

(12)

**EUROPEAN PATENT APPLICATION**

(21) Application number: 79302380.5

(51) Int. Cl.<sup>3</sup>: **H 01 H 13/12**  
**H 01 H 1/34**

(22) Date of filing: 31.10.79

(30) Priority: 03.11.78 GB 4313678

(43) Date of publication of application:  
28.05.80 Bulletin 80 11

(84) Designated Contracting States:  
DE FR GB IT SE

(71) Applicant: **BONNELLA SWITCHES LIMITED**  
The Moors Tewkesbury Road  
Cheltenham, Gloucester GL51 9BP(GB)

(72) Inventor: **Ayres, Frederick Charles**  
22 Monica Drive  
Cheltenham, Gloucestershire GS50 4NQ(GE)

(74) Representative: **Eyles, Christopher Thomas et al.**  
**BATCHELLOR, KIRK & EYLES** 2 Pear Tree Court  
Farringdon Road  
London, EC1R 0DS(GB)

(54) **Switch.**

(57) A push button switch comprises a pair of fixed contact members (2,3; 21, 22) which are bridged in the closed condition of the switch by a movable contact member (4; 23) that is biased towards engagement with the fixed contact members (2, 3; 21, 22) by means of a spring or the like (5; 24). Breaking of the electrical pathway through the switch is achieved by actuation of a plunger (9; 26) which is arranged to bear on the movable contact members (4; 23) so as to pivot it relative to a predetermined one (3; 21) of the fixed contact members at least during the initial travel of the plunger during actuation thereof and so that making and breaking of the electrical pathway through the switch occurs between the other fixed contact member (2; 22) and the movable contact member (4; 23). Only one pair of contacts (6, 8; 29, 30) need be made from fine silver. Forms of switch are illustrated with an essentially planar movable contact member (4) and an asymmetric plunger (9) formed with a nib (13), as well as forms of switch with an L- or 7-shaped movable contact member (23). One of the fixed contact members (21) can have a lip (35).

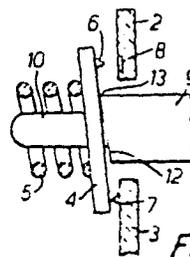


FIG. 3.

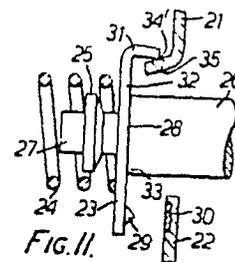


FIG. 11.

EP 0 011 413 A1

- 1 -

SWITCH

This invention relates to a switch, more particularly to a switch of the push button type.

It is known to construct a push button switch having two fixed contact members and a movable contact member biased towards the fixed contacts by means of a spring. In such a switch the fixed contact members comprise aligned portions of conductive material which provide the fixed contacts and the movable contact member takes the form of a generally planar conductive bridge member which provides an electrical pathway between the fixed contacts in the closed condition of the switch. To break this electrical pathway the plunger of the push button, which is slidably mounted between the fixed contact members so as to be movable in a direction substantially perpendicular to the plane of the fixed contacts, is depressed so as to bear against the movable contact member and move it bodily away from the fixed contacts.

In practice it is found that, due to manufacturing tolerances, switches of this type make and break at only one of the fixed contacts. However, it is not possible to predict for a particular sample of switch at which of the two fixed contacts making and breaking of the electrical pathway through the switch will occur. For this reason, if the switch is to be used to carry a reasonably high current, for example a stop lamp switch for a vehicle, it is necessary that the fixed contacts

and also the corresponding contacts on the movable contact member must be made of fine silver or the like so that it matters not at which of the fixed contacts making and breaking of the electrical pathway through the switch occurs. This factor adds significantly to the cost of the manufacture of such a switch.

The present invention accordingly seeks to provide a switch of the push button type in which it can be reliably predicted at which of the fixed contacts making and breaking of the electrical pathway through the switch will occur and which can be manufactured for moderately high current density usage significantly more cheaply than the known design by requiring the use of a single set only of fine silver contacts or the like in place of the two sets of the known design.

The invention thus provides a switch comprising first and second fixed contact members, a movable contact member for bridging the fixed contacts and providing an electrically conductive pathway therebetween in the closed condition of the switch, biasing means for biasing the movable contact member towards engagement with the fixed contact members, and a plunger arranged to bear on the movable contact member so as to pivot it relative to a predetermined one of the fixed contact members at least during the initial travel of the plunger during actuation thereof and so that making and breaking of the electrical pathway



through the switch occurs between the other fixed contact member and the movable contact member.

5 Since it can be predetermined reliably at which of the fixed contacts making and breaking of the electrical pathway occurs, the switch of the invention can be designed for high current density usage utilising a single set only of fine silver contacts or the like in place of the two sets required by the prior art design of switch. This set of fine silver contacts or the like  
10 comprises the fixed contact at which making and breaking of the electrical pathway through the switch occurs and the corresponding moving contact on the movable contact member. It is not necessary to provide a set of fine silver contacts or the like at the pivot point between  
15 the movable contact member and the said one fixed contact.

In one embodiment of this invention the plunger is constructed to slide substantially without rotation about its axis and is formed with a nib which bears  
20 against the movable contact member asymmetrically with respect to the fixed contacts. Thus as the plunger is actuated, the movable contact member is made to pivot about the pivot point between it and the fixed contact that is further from the nib and making and breaking  
25 of the electrical pathway through the switch occurs between it (the movable contact member) and the other fixed contact. The nib may be formed in any convenient manner; for example, the plunger may be formed with an

angled face that is inclined obliquely to the plunger axis, the nib being formed where this angled face intersects the longitudinal surface of the plunger.

In another embodiment of this invention the movable contact member is provided with a surface that, in the closed condition of the switch lies oblique to the axis of the plunger and intersects its path whilst the plunger preferably has an abutment surface substantially perpendicular to the plunger axis. As the plunger is moved to break the electrical pathway through the switch, it first bears against the movable contact member at a point that is asymmetric with respect to the fixed contacts. Hence the initial movement of the movable contact member is a pivoting movement about the fixed contact that is further from the point of abutment, and making and breaking of the electrical pathway through the switch occurs at the other fixed contact.

Preferably the biasing means comprises a compression spring.

In order that the invention may be clearly understood and readily carried into effect some preferred embodiments thereof will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, wherein:-

Figure 1 is a section through a push button switch constructed according to the invention;

Figures 2, 3 and 4 are enlarged side views of the fixed and movable contact members of the switch of Figure 1 and show the plunger of the switch in three different positions;

5           Figure 5 is a detail view of part of a stop lamp switch for a vehicle constructed according to the invention;

          Figure 6 is a section on the line VI-VI of Figure 5;

10           Figure 7 is a detail view of another stop lamp switch constructed according to the invention;

          Figure 8 is a section on a reduced scale on the line VIII-VIII of Figure 7;

15           Figure 9 is a side view of the fixed and movable contact members of an alternative construction of push button switch; and

          Figures 10 and 11 are detail sectional views of a modification of the switch of Figure 9 showing the plunger of the switch in two different positions.

20           Referring to Figures 1 to 4 of the drawings, a push button switch comprises a housing 1 having a first fixed contact member 2 and a second fixed contact member 3 mounted therein.

          A movable contact member 4 is biased towards the  
25   fixed contact members 2 and 3 by means of a spring 5. As can be seen perhaps more clearly from Figures 2 to 4 movable contact member 4 is provided with a pair of



contacts 6, 7, whilst fixed contact member 2 has a contact 8 formed thereon. A plunger 9 is formed at one end with a projecting pin 10 which passes through a cut out in movable contact member 4 and serves to locate it in the housing 1. Plunger 9 is non-circular in section, e.g. it is of D-section or of square section, and slides in an aperture in housing 1 of appropriate cross-section; in this way plunger 9 cannot rotate about its axis. Where the pin 10 meets the body of the plunger 9, the plunger 9 has an angled face 12 forming at one side of the plunger 9 a nib 13.

The operation of the switch is illustrated in Figures 2 to 4. Figure 2 shows the closed condition of the switch with the movable contact member 4 bridging the fixed contact member 2 and 3 and completing an electrical pathway therebetween. As the plunger moves to open the switch, i.e. to the left as illustrated, the nib 13 abuts against movable contact member 4 as shown in Figure 3. Since nib 13 is positioned asymmetrically with respect to the fixed contact members 2 and 3 and lies closer to contact 6 than contact 7, the movable contact member 4 pivots about contact 7 and the electrical pathway is broken between contacts 6 and 8. Pivoting of the movable contact member 4 about contact 7 continues until it abuts angled face 12, whereafter further movement of plunger 9 lifts the movable contact member 4 bodily away from the fixed contacts 7 and 8,

- 7 -

as shown in Figure 4. Upon releasing plunger 9 spring 5 returns member 4 to the position of Figure 2, via the position of Figure 3. Hence the design of the switch of Figures 1 to 4 ensures that making and breaking of the electrical pathway through the switch always occurs between contacts 6 and 8. This means that, in a push button switch intended to carry a moderately high current, for example a stop lamp switch for a vehicle, it is necessary to form only the contacts 6, 8 from fine silver, but not the contact 7 or any part of fixed contact member 3. This represents a substantial saving in manufacturing cost compared with a conventional push button switch which requires four fine silver contacts, i.e. two fixed and two moving contacts of fine silver.

Figure 5 is a detail side view of part of a modified form of vehicle stop lamp switch. In this case the switch body (indicated at 14) has an externally threaded projection 15 which can be passed through a suitable aperture in a vehicle body and retained therein by means of a corresponding nut (not shown). As can be seen from Figure 6, plunger 9 is of D-section and slides in a corresponding guideway in projection 15. The interior construction of the switch of Figures 5 and 6 is identical to that of Figures 1 to 4.

The switch of Figures 7 and 8 has an interior construction that is identical to that of Figures 1 to 4.



The body 16 of the switch of Figures 7 and 8 has a face plate 17 and is formed with a pair of external projections or "pips" 18. This construction enables the switch body to be pressed home into a suitable aperture in a vehicle body until the face plate 17 lies flush with the surface around the aperture, whereupon it is retained in the aperture by projections 18. As can be seen from Figure 8, the plunger 9 is of square section to prevent rotation about its axis.

10 Figure 9 shows an alternative construction. In this form of switch the fixed contacts 21, 22 are bridged by generally L-shaped movable contact member 23 which is biased towards engagement with the fixed contact members 21, 22 by means of a compression spring 24 and is  
15 retained by means of a retainer lug 25 on plunger 26. Plunger 26 has a projection 27, which passes through a cut-out in movable contact member 23, and a transverse face 28 which is substantially perpendicular to the plunger axis. Movable contact 29 and fixed contact 30  
20 are made of fine silver or the like. Leg 31 of member 23 bears against fixed contact member 21 whilst the upright of the L presents a face 32 towards face 28 of plunger 26.

25 In operation of the switch, plunger 26 is moved (leftwards as illustrated) until contact occurs between it and face 32 of member 23 as indicated at 33. Since point 33 lies further from leg 31 than from movable

contact 29, further movement leftwards of plunger 26 causes member 23 to pivot about the pivot point 34 between its leg 31 and fixed contact 21 and contacts 29 and 30 to break contact.

5           Pivoting continues as the plunger moves further leftwards until faces 28 and 32 abut, whereafter member 23 is lifted bodily away from fixed contact members 21, 22. It will thus be seen that making and breaking of the electrical pathway through the switch occurs between  
10 contacts 29 and 30 and hence it is not necessary that silver contacts be provided at the "leg" end 31 of movable contact member 23. Plunger 26 can be of circular section in this embodiment.

          The switch of Figures 10 and 11 is generally  
15 similar to that of Figure 9 and similar parts have similar reference numerals in Figures 10 and 11 to those of Figure 9. However, the movable contact member 23 is bent somewhat more in the embodiment of Figure 10 than that of Figure 9; thus it is bent to the shape of a  
20 numeral 7 rather than being L-shaped. In addition fixed contact 21 is formed with a lip 35. In this modified form of switch pivot point 34 can move somewhat along lip 35, e.g. to the position 34' shown in Figure  
25 11, as plunger 26 is actuated, due to the interference between leg 31 of movable contact member 23 and lip 35. In this way any tendency for breaking of the electrical pathway through the switch to occur at contact 21

rather than at contact 22 is obviated. In particular, any tendency of leg 31 to bounce during actuation is overcome. Moreover movement of pivot point 34 along lip 35 has a wiping action that helps to keep clean the contact areas between leg 31 and fixed contact member 21. The lip 35 is so formed that in the closed condition of the switch as illustrated in Figure 10 the leg 31 and lip 35 are tightly pulled together.

Although the switches illustrated are single pole switches it will be appreciated by those skilled in the art that the invention can readily be adapted for use in double pole or multi pole switches.



CLAIMS

1. A switch comprising first and second fixed contact members, a movable contact member for bridging the fixed contacts and providing an electrically conductive pathway therebetween in the closed condition of the switch, biasing means for biasing the movable contact member towards engagement with the fixed contact members, and a plunger arranged to bear on the movable contact member so as to pivot it relative to a predetermined one of the fixed contact members at least during the initial travel of the plunger during actuation thereof and so that making and breaking of the electrical pathway through the switch occurs between the other fixed contact member and the movable contact member.
2. A switch according to claim 1, in which the fixed contact on the said one fixed contact member and the corresponding movable contact on the movable contact member only are made of fine silver.
3. A switch according to claim 1 or claim 2, in which the plunger is constructed to slide substantially without rotation about its axis and is formed with a nib which bears against the movable contact member asymmetrically with respect to the fixed contacts.
4. A switch according to claim 3, in which the plunger is formed with an angled face that is inclined



obliquely to the plunger axis, the nib being formed where this angled face intersects the longitudinal surface of the plunger.

5. A switch according to claim 3 or claim 4, in which at least a part of the plunger is of D-section and slides in a correspondingly shaped bore in a housing of the switch.

6. A switch according to claim 3 or claim 4, in which at least a part of the plunger is of square section and slides in a correspondingly shaped bore in a housing of the switch.

7. A switch according to claim 1 or claim 2, in which the movable contact member is provided with a surface that, in the closed condition of the switch, lies oblique to the axis of the plunger and intersects its path whilst the plunger has an abutment surface substantially perpendicular to the plunger axis, whereby, as the plunger is moved to break the electrical pathway through the switch, it first bears against the movable contact member at a point that is asymmetric with respect to the fixed contacts and imparts initially a pivoting movement to the movable contact member about the fixed contact that is further from the point of abutment and making and breaking of the electrical pathway through the switch occurs at the other fixed contact.

- 13 -

8. A switch according to claim 7, in which the movable contact member is formed as an L-shaped or 7-shaped member, the shorter leg of which abuts the said one fixed contact member.

9. A switch according to claim 8, in which the said one fixed contact member is formed with a lip which interengages with the shorter leg of the movable contact member.

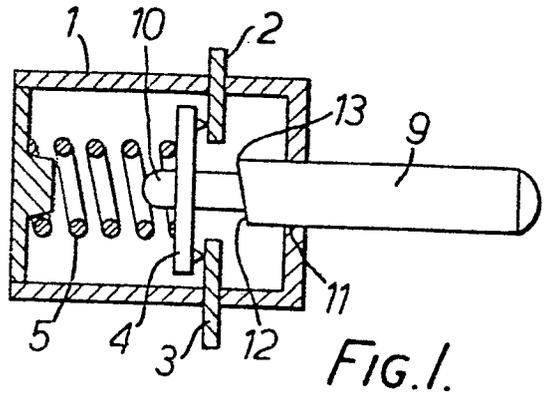


FIG. 1.

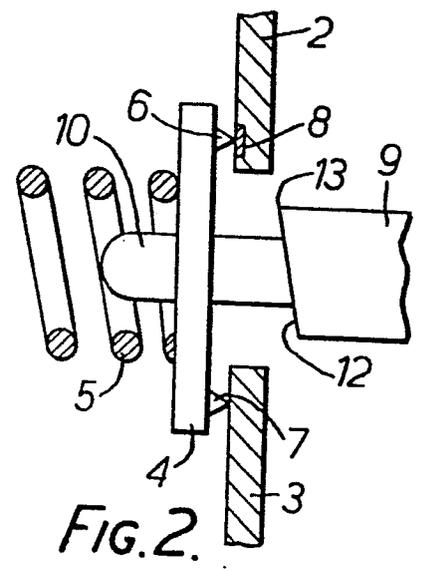


FIG. 2.

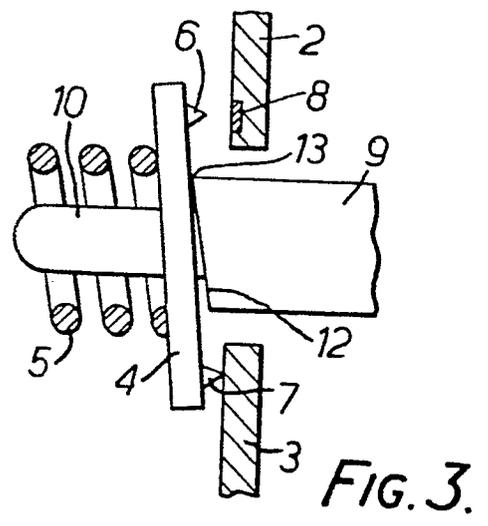


FIG. 3.

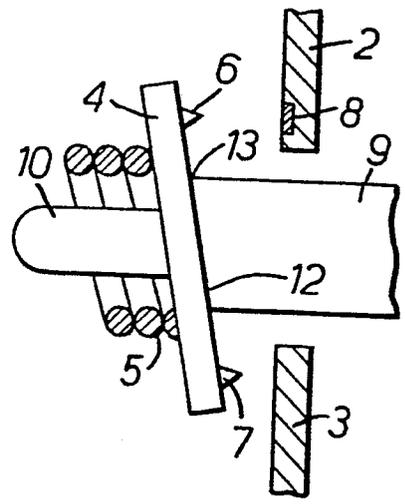


FIG. 4.

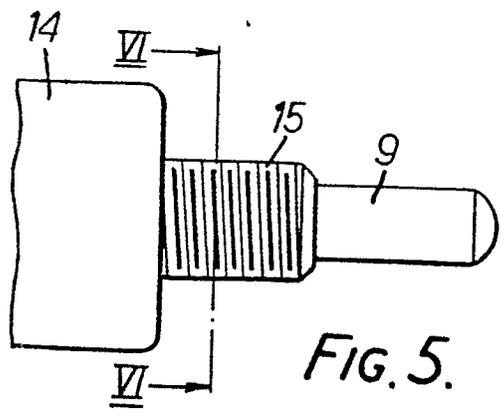


FIG. 5.

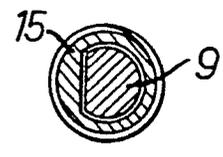


FIG. 6.

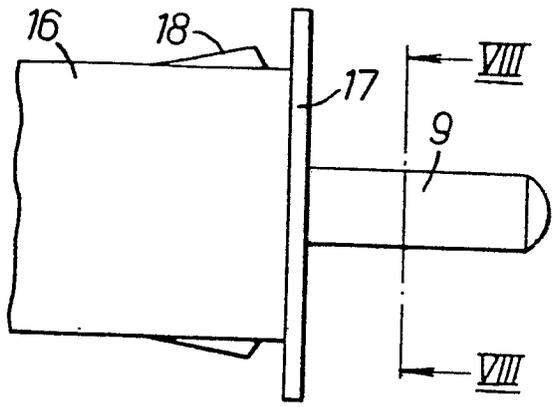


FIG. 7.

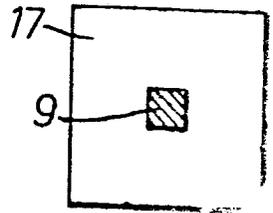


FIG. 8.

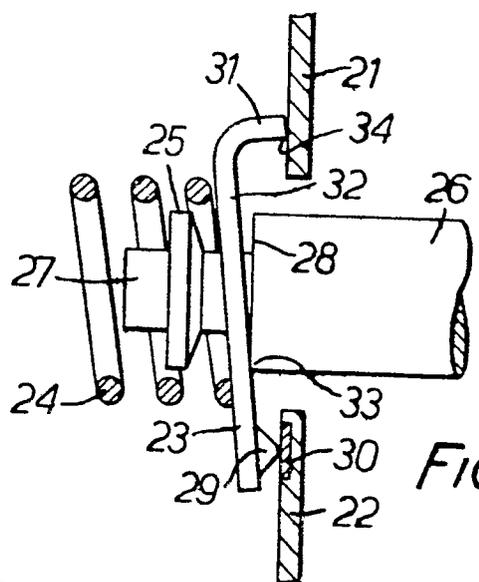


FIG. 9.

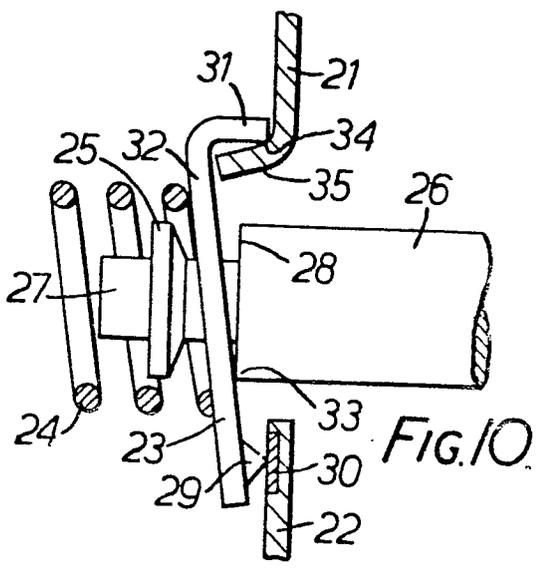


FIG. 10.

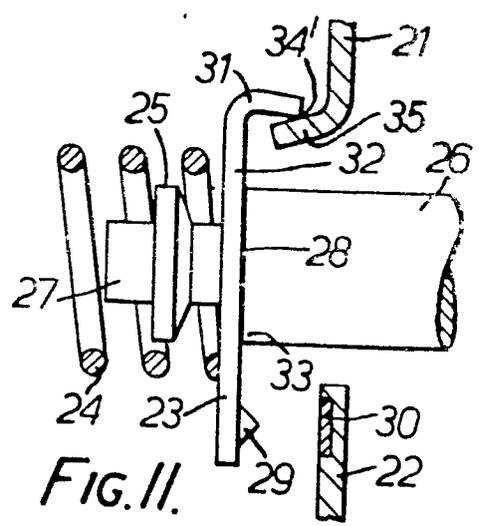


FIG. 11.



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<p><u>FR - A - 1 510 980</u> (UNELEC) * complete document *</p> <p>&amp; <u>DE - A - 1 690 363</u> --</p>	1-4,6	<p>H 01 H 13/12 H 01 H 1/34</p>
A	<p><u>DE - C - 952 194</u> (F. KIRSTEN) * page 2, lines 27 to 44; fig. 2 *</p> <p>--</p>	2	
A	<p><u>DE -A1 - 2 613 690</u> (BAYERISCHE MOTO- RENWERKE AG) * claims 3, 4; fig. 1, 3 *</p> <p>--</p>	5,6	<p>TECHNICAL FIELDS SEARCHED (Int. Cl.)</p>
P	<p><u>DE - A1 - 2 724 530</u> (A. TEVES GMBH) * claims 1, 2 *</p> <p>----</p>	2	<p>H 01 H 1/00 H 01 H 3/00 H 01 H 13/00 H 01 H 35/34</p>
			<p>CATEGORY OF CITED DOCUMENTS</p>
			<p>X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons</p>
<p><input checked="" type="checkbox"/> The present search report has been drawn up for all claims</p>			<p>&amp;: member of the same patent family, corresponding document</p>
Place of search	Date of completion of the search	Examiner	
Berlin	15-02-1980	RUPPERT	