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LOW-VOLTAGE MULTI-POLE CIRCUIT-BREAKER PROVIDED WITH A DEVICE
FOR SETTING THE BAR

The invention relates to a low voltage multipole circuit-breaker with a molded case and an operating toggle mechanism, comprising

- an operating handle manually movable between closed F and open O positions,
- a trip cradle cooperating with the trip unit for automatically opening the contacts when a fault current appears,
- a common support bar of the movable contact arms of all poles, rotatably mounted on an axis, during a predetermined angular course, corresponding to the movement of handle,
- and a setting device for compensating manufacturing tolerances of mechanism elements.

According to a well-known circuit-breaker of the kind mentioned, the setting device is constituted by an adjustable connection with an eccentric cam, arranged between the lower lever of the toggle and a driving arm. The setting of the cam is realized by the appropriate positioning of an hexagonal head of a pin, to compensate manufacturing tolerances, in the best way. Nevertheless, this device is complicated and expensive (US-A-3 341 791).

This invention aims at coping with this disadvantage and allowing the realisation of a circuit-breaker, equipped with a simple, precise and cheap setting device. The circuit-breaker, according to the invention, is characterized by the fact that said setting device comprises a bar support member and at least an assembling screw of said member to a fixed part of the circuit-breaker, so that screwing or unscrewing of screw provokes bringing near or away of said member with respect to said fixed

part and a limited bidirectionnel movement of the bar to an optimum set position.

According to a particular embodiment of the invention, a blocking means cooperates with said setting device for blocking said assembling screw in the optimum set position for the best compensation of the manufacturing tolerances.

According to another embodiment of the invention, said bar support member comprises two independent positioning bearings, each cooperating with an assembling screw to provide said optimum setting and that said bearings are longitudinally spaced on said bar.

Other objects and disadvantages will become apparent from the following description of two embodiments of the invention, when read in conjunction with the accompanying drawings in which :

- figure 1 is a vertical view and a middle section of an operating mechanism, equipped with a setting device according to the invention,
- figure 2 is a vertical view of the mechanism, according to figure 1,
- figure 3 is a side view, showing the bar and the associate setting device,
- figure 4 is a vertical and sectional view of a variant of the invention, the circuit-breaker being represented in closed position.

On figures 1 to 3, an operating mechanism 10 of low voltage four-pole circuit-breaker, with a molded case, cooperates with one of the intermediate poles, the movement being transmitted to the adjacent poles by a transversal bar 12, made with insulating material. An operating manual handle 14 is associated to the

mechanism 10, and may have three stationary positions, closing F, fault tripping D and manual opening O of the circuit-breaker. The mechanism 10 is mounted between two support fixed parallel plates 16, and comprises a transmission toggle 18 with an axis 20, on which two levers 22, 24, are articulated. Lever 22 is coupled with bar 12 by a connection axis 26 and lever 24 is articulated on a trip cradle 28, on a reference mark 30. A tension spring 32 is tied to the axis 20 of toggle 18, and to a support 34, secured to handle 14. Handle 14 and support 34 together, are articulated on a fixed pivot 36, hold by plates 16.

The U-shaped trip cradle 28 is pivotally mounted on a fixed axis 38 and cooperates with the thermic and electromagnetic detectors of the tripping block (not shown) of the circuit-breaker. The cradle 28 comprises a hanging beak 40 being engaged in tensioned position with a latch 42 rotatably mounted on an axis 44 between locked and unlocked positions. A half-moon shaped locking apparatus 46, mounted on an axis 48, cooperating with a latch 42 is attracted by locked position of latch 42, under the action of a restoring spring 50, thread on the axis 44. When a fault current is detected by one of the thermic or electromagnetic detectors, the pivoting of the release bar (not shown) of the trip provokes the tipping of the locking apparatus 46, in the direction of arrow F1 to unlock latch 42 and release the hanging beak 40 of the trip cradle 28. This latter pivots round the axis 38, under the action of spring 32, when moving the linkage point 30 of lever 24, on the right, on figure 1, provoking the opening of the contacts of the different poles of the circuit-breaker and moving of handle 14 towards stationary tripping position D. Such a working is standard and it is necessary to mention that the re-set is made by a moving of handle 14, clockwise, from position D until re-position (see figure 1) near position O, assuring the hanging of the trip cradle 28 to latch 42, in locked position.

The locking of the circuit-breaker appears after arming the trip cradle 28, by opposite rotation of handle 14 towards position F.

The bar 12 is rotatably mounted on an axis 52 and holds four contact arms 54 corresponding to the different poles. Each contact arm 54 is articulated on an axis 55 and holds a movable contact 56, cooperating with a stationary contact 58. Each (contact) arm is electrically connected to a corresponding range 60 by a braid 62, and a pressure spring 64, inserted between the contact arm 54 and bar 12 ensures the appropriate contact pressure when the circuit-breaker is in locked position.

According to the invention, the operating mechanism 10 is equipped with a locating device 66 of bar 12, the set of which provides the compensation of the manufacturing tolerances of the elements of the movable contact assembly of the mechanism. The axis 52 of bar 12 rests on two spaced bearings 68, 70, equipped with fastening tongues 72, 74, facing the edges of the two fixed plates of the mechanism 10. Each fastening tongue 72, 74, has an orifice for the passage of a setting screw 76 of the TARSID type, screwed in a housing 78 of the corresponding plate 16.

Each bearing 68, 70, is pivotally mounted on an axis 73, secured to the associated plate 16, and screwing or unscrewing of screws 76, provokes a pivoting of bearings 68, 70, in planes parallel to the plane of movement of the contact arms 54 and the relative movement of the pivot axis 52, with respect to plates 16. This setting is made in factory, after assembling of elements of the circuit-breaker and clamping counter-nut 80 is then tight on each fastening tongue 72, 74, of bearings 68, 70, to the screws 76 of positioning device 66, in the optimum set position. During this setting, the movement of pivot axis 52 of bar 12 provides a correct positioning of contact arms 54, with respect to corresponding stationary contacts 58, in order to obtain a good pressure contact, in close position of the circuit-breaker.

Figure 4 shows a variant of a multipole circuit-breaker in which the same references will be used to indicate analogue or similar parts.

Bar 12 supporting the contact arms 54 is positioned in the lower chamber 82 of the case 84 of the circuit-breaker, separated from upper chamber 86 of housing of the operating mechanism (not shown) by an intermediate wall 88, made of insulating material. A lever 90 of the mechanism is coupled with bar 12, by connection axis 26. The extinguishing chamber 92 of each pole of the lower chamber 82 is equipped with a window 94 for the passage of the corresponding contact arm 54, the pivot axis 55 of the latter is secured to bar 12.

The opening of the contacts 56, 58, of the different poles takes place with a pivoting of bar 12, counter clockwise, provoking a downward tipping (indicated by arrow F2) of the contact arms 54, towards the base 96 of the case 84.

The positioning device 66 of bar 12 comprises two bearings 68, 70, subject to the intermediate wall 88, parallel to the base 96 by assembling screws having hexagonal heads 98, available in upper chamber 86, when cover 100 is in overhauled position. Screwing or unscrewing of screws 76 provokes a vertical translation bringing near or away of the bearings 68, 70, and bar 12 with respect to the intermediate wall 88, and allows in this way the optimum setting of a driving of contact arms 54, for the best compensation of the manufacturing tolerances. A braking plate 102, inserted between the head 98 of the screws 76 and the intermediate wall 88, blocks the setting positioning device 66 in this position, after setting in factory.

The invention is not at all limited to the embodiment more fully described and represented on enclosed drawings, but it especially extends to any variant, among electrical and mechanical equivalences, more particularly the variant in which the setting positioning device, according to the invention, would provoke a movement of the pivot axis 55 of the contacts arms 54, or the one in which said setting device 66 would operate at the level of stationary contacts 58.

CLAIMS

1. Low voltage multipole circuit-breaker with a molded case and an operating toggle mechanism (10) comprising :

- an operating handle (14) manually movable between closed F and open O positions,
- a trip cradle (28) cooperating with the trip unit for automatically opening the contacts (56, 58) when a fault current appears,
- a common support bar (12) of the movable contact arms (54) of all poles, rotatably mounted on an axis (52) during a predetermined angular course corresponding to the movement of handle (14),
- and a setting device (66) for compensating manufacturing tolerances of mechanism elements, characterized by the fact that said setting device (66) comprises a bar (12) support member (68, 70) and at least an assembling screw (76) of said member to a fixed part (16, 88) of the circuit-breaker, so that screwing or unscrewing of screw (76) provokes bringing near or away of said member (68, 70) with respect to said fixed part (16, 88) and a limited bidirectionnel movement of the bar (12) to an optimum set position.

2. Multiple circuit-breaker according to claim 1, characterized by the fact that a blocking means (80) cooperates with said setting device (66) for blocking said assembling screw (76) in the optimum set position for the best compensation of the manufacturing tolerances.

3. Multipole circuit-breaker according to claim 1 or 2, characterized by the fact that said bar (12) support member comprises two independent positioning bearings (68, 70), each cooperating with an assembling screw (76) to provide said



optimum setting and that said bearings (68, 70) are longitudinally spaced on said bar (12).

4. Multipole circuit-breaker according to claim 3, wherein the operating toggle mechanism (10) is housed between two fixed parallel plates (16) characterized by the fact that said fixed part is constituted by said plates (16) of the mechanism and that each bearing (68, 70) includes a fastening tongue (72, 74) extending before a plate (16) and having an orifice for the passage of the assembling screw (76) introduced within an aligned housing (78) of said plate (16).

5. Multipole circuit-breaker according to claim 4, characterized by the fact that each bearing (68, 70) is rotatably limited mounted on an axis (73) secured to the associated plate (16) for providing said setting.

6. Multipole circuit-breaker according to claim 4 or 5, characterized by the fact that the length setting of said assembling screws (76) provokes a movement of said bearings (68, 70) in planes parallel to the plane of movement of the contact arms (54).

7. Multipole circuit-breaker according to claim 1, 2 or 3, wherein an intermediate wall (88) subdivides the inner space of casing (84) into two superposed chambers (82, 86), lower and upper, characterized by the fact that the bar (12) is housed in the lower chamber (82) with the whole of the poles and that said fixed part is constituted by the intermediate wall (88) through which extend the assembling screws (76), the length setting of the latter providing the movement of the pivot axis (52) of bar (12) along a vertical translation to said optimum portion.

8. Multipole circuit-breaker according to claim 1, 2 or 3, characterized by the fact that the setting device cooperates with the bar (12) for the limited movement of the pivot axis (55) of the contact arms (54) to said optimum position.

