

A Pushbutton Electric Switch

The present invention relates to a switch comprising a casing defining a housing in which are mounted a "rest" first fixed contact, an "operative" second fixed contact, a fixed terminal, a movable contact resting on two ridges and capable of oscillating, about a line passing through said ridges, between a position of rest in which said movable contact comes into contact with the first fixed contact, and an operative position in which said movable contact comes into contact with the second fixed contact, said first and second fixed contacts being disposed one at each side of said line, and a pushbutton movable along an axis at right angles to said line between a rest position and an ^{operative} ~~active~~ position, said pushbutton bearing, at a point of its travel intermediate its rest position and its operative position, against two springs the direction of action of each of which on said movable contact is parallel to said axis and respectively at each side of said line so that, in said position of rest of said pushbutton, a first of said springs applies to said movable contact a torque greater than is applied against said movable contact by said second spring, so as to maintain the movable contact in its position of rest, whereas in said active position of said pushbutton, the second of said springs applies against said movable contact a torque greater than that applied by said first spring, so as to cause said movable contact to be tilted to its operative position.

Such switches are used in particular on control boards or in control boxes and, in view of their number

and of the usually small area available, it is imperative to reduce their dimension substantially; moreover, a very simple construction is usually required from such apparatus, both in order to provide same with an
5 excellent reliability and to allow a fast assembly of the elements thereof during manufacture.

Apparatus of the prior art meeting the above-mentioned requirements frequently makes use of a movable contact mounted on a resilient blade, or leaf,
10 requiring a special operation for its assembly with a feed or common terminal, said blade being mounted either transversally with respect to the direction of movement of the pushbutton, or in parallel relationship therewith.

In the first instance, the transverse dimensions
15 of the switch casing require to be relatively large, whereas in the second instance it is necessary to provide rubbing surfaces, the satisfactory cooperation of which makes it necessary to maintain relatively close manufacturing tolerances.

20 The object of the present invention is to provide an electric switch exempt from the above-mentioned drawbacks and of simple construction which facilitates its assembly and enhances its reliability.

According to the present invention, a switch as
25 first set forth hereinabove is characterised in that one of said ridges is at an extremity of a flat blade

or leaf parallel to said axis and constituting said terminal, said other ridge being constituted by an inner protrusion or boss in said housing, an inner surface of said pushbutton facing towards said movable
5 contact and serving to abut said springs being provided with two guiding rods parallel to said axis and about which are disposed said two springs respectively, said springs bearing on a flat disk constituting said movable contact, said guiding rods having extremities passing through
10 respective openings of said disk.

Other features and advantages of the present invention will appear from the following description, given by way of example, with respect to the accompanying drawings, in which:

15 Figs. 1, 2 and 3 are partial axial sections of the switch in the rest, intermediate and operative positions respectively, and

Fig. 4 is a partial view from above of the apparatus, seen in cross-section along plane PP in Fig. 2.

20 An electric inverter switch is provided with a hollow cylindrical body (1), having an axis XX', said body having an upper portion (2) adapted to come into contact with the surface of a wall (not shown) when a bottom portion (3) of said body is inserted in an opening
25 of said wall.

A generally cylindrical housing (4) coaxial with said body is adapted to receive a feed terminal (5), a rest contact (6) and an operative contact (7); said terminal and said contacts, each of which is fixed to the bottom portion (3) and is constituted by a flat blade, or leaf, parallel to axis XX', are provided in said housing respectively with a first (8), a second (9) and a third (10) extremity, these three blades are preferably similar; the three extremities are in the same plane PP transverse with respect to the axis, e.g. at right angles to the latter.

A ridge (11) or an inner protrusion or boss in said housing and facing towards opening (12) of housing (4), is situated between plane PP and the opening (12) and is turned towards the upper portion (2) of the body. A conductive disk (13), the diameter of which is smaller than that of housing (4), is mounted in the latter and is permanently in resilient contact with ridge (11) and with the extremity (8) of the terminal 5 by means of members to be specified later herein, and can be placed in contact with said second (9) or with said third (10) extremity. Such an alteration, due to tilting movement of the disk about a line D1 passing through the ridge and through said first extremity, induces the expected electric inversion effect, by means of a resilient effect to be explained hereunder.

Referring to Fig. 4, it is to be noted that a second line D2 passing through the second (9), and third (10) extremities, is substantially at right angles to the first line D1; in the illustrated embodiment, in which the three extremities are in register with the periphery (14) of disk (13) said extremities are regularly spaced by angles substantially equal to 120° .

As can be seen from Fig. 1, a pushbutton (15) is mounted in the housing and is movable along the axis XX' between its rest position, viz. the one shown in Fig. 1, and an operative position shown in Fig. 3.

Said pushbutton comprises an upper portion (16), level with the upper portion of the body, a guiding skirt (17) sliding in the housing, a hook (18) engaged in a lateral groove (19) of said body, two guiding rods (20, 21) integral with said upper portion and parallel with the axis, and a finger (22) again parallel with said axis but the length of which is less than that of said guiding rods.

The length of said rods, the extremities (23, 24) of which face towards the bottom portion (3) is such that, even when the pushbutton is at its position of rest, said extremities are positioned through two openings (25, 26 respectively) of the disk without coming into contact with said bottom portion, said openings being situated on both sides of line D1 (see also Fig. 4); the

disk is preferably obtained by a mere cutting operation.

Finally, two compression springs (27, 28 respectively) are mounted one about each of the guiding rods and, when the pushbutton has moved to a point intermediate its rest position and its operative position, abut the upper inner surface (29, 29') of the pushbutton, on the one hand, and at two rest points (30, 31 respectively) of the disk, on the other hand, such that an initial compression imparts to the latter the position shown in Fig. 1, said initial
10 compression also developing a return force required for driving said pushbutton to its position of rest.

It can be seen from Fig. 1 to 4 that said two springs have different lengths and diameters, and that the two rest points (30, 31) are at different distances (e_1 , e_2)
15 from straight line D1. In addition, line D3 passing through the rest points, is substantially at right angles to line D1; in the embodiment described by way of example, said straight line D3 passes through axis XX' and in all cases said line D3 should preferably be situated between
20 line D2 and extremity (8).

Torques C1 and C2, transmitted to the disk as a result of the spring forces (f_1 , f_2) applied at distances (e_1 , e_2) from the pivoting axis D1, are antagonistic torques, so that the resultant torque transmitted to the inverter
25 disk is equal to the difference between said two torques; since forces f_1 and f_2 undergo

unequal increases while the pushbutton is moving towards its operative position, because of different stiffness of the two springs and of the values given to e_1 and e_2 the resultant torque can be nil at the position shown in Fig. 2, at which said pushbutton is situated between the rest and the operative positions, and said resultant torque changes its direction immediately after, as the pushbutton is moving on.

When the extremities (23, 24) of the rods reach the bottom portion, at the operative position shown in Fig. 3, said resultant torque causes said disk to be resiliently applied against the third extremity (10). When the pushbutton is released, the reverse operations are obtained.

However, should there be a weld between the surface of disk (13) and the second extremity (9), and should the resultant torque be so weak as to be unable to induce the rupture of said weld, finger (22) would come into contact with said disk before the operative position of the pushbutton is reached, thus inducing a mechanical, and no longer resilient, separation of the surfaces in contact, at the accidentally maintained position of rest.

The pushbutton and the switch body should not be able to rotate with respect to each other about axis XX'; thus a permanent positioning can be provided by any means ensuring cooperation between the pushbutton and

said body, and it can be obtained, e.g. through the engagement of hook (18) in groove (19), thus simultaneously rendering the pushbutton perfectly tight.



CLAIMS

1. A switch comprising a casing defining a housing in which are mounted a "rest" first fixed contact, an "operative" second fixed contact, a fixed terminal, a movable contact resting on two ridges and capable of oscillating, about a line passing through said ridges, between a position of rest in which said movable contact comes into contact with the first fixed contact and an operative position in which said movable contact comes into contact with the second fixed contact, said first and second fixed contacts being disposed one at each side of said line, and a pushbutton movable along an axis at right angles to said line between a rest position and an ~~active~~^{operative} position, said pushbutton bearing, at a point of its travel intermediate its rest position and its operative position, against two springs the direction of action of each of which on said movable contact is parallel to said axis and respectively at each side of said line so that, in said position of rest of said pushbutton, a first of said springs applies to said movable contact a torque greater than is applied against said movable contact by the second spring, so as to maintain the movable contact in its position of rest, whereas in said active position of said pushbutton, the second of said springs applies against said movable contact a torque greater than that applied by said first spring so as to cause said movable contact to be tilted to its operative position, characterised in that one of said



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ridges is at an extremity of a flat blade or leaf parallel to said axis and constituting said terminal, said other ridge being constituted by an inner protrusion or boss in said housing, an inner surface of said pushbutton facing towards said movable contact and serving to abut said springs being provided with two guiding rods parallel to said axis and about which are disposed said two springs respectively, said springs bearing on a flat disk constituting said movable contact, said guiding rods having extremities passing through respective openings of said disk.

2. A switch, according to claim 1, characterised in that said openings are at an unequal distance from said line passing through said ridges.

3. A switch according to either of claims 1 and 2, wherein said fixed contacts are on a first straight line substantially parallel to a second straight line passing through the centres of said openings, the second straight line passing substantially through the centre of said disk between said first straight line and the ridge on said terminal.

4. A switch substantially as described herein with reference to the accompanying drawings.
