

Description

The invention concerns an electrical installation device with the features of the introductory part of claim 1.

The electrical installation device can be mounted on a supporting rail by means of the casing of the device. For this purpose, the casing of the device usually has two fixing elements. One fixing element is formed in a substantially rigid manner on a casing wall of the device, and in the position when the casing bottom is fitted on the supporting rail, it clamps a longitudinal edge of the rail between itself and the casing bottom. The second longitudinal edge of the rail extending parallel to the first longitudinal edge of the rail is clamped in the fitted position of the electrical installation device between the casing bottom and a movable engagement slide. On this occasion, the engagement slide is situated in its engaged position. It can be moved in an engagement direction between its engaged position and a released position. Because of the facility of moving the engagement slide, the casing of the device is secured on a supporting rail during the fitting process in the manner of a catch engagement mounting. For releasing the mounting, the engagement slide is displaced into its released position.

Such an electrical installation device is known, for example from the DE 37 28 907 A1. The engagement slide in that Patent is integrally formed on the casing of the device with a displacement facility, by means of a bending member extending perpendicularly to the plane of the supporting rail. At its end remote from its engagement projection which serves for securing the longitudinal edge of the rail, the engagement slide is extended in the engagement direction by an actuating end. An actuating tool, for instance the blade of a screwdriver, engages in the actuating end so as to transfer the engagement slide from its engaged position into its released position. In this arrangement, the movement of the actuating end is guided by means of a slot guide that is integrally formed on the shell body wherein the actuating end engages.

In the known electrical installation device, the arrangement and the form of the engagement slide are disadvantageous. The engagement slide forms an extension of the actuating end of the bending member. To ensure that the engagement slide produces in its engaged position a mechanically stable mounting of the casing of the device on the supporting rail, the bending member must be designed to be relatively rigid in spite of its required elasticity to ensure that the engagement slide remains reliably in its engaged position and to enable it to exert an adequate pressure force on the supporting rail. However, the mechanically stable and relatively rigid design of the bending member requires an increased exertion of force on the user's part for transferring the engagement slide from its engaged position into its released position. On the other hand, a more elastic design of the bending member produces less pressure of the engagement slide on the supporting rail. A stable mounting of the casing of the device on

the supporting rail is therefore not ensured. This safety risk is additionally increased, because due to the natural wear of the bending member during the bending processes, the engagement slide increasingly moves away from its original engaged position and, as a component only supported by the bending member itself, permanently exerts lower pressure forces on the supporting rail during the service life of the bending member.

Starting with these drawbacks, the invention is based on the problem of increasing the mechanical stability of the casing of the device and to render possible a release of the mounting which is more user-friendly. This problem is solved by the combination of the features of claim 1. The engagement slide is inserted in the longitudinal guide so that it is carried by the longitudinal guide. In this way, the longitudinal guide takes over the force component for securing the engagement projection on the supporting rail. Without any external force action on the actuating end, the engagement slide therefore remains reliably in its engaged position. Moreover, the force exerted by the engagement slide on the supporting rail does not depend on the material properties of the bending member. In the case of the bending member, it is therefore only necessary to contemplate an adequate elasticity to produce the sliding movement of the engagement slide with a small exertion of force.

The longitudinal guide is neither stressed by flexure nor by other external forces. It therefore exerts a holding force on the engagement slide that is constant over the service life of the electrical installation device. Moreover, the required securing action of the engagement slide is not impaired by the natural wear of the bending member due to the many mounting and releasing actions. By this means, the mechanically stable mounting of the electrical installation device on the supporting rail is ensured. Unintended external forces acting on the casing of the device are continuously and effectively compensated over the whole operating time. This in turn improves the operational reliability of the electrical installation device.

The longitudinal guide produces a pure translational movement of the engagement slide. As compared with a rotational movement, the translational movement makes possible a shorter effective displacement path of the engagement slide during its transfer from the engaged position into the released position. By this means, the actuation of the actuating end is simplified.

The forced translational movement of the engagement slide obtained by the longitudinal guide prevents the bending member and the engagement slide connected thereto from being liable to be pivoted in the manner of a pendulum. Since the bending member cannot be artificially extended, the translational movement of the engagement slide therefore produces, on the one hand, a strong limitation of the displacement path of the engagement slide with the effect of a greater user-friendliness and, on the other hand, an improved restoring action of the bending member on the engagement slide, so that the mechanically stable mounting of

the casing of the device on the supporting rail is further improved.

Claim 2 ensures the mechanical stability between the engagement projection and the engagement slide, so that the actions of the longitudinal guide on the engagement slide are also transmitted to the engagement projection.

The flexible connection between the engagement slide and the bending member permits pivoting of the bending member with a small exertion of force. In contrast to a rigid connection, the flexible connection avoids possible fracture points due to very high flexural stresses during the displacement movement of the engagement slide. The service life of these components is therefore increased.

Claim 3 concerns a preferred mode of embodiment of the flexible connection between the engagement slide and the bending member. The connecting member ensures the required mechanical stability between the engagement slide and the bending member for an effective force transmission during the sliding movement. The intended bending point permits the translational movement of the engagement slide in a technically simple way, even if the bending member is pivoted by means of an actuating tool in a way similar to a pendulum on a circular path.

The arrangement of the connecting member and the bending member according to claim 4 permits the action of a greater force component of the bending member on the engagement slide and consequently ensures a higher pressure force of the engagement projection on the supporting rail. Furthermore, the greater force component provides an effective compensation of any forces inadvertently exerted on the engagement slide against its engaged position, so that it remains securely in its engaged position.

In accordance with claims 5 to 7, a user-friendly engagement of the actuating tool in the actuating end is possible for displacing the engagement slide with a small exertion of force. Due to the obtuse angle between the side wall of the casing and the bending member, the actuating tool can be supported on the side wall of the casing during its engagement in the actuating end. The side wall forms a bearing means for the actuating tool, so that the latter can be pivoted with a small exertion of force, with a very effective transmission of force onto the engagement slide. At the same time, this side wall of the casing has the further function of a limiting stop for the pivoting of the actuating tool. By this means, an excessive flexural stressing of the bending member is avoided.

According to claim 8, the longitudinal guide has a two-shell design. It surrounds the engagement slide on both sides on its periphery and ensures in this way that the engagement slide is only moved in translation in the engagement direction. Lateral forces acting transversely to the engagement direction therefore do not impede the required sliding movements of the engagement

slide. Since the engagement slide is mechanically joined to the bending member and the actuating end, these two last mentioned components are also protected in a better way against laterally acting forces, so that the mechanically stable arrangement of the bending member and of the actuating end on the casing of the device remains preserved during the whole operating time.

According to claim 9, the engagement slide is very effectively protected against external mechanical damage. The guide shells surround the engagement slide, preferably with a form fit, so as to additionally improve its displacement guidance.

A longitudinal guide designed in accordance with claim 10, limits the translational movement of the engagement slide against its engaged position by means of its boundary faces, and therefore also contributes to the protection of the bending member against excessive flexural stresses.

In accordance with claims 11 and 12, the manufacture of the casing shells and the assembly of the casing are simplified.

The elasticity of the bending member and of the connecting member makes it possible for the two halves of the engagement slide and the guide shells assigned to them to be manufactured as lying in approximately the same plane, without the engagement slide already being inserted in the guide shells. The coplanar manufacture promotes the narrow design of the device casing. Due to the elasticity of the bending member, as well as of the adjoining connecting member, the halves of the engagement slide can be inserted in a simple manner by being laterally bent into the respective associated guide shell after the casing shells have been manufactured.

Claim 13 simplifies the assembly of the part units respectively consisting of the engagement slide, the connecting member and the bending member, into one unit. The fixing means ensure that in the assembled state of the casing of the device, the part units are secured to each other, being fixed in position over their whole service life and that they jointly perform their functions. Because of their integral formation on the casing shells, the part units secured to each other and being fixed in position in the assembled state of the casing of the device also produce an improved fixing of the two casing shells to each other, so that the mechanical stability of the casing of the device is further improved.

According to claim 14, the fixing of the part units into one unit during their assembly becomes possible without additional working steps, since the two casing halves are in any case displaced towards each other in the direction of the supporting rail during the assembly of the casing of the device. In this process, the fixing means lying opposite each other in the direction of the supporting rail and corresponding to each other engage in one another.

Claims 15 and 16 improve a mechanically stable application to each other of the part units in the assembled state of the casing of the device.

The object of the invention will be explained in greater detail with reference to the examples of embodiments shown in the Figures. There are shown in:

Fig. 1 a representation in perspective of the electrical installation device secured on a supporting rail;

Fig. 2 a part view of a casing shell situated in its fitted position, with an engagement slide in its engaged position;

Fig. 3 a representation in perspective of a casing shell of the casing of the device;

Fig. 4 a representation in perspective of the two casing shells that can be assembled into the casing of the device.

In Figure 1, the electrical installation device 1 is situated in its fitted position on a supporting rail 2. In this example of the embodiment, the electrical installation device 1 is a low voltage switch, designed as an overcurrent protective circuit breaker. The longitudinal reach of the supporting rail 2 is aligned in the direction 3 of the supporting rail. As viewed in the direction 3 of the supporting rail, the supporting rail 2 has a C-shaped profile. The bent rail portions 4, 5 extending parallel to each other, and being aligned in the direction 3 of the supporting rail, are bent over relative to the supporting rail 2 by 90° and lie in a plane formed by the direction 3 of the supporting rail and a direction 6 that is transverse to the rail.

The casing of the device, made of an insulating plastic material, for the accommodation of the mechanical, electromechanical and/or electronic components consists of casing halves 7, 8, the outer contours whereof have a substantially identical shape. The side walls of the two casing halves 7, 8 adjoining each other may contain projections or grooves, not shown herein in greater detail, so as to allow the two casing halves 7, 8 to be fixed to each other in the assembly of the casing of the device. By means of bores, which herein have also not been shown in greater detail, passing through the casing halves 7, the two casing halves 7, 8 can be joined to each other in a mechanically stable way, for example, by plastic screws. The approximately central parting plane of the casing of the device is formed by the direction 6 that is transverse to the rail and a fitting direction 9. The parting plane is moreover, orientated perpendicularly to the direction 3 of the supporting rail.

The assembled device casing of the electrical installation device 1 is fitted approximately in the fitting direction 9 on the supporting rail 2. The casing halves 7, 8 respectively engage behind

the bent rail portion 4 by means of an integral rigid engagement projection 10 formed in a wedge shape, whereof in Figure 2 there may be seen the engagement projection 10 of the casing half 8. Lying opposite each other in the direction 6 transverse to the rail, there is integrally formed on the two casing halves 7, 8 one engagement slide 12 each, whereof the engagement slide 12 of the casing half 8 may be seen in Figure 2. The engagement direction 11 extends parallel to the direction 6 that is transverse to the rail. The engagement slides 12 fit behind the bent rail portion 5.

In Figure 2, it may be seen that the casing half 8 is disposed on the bent rail portions 4, 5 with a casing side wall acting as a casing bottom 13. The surface of the engagement projection 10 facing the casing bottom 13 extends in an acute angle relative to the casing bottom 13. At the start of the fitting process, this bent portion at first permits the direct application of the engagement projection 10 and of the bent rail portion 4 to each other. Thereupon, the casing halves 7, 8 are pivoted round an imaginary axis of pivoting, formed by the outer edge of the bent rail portion 4 and extending in the direction 3 of the supporting rail, until the casing bottom 13 bears on the surface of the bent rail portion 4 facing it. The engagement slide 12 therewith engages in its engaged position (Figure 2).

On the engagement slide 12, provided in Figure 2 with an approximately rectangular outer contour, there is integrally formed a wedge-shaped engagement projection 14. In the engaged position of the engagement slide 12, a side 15 of a securing wedge of the engagement projection 14 engages behind, and secures the outer edge of the bent rail portion 5, while the casing bottom 13 bears on the bent rail portion 5. In cooperation with the engagement projection 10, a sufficiently stable fixing of the casing of the device on the supporting rail 2 is achieved by this means. The second side of the wedge is approximately twice as long as the side 15 of the securing wedge. The outer face of the second wedge side facing the supporting rail 2 is acting as a sliding surface 16. During the fitting process, the sliding surface 16 slides along the outer edge of the bent rail portion 5, whereby the engagement slide 12 is moved in the engagement direction 11 in the opposite direction to the bent rail portion 5. As soon as the wedge tip of the engagement projection 14 has reached the outer edge of the bent rail portion 5, the side 15 of the securing wedge engages behind the outer edge of the casing bottom 13 as the casing bottom 13 continues to be pivoted in the direction towards the bent rail portion 5. By this means, the engagement slide 12 acts in the manner of a catch engagement means.

The engagement slide 12 lies in a guide shell 17 and because of this, executes a purely translational movement in the engagement direction 11. The shell is integrally formed on the casing bottom 13. Together with the casing bottom 13, it delimits a rectangular guide cavity 18. The guide cavity 18 is freely accessible in the direction 6 transverse to the rail and facing the bent rail portion 5, to ensure that the engagement projection

14 projects beyond the guide shell 17 in the engaged position. The guide cavity 18 of the casing half 8 is also freely accessible in the direction 3 of the supporting rail and facing the casing half 7 to ensure that its engagement slide 12 can, in the assembled state of the device casing, cooperate as one unit with the engagement slide 12 of the casing half 7 by means of a cylindrical connecting pin 19 that extends in the direction 3 of the supporting rail. The surface of the guide shell 17 lying opposite the connecting pin 19 in the direction 3 of the supporting rail, the casing bottom 13 and the side face of the guide shell 17 acting as a holding surface 20 that lies opposite thereto in the fitting direction 9, each directly touch an outer face of the engagement slide 12. However, in this arrangement, the friction of the adjoining faces is so small that the required facility for a longitudinal movement of the engagement slide 12 is ensured. The engagement slide 12 bears on the holding surface 20 and thereby exerts in its engaged position a constant pressure on the bent rail portion 5 during the service life of the casing of the device. In the opposite direction to the engagement direction 11 of the engagement projection 14, the displacement path of the engagement slide 12 is delimited by a side face of the guide shell 17 acting as a boundary face 21. The boundary face 21 lies in the plane formed by the fitting direction 9 and the direction 3 of the supporting rail.

While the engagement slide 12 is rigidly connected to the engagement projection 14, it is flexibly connected to a bending member 22 that is integrally formed on the casing half 8. The bar-type bending member 22 forms an extension of the bottom end of a casing side wall 23 of the casing half 8 which extends in the fitting direction 9. The casing side wall and the bending member 22 form an obtuse angle. The bending member 22 projects beyond the casing bottom 13 in the fitting direction 9 and is at the same time orientated towards the guide shell 17. The bending member 22 is elastic and thereby permits the movements of the engagement slide 12 in the engagement direction 11.

The engagement slide 12 is connected to the bending member 22 by means of a bar-type connecting member 24. The bending member 22 and the connecting member 24 form an obtuse angle. In the apex zone of the angle, the surface of the connecting member 24 facing the bending member 22 in the fitting direction 9 has a dish-shaped pared portion, so that at this point its wall thickness is reduced. This reduced wall thickness serves as an intended bending point and provides the necessary pivoting facility between the bending member 22 and the connecting member 24. At the movement end of the bending member 22, facing the reduced thickness 25, an actuating end 26 is integrally formed having a bearing member 27 that extends in the direction 6 transverse to the rail. In the fitting direction 9, the bearing member 27 and the connecting member 24 are formed at the movement end of the bending member 22, being aligned at approximately the same level. The bearing member 27 forms an acute angle with the bending member 22.

The actuating end 26 is preferably designed to be rigid. At the end zone of the bearing member 27 lying opposite the reduced wall thickness 25 in the direction 6 transverse to the rail an engagement member 28 is formed which extends substantially in the fitting direction 9 (Figure 2). The engagement member 28 projects in the direction 3 of the supporting rail beyond the bearing member 27 on one side, so as to engage during the assembly of the casing halves 7, 8 in an engagement groove 29 of the actuating end 26 of the casing half 7 and to obtain a mechanically stable assembly of the two casing halves 7, 8 (Figure 4).

In Figure 2, an actuating tool 30, formed as a screwdriver blade, engages with its blade end in the internal space delimited by the bending member 22, the bearing member 27 and the engagement member 28. The actuating tool 30 bears on the end of the bending member 22 on the casing side. The end of the bending member 22 on the casing side forms a mechanically stable bearing means, so that the actuating tool 30 being fixed in the actuating end 26 can be pivoted in the pivoting direction 31 with a small exertion of force. In this arrangement, the end of the bending member 22 on the casing side forms the fulcrum of the actuating tool 30 which acts as a two-armed lever during its pivoting.

During the pivoting of the actuating tool 30 in the pivoting direction 31, the engagement slide 12 is transferred in the engagement direction 11 in the opposite direction to the bent rail portion 5 into its released position. In this way, the catch engagement mounting of the casing of the device is releasable. The displacement path of the engagement slide 12 is limited by the boundary face 21 and partly also by the limited elasticity of the bending member 22.

In Figure 3 it may be seen that all the functional parts for the catch engagement mounting and for its release are integrally formed on the casing half 8. This simplifies their manufacture. The subsequent insertion of the engagement slide 12 into the cavity 18 of the guide shell 17 is readily possible since the bending member 22 and, to a limited extent, the connecting member 24 too, are designed to be elastic. To ensure that the sliding movements of the engagement slide 12 are not obstructed in the direction 6 that is transverse to the rail, the connecting member 24 has in its zone facing the guide shell 17 a rectangular cutout. The cutout immediately follows the end of the engagement slide 12 on the side of the connecting member. However, in the zone of the reduced wall thickness 25, the connecting member 24 extends in the direction 3 of the supporting rail just as far as the reduced wall thickness 25 itself and as the bending member 22. By this means the connecting member 24 receives an L-shaped outer contour. As the engagement slide 12 is transferred into its engaged position, the L base of the connecting member strikes the guide shell 17 and therefore acts as a stop for the engaged position.

In Figure 4 it may be seen that the engagement slide 12 projects beyond the guide cavity 18 of the guide shell 17 in the direction

3 of the supporting rail. At this projecting side, the engagement slide 12 terminates flush with the side of the connecting member 24 that does not have a cutout. On the other hand, the engagement projection 14 is arranged with an offset in the direction 3 of the supporting rail relative to the surface of the engagement slide 12 that is assigned to the connecting pin 19 and terminates flush with the surface of the engagement slide 12 lying opposite the connecting pin 19. The reach of the engagement projection 14 and that of the bearing surface 20 of the guide shell 17 carrying it, as well as the engagement slide 12, extend approximately over the same distance in the direction 3 of the supporting rail.

In Figure 4, it may also be seen that the two casing halves 7, 8 that can be assembled into the casing of the device have an identical design, with the exception of the connecting pin 19, the connecting bore 32 of the engagement slide 12 that is assigned to the casing half 7 corresponding to the pin, and with the exception of the engagement member 28 of the casing half 8 and of the engagement groove 29 of the casing half 7 corresponding to the engagement member. This also simplifies the manufacture of the casing of the device.

At its projecting end facing the casing half 7, the engagement member 28 has an engagement projection 33 which produces the engagement of the engagement member 28 and of the engagement groove 29 during the assembly of the casing halves 7, 8 (Figure 1). By this means, the mechanical stability of the actuating end 26 is improved, as well as that of the complete casing of the device too. At their outer edges facing away in the direction 3 of the supporting rail, the engagement member 28 and the engagement groove 29 are each extended in the direction 3 of the supporting rail in the direction towards the bending members 22 by one web side wall 34. As viewed in the direction 3 of the supporting rail, the two web side walls 34 are congruent and extend in the fitting direction 9 to a somewhat lower height than the engagement member 28 and the engagement groove 29. The design height of the end zone of the web side walls 34 facing the bending members 22 continuously declines in the fitting direction 9. The web side walls 34 render possible an improved support of the actuating tool 30 in the direction 3 of the supporting rail. The two guide shells 17, the two engagement slides 12, the two connecting members 24, the two bending members 22, as well as the bearing members 27, bear in the assembled state of the casing halves 7, 8 directly on each other and form a two-part mechanically stable unit. The parting plane of this unit corresponds in this arrangement to the parting plane formed by the fitting direction 9 and the engagement direction 11 of the casing of the device consisting of the two casing halves 7, 8.



PATENT CLAIMS

1. An electrical installation device (1), in particular a low voltage switch, designed for being secured in the fitted position on a supporting rail (2), with an engagement slide (12) integrally formed on the casing wall of the device, consisting of an insulating material, which slide

- is movable in the engagement direction (11) transversely to the fitting direction (9) and to the direction (3) of the supporting rail,

- is pivotably connected to a casing wall via a bending member (22) that is spring-loaded in the engagement direction (11),

- engages behind the supporting rail (2) with an engagement projection (14) and

- can be returned from its engagement position against the spring resilience of the bending member (22) into a releasing position by means of an actuating end (26) that is remote from the engagement projection (14),

characterized in that

the engagement slide (12) is guided between its engagement projection (14) and the bending member (22) in a longitudinal guide attached to the casing wall.

2. A device according to claim 1,

characterized in that

- the engagement projection (14) is rigidly connected to the engagement slide (12) and

- that the engagement slide (12) is flexibly connected to the bending member (22).

3. A device according to claim 1 or 2, wherein the direction of movement of the engagement slide (12) forms an angle, in particular, approximately a right angle, with the longitudinal reach of the bending member (22),

characterized by

a connecting member (24) arranged between the engagement slide (12) and the bending member (22) as the intended bending place.

4. A device according to one or more of the preceding claims,

characterized in that

the connecting member (24) extends approximately in the engagement direction (11) of the engagement slide (12) and forms an



obtuse angle with the bending member (22).

5. A device according to one or more of the preceding claims,

5 characterized in that

the end of the bending member (22) on the side of the casing projects from the end on the bottom side of a side wall (23) of the casing, forming an obtuse angle therewith.

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6. A device according to claim 5,

characterized in that

15 the actuating end (26) is formed on the side remote from the engagement slide (12) on the moving end of the bending member (22) and lies in the fitting direction (9) beneath the end of the bending member on the side of the casing.

20 7. A device according to claim 6,

characterized in that

25 the actuating end lies beneath the apex of the angle between the bending member (22) and the casing side wall (23).

8. A device according to one or more of the preceding claims with a two-shell casing for the device, whose approximately central parting plane extends in the fitting direction (9) and in the engagement direction (11),

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characterized in that

35 the longitudinal guide of the engagement slide (12) is constituted by one guide shell (17) each, formed on a casing half [= casing shell (7), casing shell (8)] which surround the engagement slide (12) on both sides on its periphery.

40 9. A device according to claim 8,

characterized in that

45 the guide shells (17) surround the engagement slide (12) in its peripheral direction, being closed in themselves.

10. A device according to claim 8 or 9,

characterized in that

50 the guide shells (17) have at their end remote from the engagement projection (14) in the engagement direction (11), boundary faces extending in the fitting direction (9) and in the direction (3) of the supporting rail, for limiting the displacement movement of the engagement slide (12) against its engagement position.

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11. A device according to one or more of claims 8 to 10,
characterized by

5 a two-part structure of the longitudinal guide formed by the
guide shells (17), with the parting plane of the casing of the
device as the plane of symmetry.

10 12. A device according to one or more of the preceding claims,
characterized by

15 a two-part structure of the unit formed by the engagement slide
(12), the connecting member (24) and the bending member (22),
with the parting plane of the casing of the device as the plane
of symmetry.

20 13. A device according to claim 12,
characterized in that

the two part units

25 - are each integrally formed on a casing shell (7, 8) and
- in the assembled state of the casing of the device, are
combined into the unit by fixing means that are formed on
them.

30 14. A device according to claim 13,
characterized in that

35 the fixing means of the part units are arranged opposite each
other in the direction (3) of the supporting rail and engage in
one another in the assembled state of the casing of the device.

40 15. A device according to claim 14,
characterized by

a conjugate engagement of the fixing means consisting of the
connecting pin (19) and the connecting bore (32).

45 16. A device according to claim 14,
characterized by

50 an engagement of the fixing means consisting of the engagement
member (28) and the engagement groove (29).