

The invention relates to a switching mechanism for low-voltage switching devices, according to the precharacterizing clause of Claim 1.

Such a switching mechanism for activating the electrical contacts of a switching device is already known (DEP 35 08 110). The switching mechanism described therein has a locking member which has the function of locking the switching contacts first shortly before contact. The pre-stressed locking member holds a switching spindle which brings about the transmission to the switching contacts of the switching device, by way of a disc up to a selectable switch-on force at the switching bar. As the switch-on force at the switching bar is increased, energy is stored between the switching bar and the switching spindle as a result of resilient deformation of the switching members. On overcoming the switch-on force, the pre-stressed locking member is deflected outwards and the disc of the switching spindle rolls against a circular contour of the locking member. With an appropriate outward deflection of the pre-stressed locking member, the disc is disengaged from the locking member and the switching spindle springs in the switching-on direction and thus brings about a sudden switching on of the switching contacts of the switching device. This switching mechanism is provided for use in conventional earth leakage-current circuit breakers. However, the further development is such that the earth leakage-current circuit breakers are reduced in size, this also making available less room for the switching mechanism than hitherto.

The object of the invention is to develop a switching mechanism for an earth leakage-current circuit breaker which can be accommodated in a predetermined small space and which at the same time meets all the requirements with respect to switching capacity, service life and climatic resistance.

This object is achieved according to the invention by the combination of constructional features specified in the characterizing clause of Claim 1.

The advantages achieved by the invention consist in the fact that an extremely space-saving switching mechanism which can be used in different switches, but in particular in earth leakage-current circuit breakers, has been created. In addition to its reliability, it should also be mentioned that it is inexpensive to produce.

Advantageous embodiments and further developments of the subject according to Claim 1 are to be found in the sub-claims.

Thus, it is advantageous that in the case of the present switching mechanism the force transmitted from the contacts by way of the connecting link torque, the link, and the rocker lever to the trip lever is partly cancelled by a corresponding, counteracting torque which is exerted on the trip lever by the torsion spring (Claim 4). Here, the size of the force compensation can be designed such that the uncompensated part of the force is still sufficient to overcome the friction forces of the individual parts and to ensure tripping. Thus, the force effecting unlatching at the spindle for a resetting plate can be minimized, and a trip relay can be used with relatively small force.

After switching off by means of the trip relay, the latter must be returned to the starting position. This is effected advantageously by means of a resetting plate which is mounted rotatably on a spindle and, in the switched-off position of the switching mechanism, is turned clockwise by the end of the connecting link, a lever of the resetting plate pressing on the pin of the trip relay and resetting it. The resetting plate is produced from resilient sheet metal, so that the levers act as leaf springs (Claims 5 and 6). Here, these leaf springs are of a size such that they deform plastically in the event of a force which is greater than the necessary resetting force. To compensate for manufacturing tolerances, this resetting plate can be produced oversized, and on the first actuation is matched to the actual installation conditions by means of plastic

deformation. It is hereby ensured that the trip relay is completely reset and is not acted upon by an unnecessarily large force.

An embodiment of the invention is illustrated in the drawings and is described in more detail below. In the drawings:

Fig. 1 shows a switching mechanism for an earth leakage-current circuit breaker in the switched-off position, in side view,

Fig. 2 shows this switching mechanism in the locking position, in side view,

Fig. 3 shows this switching mechanism in the switched-on position, in side view, and

Fig. 4 shows this switching mechanism in the switched-off position after tripping as a result of an earth leakage-current, in side view.

According to Figures 1 to 4, the earth leakage-current circuit breaker can be switched on and off by hand by means of a switching lever 1. To this end, the switching lever 1 is connected to a toggle lever system which comprises a resilient member 2, a link 3 and a connecting link 4. The toggle lever system has a common spindle 5 which is arranged to be movable. Connected to the connecting link 4 is a contact shaft 6 which carries a movable contact 7 with which a fixed contact 8 is associated.

There is further connected to the switching lever 1 a locking device which comprises a short lever 9 and a long lever 10. Both levers have a common spindle 11. The short lever 9 is directly connected to the central spindle of the switching lever 1, while the free end of the long lever 10 is associated with the common spindle 5 of the toggle lever system, for which purpose the long lever 10 is provided at this point with an elongate hole 15.

For tripping, a trip lever 16, a resetting plate 18 and a catch 22 are provided. As soon as a trip relay 20 responds, the resetting plate 18 and the catch 22 rotate anticlockwise. As a result, the trip lever 16 is released and also rotates anticlockwise. The resetting plate 18 and the catch 22 are pivotal about a spindle 19. With the rotation of the trip lever 16, a rocker lever 14 can also rotate, as a result of which the toggle lever system causes the contacts 7 and 8 to open. The trip lever 16 is provided with a torsion spring 17. All the parts, including the trip relay 20, but not contact shaft 6 and contacts 7, 8 are accommodated in a breaker mechanism 21.

The operation of the switching mechanism is as follows: the breaker mechanism 21 has a rapid switching-on facility with a position-dependent locking device. In the switched-off position according to Fig. 1, the levers 9 and 10 form with the spindle 11 a toggle lever system in a top dead-centre position. In the locking position according to Fig. 2, the toggle lever system comprising the resilient member 2, the link 3 and the connecting link 4 is locked in a position in which touching of contacts does not yet take place. On moving the switching lever 1 further, a pressure spring of the resilient member 2, which member can be compressed in the longitudinal direction, is stressed until the projection 12 of the switching lever 1 touches the projection 13 of the short lever and moves the lever system with the levers 9 and 10 further until it springs into the straight position after passing the dead-centre position and suddenly releases the toggle lever system 2, 3 and 4. As a result, the contacts 7, 8 are suddenly closed.

Tripping is effected by way of the trip lever 16, the resetting plate 18 and the catch 22. As the trip relay 20 responds, the resetting plate 18 and the catch 22 are rotated anticlockwise. Here, the projection 23 of the catch 22 releases the trip lever 16, which can now rotate anticlockwise, and by rotating the rocker lever 14 clockwise the toggle lever system 2, 3 and 4 can be moved to the left and the contact shaft 6 goes into the

switched-off position, according to Fig. 4.

## List of reference numerals:

- |    |                                   |                       |
|----|-----------------------------------|-----------------------|
| 1  | Switching lever                   |                       |
| 2  | Resilient member                  | } toggle lever system |
| 3  | Link                              |                       |
| 4  | Connecting link                   |                       |
| 5  | Common spindle                    |                       |
| 6  | Contact shaft                     |                       |
| 7  | Movable contact                   |                       |
| 8  | Fixed contact                     |                       |
| 9  | Short lever                       | } Locking device      |
| 10 | Long lever                        |                       |
| 11 | Spindle                           |                       |
| 12 | Projection of the switching lever |                       |
| 13 | Projection of the short lever     |                       |
| 14 | Rocker lever                      |                       |
| 15 | Elongate hole                     |                       |
| 16 | Trip lever                        |                       |
| 17 | Pressure spring                   |                       |
| 18 | Resetting plate                   |                       |
| 19 | Spindle of the resetting plate    |                       |
| 20 | Trip relay                        |                       |
| 21 | Breaker mechanism                 |                       |
| 22 | Catch                             |                       |
| 23 | Projection of the catch           |                       |

**Claims:**

1. Switching mechanism for low-voltage switching devices, having a switching lever which drives a contact shaft by way of a toggle lever system, and having a set of contacts comprising a movable and a fixed contact, characterized in that there is connected to the switching lever (1) a locking device which comprises a relatively short lever (9) coupled to the switching lever (1) and a relatively long lever (10) which is connected to this lever and which is associated with a common, movable spindle (5) of the toggle lever system (2, 3, 4), the arrangement being such that the locking device (9, 10) is brought into the top dead-centre position in the switched-off position of the switching lever (1), in that on actuating the switching lever (1) the locking device (9, 10) and a resilient member (2) connected to the switching lever (1) displace the common spindle (5) of the toggle lever system (2, 3, 4) such that the contact shaft (6) connected to the toggle lever system (2, 3, 4) brings the movable contact (7) towards the fixed contact (8) without touching the latter, in that on further actuating the switching lever (1) a spring of the resilient member (2), which member can be compressed in the longitudinal direction, is stressed until a projection (12) of the switching lever (1) touches a projection (13) of the lever (9) and the locking device (9, 10) is brought into a straight position after passing the dead-centre position and is released and the contacts (7, 8) are suddenly closed.

2. Switching mechanism according to Claim 1, characterized in that the toggle lever system is formed from the resilient member (2), a connecting link (4) connected to the contact shaft (6), and a link (3) which in turn is associated with a rocker lever (14).

3. Switching mechanism according to one of Claims 1 or 2, characterized in that the relatively long lever (10) has at the connection point to the common spindle (5) of the toggle lever system (2, 3, 4) an elongate hole (15) in the longitudinal



direction of the lever (10).

4. Switching mechanism according to one of Claims 1 to 3, characterized in that a trip lever (16) is provided with a torsion spring (17) which is designed such that it cancels the force transmitted from the contacts (7, 8) by way of the connecting link (4), the link (3) and the rocker lever (14) to the trip lever (16) partly by a corresponding, counteracting torque.

5. Switching mechanism according to one of Claims 1 to 4, characterized in that a resetting plate (18) provided with two lever arms is rotatable on a spindle (19) in the switched-off position by the end of the connecting link (4) such that one of the lever arms presses in and resets the pin of a trip relay (20).

6. Switching mechanism according to one of Claims 1 to 5, characterized in that the resetting plate (18) is produced from resilient sheet metal and is matched to the installation conditions by plastic deformation.

7. Switching mechanism according to one of Claims 1 to 6, characterized in that all the parts, except for the set of contacts, are inserted in a breaker mechanism (21) enclosed by two plates such that a free space is filled by the trip relay (20).