invention as shown in FIG. **4** and FIG. **5** within the push button housing behind a viewing window **29** there is a tilting or rocking indicating element consisting of indicating surfaces **25***a*, **25***b* which are set an angle to each other. The surface **25***a* can for example be made red and indicate the "on" switch position, while the indicating surface **25***b* indicates the "off" switch position and can for example be colored green. Between the indicating surfaces on both sides of them a toothed segment **24** is fixed, which respectively has an arcuate tooth arrangement **27***a*, **27***b* respectively, whose respective center point coincides with the corner edge of the two viewing surfaces **25***a*, **25***b*. The two toothed segments each carry an inwardly projecting bearing pin **26***a*, **26***a* and these bearing pins are engaged by forks **23***a*, **23***b* of an operating lever **22,** which is journalled for pivoting movement by means of bearing pins **13***a*, **13***b* in the push button housing **5.** The arcuate tooth arrangements **27***a*, **27***b* of the segment **24** mesh with the gear rack segments **28***a*, **28***b* on both sides in the push button housing **5.** The two operating lever arms possess cams **14,** with which an operating spring **11** cooperates, which is fixed by means of a hook **12** on the switch frame **4** and has its one end **15***a* lying against the inside of the push button housing. The other J-shaped end **15***b* rests on the operating lever **22** and on depressing of the push button slides over the cam **14** and as a result brings about a swinging of the operating lever in a counter-clockwise direction in terms of FIGS. **4***a* to **4***d* so that the indicating element is moved from the position in accordance with FIG. **4***a* into the position in accordance with FIG. **4***d*.

On the top and lower side of the viewing window **29** to the inside oblique surfaces **31***a*, **31***b* and on the outside rounded portions **30***a*, **30***b* are arranged, which adjoin the edges limiting the viewing surfaces and thus provide an optically pleasing arrangement without making it possible to see behind the indicating surfaces. The respective indicating surfaces which are out of action therefore remain invisible.

The switching over of the indicating element **25***a*, **25***b* is carried out in accordance with the invention via the gear rack sections **27***a*, **27***b*, which mesh with the toothed segments **28***a*, **28***b*. On actuation of the push button the indicating element is displaced by the operating lever **25** with the help of the pins **26***a*, **26***b* and thereby positively turned via the toothed drive behind the viewing window **29** so that in accordance with FIGS. **4***a* and **4***b* each of the two operating positions or switching positions of the indicating surface **25***b*, **25***a* is fixed in a positive manner at the viewing window.

I claim:

1. An indicating push button for a push button switch, said button comprising:

a housing having a front end with a window therethrough through which indicating surfaces in the housing may be viewed;

a drive mechanism is said housing comprising lever means;

two alternately visible indicating surfaces pivotally attached to said lever means and being pivotable so that the one or the other of said surfaces becomes visible through said window;

said lever means having a first pivot axis fixedly located in said housing and about which said lever means is pivotable with respect to said housing, and means in said housing to pivot said surfaces upon pivoting of said lever means;

force applying means in said housing positioned to apply force upon said lever means to pivot it about said first axis; said force applying means being held stationary relative to motion of said housing;

said lever means being movable past said force applying means and said force applying means being positioned such that said force applying means applies force to said lever means first on one side of said first axis and then on the other side of said first axis, causing said lever means to pivot in one direction and in the opposite direction as said housing is shifted past said force applying means.

2. An indicating push button for a push button switch, said button comprising:

a housing having a front end with a window therethrough through which indicating surfaces in the housing may be viewed;

a drive mechanism in said housing comprising lever means;

two alternately visible indicating surfaces pivotally attached to said lever means and being pivotable so that the one or the other of said surfaces becomes visible through said window;

said lever means having a first pivot axis fixedly located in said housing and about which said lever means is pivotable with respect to said housing, and means in said housing to pivot said surfaces upon pivoting of said lever means;

force applying means in said housing positioned to apply force upon said lever means to pivot it about said first axis; said force applying means being held stationary relative to motion of said housing;

said lever means being movable past said force applying means and said force applying means being positioned such that said force applying means applies force to said lever means, causing said lever means to pivot in one direction and in the opposite direction as said housing is shifted past said force applying means;

said indicating surfaces are set at an angle to each other and together comprise an indicating element;

said lever means including a pivoting lever carrying said indicating element in a rocking manner;

said indicating element being pivotable about a second pivot located on said pivoting lever; said second pivot is near to said housing front end.

3. The indicating push button of claim **2,** wherein said lever means further includes an operating lever located rearwardly in said housing of said pivoting lever; said operating lever being connected to said pivoting lever at said second pivot to move said second pivot across said housing before said window.

4. The indicating push button of claim **3,** further comprising lands projecting into and fixed in said housing and positioned to be between said indicating surfaces and to be engaged by said indicating surfaces as said indicating element moves across said housing, said lands being positioned to obstruct motion of one of said indicating surfaces at a time, and thereby to pivot said indicating element.

5. The indicating push button of claim **3,** wherein said force applying means comprises a spring positioned to apply continuous biasing force in one direction to pivot said operating lever.

6. The indicating push button of claim **3,** further comprising cam means positioned at said forward end of said housing; said cam means being shaped such that as said second pivot moves across said housing, said indicating surfaces engage and are pivoted by said cam means.

7. An indicating push button for a push button switch, said button comprising:

a housing having a front end with a window therethrough through which indicating surfaces in the housing may be viewed;

two alternately visible indicating surfaces which are mounted at an angle with respect to said window;

a drive mechanism in said housing for said indicating surfaces; said drive mechanism comprising a first rotatable element, having a first peripheral surface which is engaged by a second peripheral surface to rotate said first peripheral surface and said first element;

said indicating surfaces being attached to and rotatable with said first element;

said first element having a first pivot axis about which it is rotatable with respect to said housing and said rotating of said first element pivots said indicating surfaces such that one or the other of said indicating surfaces becomes visible through said window;

a second element held stationary in said housing and stationary with respect to rotation of said first element; said second element having said second peripheral surface that engages said first peripheral surface and said first and said second peripheral surfaces mesh;

said drive mechanism further comprising first means located in said housing for operating upon said first element to cause same to move across said housing as said first and said second peripheral surfaces mesh, thereby causing rotation of said first element and pivoting of said indicating surfaces as said first element moves across said housing.

8. The indicating push button of claim **7,** wherein said first means comprises an operating lever extending through said housing and having a second pivot axis that is relatively stationary in said housing and about which said lever is pivotable in said housing;

said operating lever being connected with said first element first pivot such that pivoting of said lever around its said second pivot axis moves said first pivot across said housing;

said force applying means in said housing being positioned to apply force upon said lever to pivot it about said second pivot axis; said force applying means being held stationary relative to motion of said housing; said lever being movable past said force applying means and said force applying means being positioned such that said force applying means applies force to said lever, causing said lever to pivot in one direction and in the opposite direction as said housing is shifted past said force applying means.

9. The indicating push button of claim **8,** wherein said first peripheral surface and said second peripheral surface both comprise meshing toothed surfaces; said first peripheral surface is curved about an axis that is coincident with the junction of said indicating surfaces and with said second axis.

10. The indicating push button of claim **8,** wherein there are two said first elements and their said first peripheral surfaces and two said second elements and their said second peripheral surfaces with one of each said elements along a respective opposite side of said indicating surfaces;

said first elements carry bearing pins;

said operating lever having openings for receiving said bearing pins such that said first elements are connected to said lever for being moved across said housing thereby.

* * * * *