

CIRCUIT BREAKER WITH PIVOTING CONTROL BUTTONS

This invention relates to a circuit breaker of which the box contains a triggering and resetting mechanism susceptible of acting on separable contacts for opening and closing at least one electric current path. On the front side of the box are provided passage openings for an "ON" control button and an "OFF" control button accessible to an operator.

Such a circuit breaker is described notably in French document No. 2,448,216. The control buttons are push buttons mounted in the box so as to be able to slide in alternate manner between two operational positions and having a front pressing side for the operator's finger. When the latter wants to close the contacts, he presses the ON push button which remains pressed in, whereas the OFF push button is automatically put into the outward position in relation to the box. Conversely, to open the contacts, the operator presses the OFF push button; the latter remains pressed in, whereas the ON push button is automatically returned to the outward position. The alternating position of the push buttons thus gives the operator a clear idea of the status of the circuit breaker.

Though such a manual control device is satisfactory, it would be desirable, on the one hand, to improve its ergonomics and, on the other hand, to accentuate the visualization of its "ON" or "OFF" status.

French document No. 1,558,448 discloses the commanding on an electric switch by means of a pivoting button fitted with a transparent window; this window enables visualization of the inscriptions representative of the two operational positions. The commanding of a circuit breaker is also known by means of a pivoting control button called a "tumbler" with which a triggering

visualization means is associated. However, the known pivoting control buttons do not fully procure the desirable working safety and clearness of visualization.

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The main object of the invention is to conciliate, in a circuit breaker of the type mentioned in the introduction, an ergonomic manual control separating the ON and OFF control functions in combination with
10 good visualization of the ON operating status, and, preferably, of the ON and OFF operating statuses of the circuit breaker.

It also aims to facilitate the locking of the manual
15 control device in its OFF position.

According to the invention:

- the ON and OFF buttons of the circuit breaker are pivotably mounted in the box,
- 20 - the pressing side of each button is unique and delimited by a first low-displacement end near which is situated a pivot gudgeon and by a second high-displacement end,
- the mechanism is coupled to pivoting arms of the
25 buttons for creating, at least in the ON position, a difference in height in front projection of the second end of the OFF button in relation to that of the ON button.

30 The control buttons, preferably placed side by side to pivot about a common axis substantially situated at the level of a side of the box perpendicular to its front side, thus not only procure a distinctive projection but also a difference in frontal height of their second
35 end and therefore a satisfactory visual indication of status. This indication is preferably corroborated by the presence of indications carried by the box near the

first end of the pressing side, preferentially by the gudgeons of the buttons, to be alternately revealed and masked by the first end, and/or opposite transparent windows provided in the pressing sides.

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At the second end and on the reverse side of the pressing side, it is interesting to provide, on the one hand, a stop surface applicable against the front side of the box, and, on the other hand, an arm to activate the mechanism and, in this arm, an opening of horizontal axis for the lock to pass.

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An embodiment of the invention is described hereinafter, by way of a non-limiting example, in reference to the appended drawings.

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Figure 1 represents in perspective a circuit breaker embodying the invention.

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Figures 2 and 3 show an elevation of a front part of the box of the circuit breaker illustrating the pivoting ON button respectively in the outward and inward positions.

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Figure 4 is a perspective view from below the ON button.

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Figure 5 is a partial front view of the front part of the box, with the buttons removed.

Figures 6 and 7 represent the OFF button of the circuit breaker laterally and from below.

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Figures 8 and 9 show partial elevations of the front side of the box for the respective ON and OFF statuses of the circuit breaker.

Figures 10 and 11 show lateral elevations of another embodiment of the ON button in two distinctive operating statuses.

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The electrical device illustrated in the figures is a circuit breaker called motor circuit breaker, comprising a box 10 which contains a triggering mechanism with lock and resetting, susceptible of acting on mobile contacts separable from fixed contacts, for opening and closing several current paths connected between respective couples of terminals 11, 12.

15 The motor circuit breaker comprises, for manually acting on the mechanism, two buttons 13, 14 mounted side by side pivoting about a common axis X and running through two respective windows 15, 16 which are arranged in the front wall 17 of a nose 18 of the box 10. As a variation, the buttons could be mounted otherwise than side by side. Subsequent to a voluntary or automatic command, the buttons take on, in alternating and mutually inverse manner, an inward operational position and an outward operational position in relation to the wall 17. The buttons 13 and 14 cooperate with the mechanism through the intermediary of a control part 19 (see figures 2 and 3) with which they are engaged and which pivots about an axis Y perpendicular to the plane containing the axis X.

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The pivoting ON button 14 will now be described in reference to figures 2 to 4. It comprises a pressing side 20 for the operator's finger. This pressing side is flat, but can also be slightly concave or convex, and has two ends 20a, 20b; it is unique, i.e. the

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operator only activates the button by pressing this side and only in one direction.

5 The first end 20a of the pressing side 20 has a displacement of low amplitude determined by the proximity of the axis X of a gudgeon 21 on which the button pivots. The end 20a of the pressing side has a sloping edge 22 whose role will become apparent hereinafter.

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Near the end 20a of the pressing side 20, but on the reverse side of the latter, i.e. to the inside of the box, the button 14 has two curved pivoting arms 23 capable of sliding, on the one hand, by one side 23a on
15 the gudgeon 21, and, on the other hand, by an opposite side 23b on a fixed bearing element 24. The bearing element is extended towards the front side 17 of the box by a visualizing means 25 susceptible of appearing opposite a window 26 of the button when the latter is
20 in its inward operational position. The window 26 is constituted by a patch in transparent material.

Near the end 20b and on the reverse of the pressing side, the button has a control arm 27 cooperating with
25 the control part 19 of the mechanism. For this purpose, the arm is fitted with a reveal 28 of a shape enabling it to engage onto a slug 29 of the part 19 and to cooperate with it to activate, or respectively be activated by, the part 19. A catch 30 provided near the
30 free end of the control arm 27 enables the button 14 to be made elastically enter the opening 16, but avoids untimely exiting thereof by abutment against an edge of the window 16 or against another stop provided in the box. Finally, the control arm 27 comprises an opening
35 31 for a lock to pass in order to maintain, by means of the latter, the button in the outward position.

The surface of the gudgeon 21 has, at its end situated towards the front surface 17 of the box, a visualization area 32. This area 32 bears, for instance, the indication ON for the button 14 and the indication OFF for the button 13 (see figures 1, 5 and 8, 9). The area is alternately revealed and hidden by the low-displacement end 20a of the pressing side 20. In each couple of operational positions of the two buttons, one of the visualization areas of the latter is revealed, and the other is hidden. In figure 2, the end 20a of the pressing side can be seen to mask the area 32, the sloping edge 22 being aligned with the part adjacent to the horizontal side 18a of the nose 18 which is perpendicular to the vertical front side 17; in figure 3, the end 20a, aided by the shape of the sloping edge 22, can be seen to reveal the area 32.

Near the edges and on the reverse side of the pressing side 20, the button comprises stop surfaces 33, 34 which are applied, in order to limit the inward travel of the button, against an inner edge 35 or lateral edges 36 of the opening 16 in the side 17.

In figures 5, 8 and 9, the references relating to the button 13 will be attributed a ' marking when necessary to distinguish an element of button 13 from an equivalent element of button 14.

We can see in figure 5 that each gudgeon 21 can be broken down into two rests 37, 38 each cooperating with one of the pivoting arms 23; and that each visualizing means 25, 25', e.g. "0" for the OFF button 13 and "1" for the ON button 14, is borne by a horizontal arm 39, 39' of the bearing element which determines a sliding surface for at least one of the arms 23.

The opening 16 provided for the ON button 14 is slightly taller than the opening 15 associated with the OFF button 13, since the corresponding control arm 27, which comprises the orifice 31, is taller. Intermediate
5 horizontal edges 42 are added to the lower edges 41 of the openings to guide respective cylindrical surfaces 43, 44 of the buttons.

The pivoting OFF button 13 is illustrated in figures 6 and 7. It will not be described in any further detail as it is similar to button 14, except for the control arm 27 which is shorter as it does not need to comprise the orifice 31. Striae 45 or other non-slip contrivances can be provided on the lower part of the
10 pressing side 20 of the two buttons.
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The pivoting buttons are mounted in the box in the following manner. The free end of the pivoting arms 23 is inserted between the gudgeon 21 and the bearing element 24, then the catch 30 goes past the hard point associated with it and the control arm 27 engages by way of its reveal 28 onto the slug 29 of the control part 19. To close the contacts of the circuit breaker, the operator presses the ON button 14 and the mechanism
20 puts the OFF button 13 into the outward position, only the ON area 32 and the "1" visualizing means 25 of the button 14 are then visible (figure 9). To open the contacts, the operator presses the OFF button 13 to put it into the outward position; only the OFF area 32' and
25 the "0" means 25' of the button 13 are then visible (figure 8). As can be seen in figures 8 and 9, the end 20b of the ON button 14 is situated in the ON status and in the OFF status of the circuit breaker at a level differentiated with regard to the end 20b' of the OFF
30 button 13, this being translated both by a differentiated projection from side 17 and by a difference in height h of the front projections of the
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lower edges of the buttons, whether the OFF button is activated in the maintained mode or by pulses.

5 In the variation in figures 10 and 11, the orifice 31 for the lock to pass is provided in a pull 50, more precisely in a broad part 51 of this pull, which is lodged in the ON button 14 in such a way as to take on an unobtrusive position (figure 10) and an outward locking position (figure 11). The broad part 51 of the
10 pull is situated in the vicinity of the high-displacement end 20b of the button. The pull further comprises a tail 52 fitted with an opening 53 of which the upper edge cooperates with a stop 54 of the box for arresting the pull in the outward position. The pull
15 cooperates with its reveal 55 in the button 14 by means of appropriate guide surfaces and stop surfaces; it stays maintained in the unobtrusive position by catching or retaining means and rests, in the outward position, against the front side 17 of the box. When
20 the lock 56 is installed in the orifice 31, it prohibits the pull from returning to the unobtrusive position by abutment against the arm 27.

25 The invention can be applied to any circuit breaker or directional relay in which one wishes to conciliate the security of manual activation and the quality of status visualization.

**CLAIMS:**

1 - A circuit breaker comprising a box containing a triggering and resetting mechanism susceptible of acting on separable contacts for opening and closing at least one electric current path, the box comprising a front side fitted with passage openings for an ON button and an OFF button accessible to an operator from outside of the box and cooperating with a mechanism control part inside the box, each control button being mounted in the box so as to be capable of being displaced between two operational positions and having a pressing side for the operator's finger,

characterized by the fact that:

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- the ON (14) and OFF (13) buttons of the circuit breaker are pivotably mounted in the box (10),
- the pressing side (20) of each button is unique and delimited by a first low-displacement end (20a) near which is situated a pivot gudgeon (21) and by a second high-displacement end (20b),
- the mechanism is coupled to pivoting arms (23) of the buttons for creating, at least in the ON position, a difference in height (h) in front projection of the second end (20b) of the OFF button (13) in relation to that of the ON button (14).

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2 - The circuit breaker as claimed in claim 1, characterized by the fact that the first end (20a) of the pressing side (20) and the gudgeon (21) are arranged to enable said end to reveal and respectively hide a first visualizing means (32) associated with the front side (17) of the box (10) in both the operational positions of each button.

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3 - The circuit breaker as claimed in claim 2,



characterized by the fact that the first visualizing means (32) is borne by an end of the surface of the gudgeon (21).

5 4 - The circuit breaker as claimed in claim 2, characterized by the fact that the first end (20a) of the pressing side (20) of the button has a sloping edge (22).

10 5 - The circuit breaker as claimed in claim 1, characterized by the fact that the button has, on at least one edge and on the reverse side of the pressing side (20), a stop surface (33, 34) that can be applied against the front side (17) of the box (10).

15 6 - The circuit breaker as claimed in claim 1, characterized by the fact that each button pivots about an axis (X) substantially situated at the level of a side (18a) of the box which is perpendicular to its
20 front side (17).

 7 - The circuit breaker as claimed in claim 1, characterized by the fact that the shape of the button is such that it can be freely inserted from the front
25 into an opening in the box, the button having a retaining catch (30) to prevent it from being extracted unexpectedly.

 8 - The circuit breaker as claimed in claim 1,
30 characterized by the fact that the button has, on the reverse side of the second end (20b) of the pressing side (20), an arm for activating (27) the mechanism.

 9 - The circuit breaker as claimed in claim 8,
35 characterized by the fact that the pivoting ON button (14) has, near the second end (20b) of the pressing



side, an orifice (31) of horizontal axis for a lock to pass.

10 - The circuit breaker as claimed in claim 9,
5 characterized by the fact that the orifice (31) for the lock to pass is situated in a broad part (51) of a pull (50) which is housed mobile in the ON button so as to take on an unobtrusive position and an outward locking position and which, in its outward position, can be
10 applied against the front side (17) of the box.

11 - The circuit breaker as claimed in claim 1,
characterized by the fact that each button has a
visualization window (26) and the box (10) comprises a
15 second visualizing means (25) alternately visible through the windows of the buttons for the inward operational position of each one.

12 - The circuit breaker as claimed in claim 11,
20 characterized by the fact that the second visualizing means (25) is borne by a fixed element (39, 40) offering a guide surface to the button when pivoted.

13 - A circuit breaker comprising a box containing
25 a triggering and resetting mechanism susceptible of acting on separable contacts for opening and closing at least one current path, the box comprising a front side fitted with passage openings for an ON button and an OFF button accessible to an operator from outside of
30 the box and cooperating with a mechanism control part inside the box, the control buttons being mounted in the box so as to be capable of displacement between two operational positions and having a pressing side for the operator's finger,

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characterized by the fact that:



- the ON (14) and OFF (13) buttons of the circuit breaker are pivotably mounted in the box (10),
- the pressing side (20) of each button is unique and delimited by a first low-displacement end (20a) near
5 which is situated a pivot gudgeon (21) and by a second high-displacement end (20b),
- the first end (20a) of the pressing side (20) and the gudgeon (21) are arranged to enable said end to reveal and respectively hide a first visualizing
10 means (32) associated with the front side (17) of the box (10) in both the operational positions of each button.