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Marquardt

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[54] **MULTIPLE CIRCUIT CONTROL SWITCH WITH SPRING BIASED SLIDE OPERATING MEANS ENGAGING PIVOTED CONTACT ASSEMBLY**

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[52] **U.S. Cl.** ..... **200/6 R,** 200/16 R, 200/17 R

[51] **Int. Cl.** **H01h 19/46**

[58] **Field of Search** ..... 200/6 R, 6 B, 6 BA, 200/16 R, 17 R

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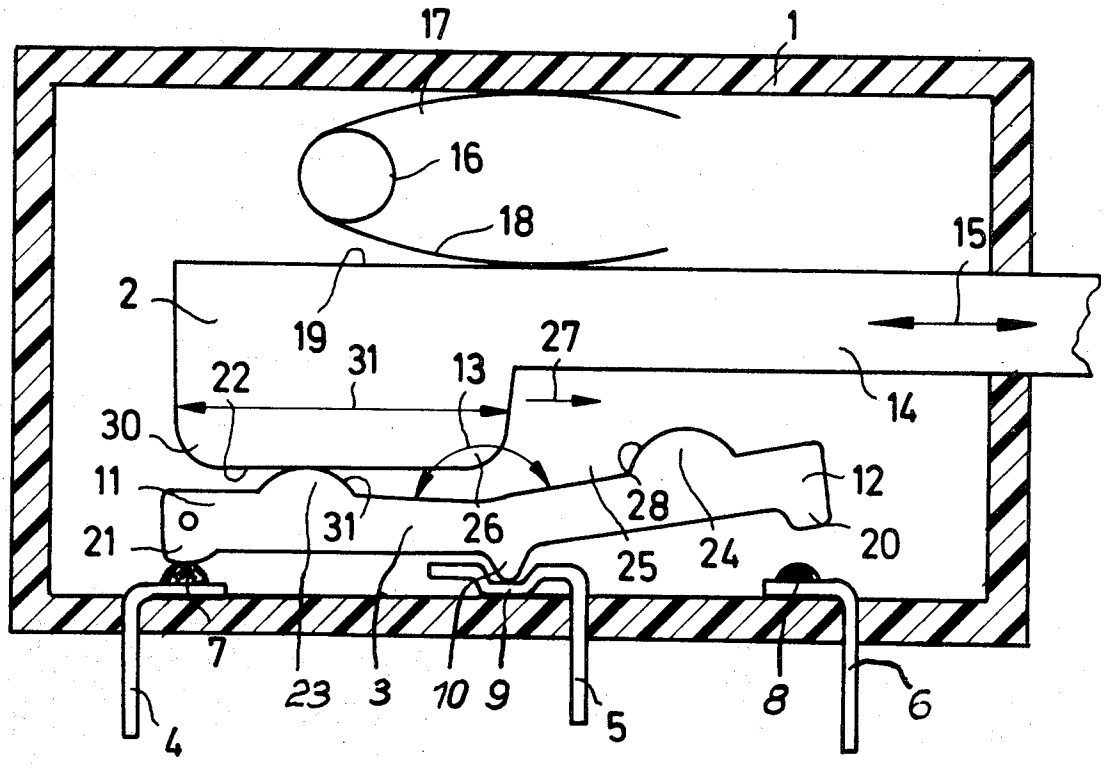
[57] **ABSTRACT**

An electric switch with a contact bridge pivotable between two end position and constructed as a double-armed lever, at least two fixed contacts being bridged in at least one of the said end positions, wherein the pivoting range of the contact bridge contains an operating element which is displaceable between two end positions, and which in one of these latter is mainly associated with one lever arm, while in the other end position it is mainly associated with the other lever arm, and which in the zone of its end positions forms a stop device for the rotation of the lever arm in question, while the particular lever arm which is free at the time, or some element connected therewith, extends into the path of motion of the said operating element.

5 Claims, 2 Drawing Figures



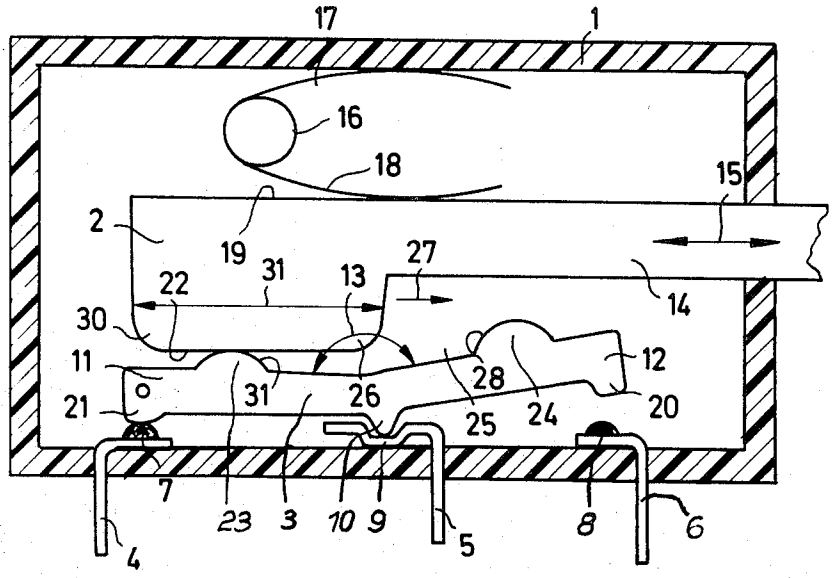

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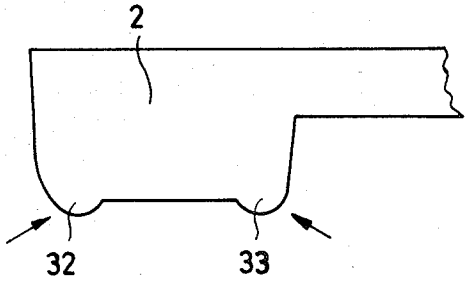
Fig. 1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32
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Fig. 2

MULTIPLE CIRCUIT CONTROL SWITCH WITH SPRING BIASED SLIDE OPERATING MEANS ENGAGING PIVOTED CONTACT ASSEMBLY

BACKGROUND TO THE INVENTION

The invention relates to an electric switch with at least one rotatably or tiltably mounted contact bridge pivotable between two end positions and constructed as a double-armed lever, at least two fixed contacts being bridged in at least one of the said end positions. The purpose of the present invention is to provide a switch of this kind in which over at least the operating distance no change takes place in the contact force.

SUMMARY OF THE INVENTION

It is proposed that this problem should be solved by a switch of the type mentioned at the beginning, characterized according to the invention by the fact that the pivoting range of the contact bridge contains an operating element which is displaceable, in a direction approximately perpendicular to its pivoting axis, between two end positions, and which in one of these latter is mainly associated with one lever arm, while in the other end position it is mainly associated with the other lever arm, and which in the zone of its end positions forms a stop device for the rotation of the lever arm in question, while the particular lever arm which is free at the time, or some element connected therewith, extends into the path of motion of the said operating element. The latter can be displaced in any desired manner from outside. In a certain manner it constitutes a holding-down device for the contact bridge, and in one position to which it is displaced it prevents one lever arm from performing a reverse rotation, while in the other position it prevents the other lever arm from doing so. As the particular lever arm of the contact bridge which is not resting against the operating element extends into the displacement range of the said element, this latter automatically moves against the said lever arm in the course of the displacement and causes it to leave its path of motion. This means that the lever arm is pivoted away from the operating element. At the same time, the other lever arm of the contact bridge is pivoted into the path of motion of the operating element. For this reason the shape of the contact bridge and the length of the operating element have to be adapted to each other, so that that end of the latter which is at the rear, as viewed in the direction of displacement, will not prevent the lever arm becoming free from pivoting into the said path. On the other hand, there is no difficulty in designing the apparatus to ensure that the operating element will first of all release the blocked lever arm and then cover a certain displacement distance before encountering the other lever arm. This may be regarded as a certain free travel, which can be utilized for special switching functions.

As a further development of the invention, the operating element is resiliently pressed against the adjacent lever arm of the contact bridge. The stronger the spring provided, the greater the contact force. The spring acts transversally, in particular perpendicularly, to the direction in which the operating element is displaced, so that given a constant height or thickness in the latter the spring tension will not change. The contact force thus remains constant until the commencement of the pivoting movement of the contact element. The contact force, furthermore, has no effect on the operating force. The movement of the operating element need not necessarily cease with the termination of the pivoting movement of the contact bridge, and in addition to the extended preliminary motion already mentioned a follow-up distance of greater or smaller length may also be provided. During this period likewise, or to be more exact, as long as the blocking action of the operating element continues, the contact force remains constant.

In a preferred embodiment of the invention the contact bridge is provided, on the side facing towards the operating element, with a cavity which is in particular symmetrical to the axis of rotation and of which the length in the direction of displacement of the operating element corresponds approximately to the length of the latter and of which the two ends are constructed as oblique run-up surfaces. When the switching operation takes place, that end of the operating element which is at the front, as viewed in the direction of displacement, first of all enters the said cavity until it eventually encounters that lever arm which is free in the first instance. The latter is then pivoted towards its other end position. The ends which are in each case at the front, as viewed in the direction of motion, are preferably likewise provided with a rounded or bevelled portion.

A further feature of the invention is characterized by the fact that the two lever arms of the contact bridge preferably form an obtuse angle with each other and, in particular, are constructed on exactly the same lines. It is particularly in the case of reversing switches that this construction will be adopted. As a further development of the invention the contact bridge is provided, on the side facing away from the operating element, with at least one and preferably two contacts or contact points symmetrical to the axis of rotation. In this connection all possible variations are conceivable, e.g., the bridging of two or more fixed contacts by one and the same lever arm or else a contact-making operation with one single contact, in which case the contact bridge has to be connected with a special terminal. In the latter case the two lever arms can each bear a movable contact, thus providing a means of switching over from a first to a second current circuit. It should also be noted that a number of contact bridges can naturally be switched over simultaneously by means of one and the same operating element. A particular advantage is provided by the fact that the contact bridge is constructed as a current connection.

According to a further feature of the invention the operating element is constructed as a slide to be operated from the outside or is connected with such a slide. This version could also be regarded as a push-pull switch, if the prolongation of the operating element extends in its direction of motion. For certain applications it may be of great advantage for the operating element to be displaceable against the force of a restoring spring, thus automatically returning to its initial position after the removal of the operating force. In this case the switch operates on the lines of a switch key.

In a further development of the invention the bearing of the contact bridge includes a certain clearance, at all events in the direction of motion of the operating element, so that on being switched over the contact bridge is at the same time displaced to a certain extent in the longitudinal direction, a frictional contact-making operation thus being obtained. The latter is very important for the self-cleaning of the contact.

BRIEF DESCRIPTION OF DRAWINGS

FIGS. 1 and 2 of the drawing provides a schematic lateral diagram of one example of the invention.

DESCRIPTION OF PREFERRED EMBODIMENT

The switch to which the invention relates consists of a housing 1, not shown in detail, the operating element 2, a contact bridge 3 and three connecting element 4–6. The latter are fixed in the usual manner in the housing 1 and their ends extending towards the outside are connected with electric conductors. The two outermost connecting elements 4 and 6 bear fixed contacts 7 and 8 respectively. The central connecting element 5 is specially constructed to form a pivot bearing brass 9. The bearing attachment 10 of the contact bridge 3 extends into the said bearing brass. The said bridge takes the form of a double-armed lever and is symmetrical to the bearing attachment 10. The two lever arms 11 and 12 form an obtuse angle 13.

The operating element 2 is integral with a prolongation 14 which passes through the housing to the outside and of which the free end represents the operating device of the switch. It is longitudinally displaceable in the direction shown by the double arrow 15.

A stirrup-shaped leaf spring, of which one arm 17 rests against the housing and the other arm 18 against the upper side of the operating element 2 or of its prolongation 14 produces the necessary contact pressure between the fixed contacts 7, 8, and the movable contacts or contact points 20, 21.

In FIG. 1, that surface of the lower side 22 which takes its course parallel to the surface 19 is situated on a raised part 23 of the lever arm 11. In the other switching position it rests against the raised part 24 of the other lever arm 12. Between these two raised parts 23 and 24 a kind of recess 25 is provided into which extends that end 26 of the operating element which is in front as viewed in the switching direction. In the switching operating, i.e., the displacement of the operating element 2 in the direction shown by the arrow 27, the said front end 26 encounters the flank belonging to the raised part 24 and constructed as an oblique run-up surface 28. On the return switching operation to the position shown in FIG. 1 that end 30 of the operating element which is now in front interacts in the same way with the oblique run-up surface 31 of the raised part 23. As soon as the said ends encounter the respective oblique run-up surfaces associated with them the operating element begins to rotate about the bearing point of the bearing attachment 10. The lever arm which first extends into the path of motion of the operating element 2 is pivoted against the fixed contact associated with it, while the other lever arm is removed from its fixed contact and pivoted into the path of motion of the returning operating element. For this reason the length 31 (as mentioned in the direction of displacement 15) of the operating element 2 and the distance between the oblique run-up surfaces 28 and 31 and also the length of the recess 25 must be adapted to one another. If the length 31 is excessive, the end which is to the rear as viewed in the switching direction 27 will obstruct the ascending movement and thus the pivoting of the contact bridge. If the length is made shorter than the distance between the oblique run-up surfaces 28 and 31, this produces a certain dead travel, during which the spring 16 is no longer able to exert any contact pressure on the adjacent contacts. If these disadvantages are to be avoided the lengths must be accurately adapted to one another, so that as soon as the contact pressure is removed the pivoting action for switching over can immediately take place. In this connection it should also be noted that the operating element 2 with its prolongation 14 is naturally guided in the longitudinal direction but nevertheless includes a certain transversal clearance, so that the force of the spring 16 can also take effect as a contact pressure. This spring naturally need not necessarily be provided in the form shown in the example but can be replaced by any desired spring or springs of which the action is transversal to the displacement direction 15.

FIG. 2 shows an alternative version of the operating element 2, differing from that shown in FIG. 1 by the two protuberances 32 and 33. Its method of operation is essentially the same as in the first example.

To enable the spring 16 to take effect, the longitudinal motion of the operating element 2 must allow of a certain play transversally to the direction of displacement 15.

If the operating element 2 is secured in an intermediate position, the reversing switch shown in the example can also be used as a disconnecting switch. In this case one of the pairs of fixed contacts 7 and 8 can be dispensed with. It is also perfectly possible for the fixed contacts 7 and 8 to be replaced by electrically non-conductive stops, so that even if there are two defined end positions into which the switch can be tilted it will only operate as an on-off switch.

I claim:

1. In an electric switch the combination comprising a switch housing having lower and upper walls, a central fixed electrically-conductive contact located on said lower wall and forming a pivot bearing, two outer fixed contacts located on opposite sides of central contact, a double-armed lever having a central attachment depending from said lever at the juxtaposition of said two arms, said attachment being pivotably mounted in said pivot bearing, a movable contact on the end of each said arm remote from said central attachment, an operating element within said housing and having an extension which passes through said housing to the outside thereof, the operating element and extension being longitudinally movable along their longitudinal axes, the combination further comprising a spring between said upper wall and said operating element and its extension, whereby when said operating element is moved in one direction said movable contact on one arm of said double-armed lever is urged into contact with one of said fixed contacts and when said operating element is moved in said opposite direction said movable contact on said other arm of said double-armed lever is urged into contact with said other fixed contact.

2. Said switch as defined in claim 1 in which said double-armed lever is provided, on said side facing towards said operating element, with a cavity which is symmetrical to the axis of rotation and of which the length in the direction of displacement of said operating element corresponds approximately to the length of the operating element and of which the two projecting ends of said operating element are constructed as oblique run-up surfaces.

3. Said switch as defined in claim 1 in which said two arms of said double-armed lever form an obtuse angle with each other.

4. Said switch as defined in claim 1 in which one of said outer fixed contacts is electrically conductive and said other fixed outer contact is non-conductive.

5. Said switch as defined in claim 1 in which both said two outer fixed contacts are electrically conductive.

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