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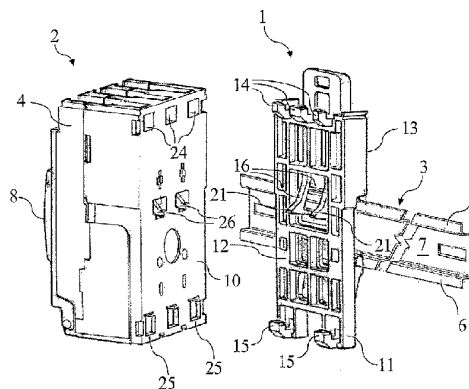
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(54) Title: SUPPORT DEVICE FOR APPLYING AN ELECTRICAL APPARATUS TO AN APPARATUS-MOUNTING RAIL.



(57) Abstract: A support device (1) for applying an electrical apparatus (2) to an apparatus-mounting rail (3), the support device (1) including fixing means (14, 15, 16) suitable to co-operate with said electrical apparatus (2) to removably fix said electrical apparatus (2) to the support device (1), characterized in that said fixing means include: coupling means (14, 15) suitable to be engaged with said electrical apparatus (2) following a relative sliding between the electrical apparatus (2) and the support device (1) to pass from a release position to a coupling position; snap-locking elastic means (16) suitable to operate when said coupling position has been reached, said elastic means being such as to allow said relative sliding from the release position to the coupling position and such as to prevent said relative sliding when said coupling position has been reached.

WO 2007/105242 A1

**"Support device for applying an electrical apparatus to  
an apparatus-mounting rail"**

**DESCRIPTION**

The present invention relates to the technical field  
5 of electrical apparatuses, such as switches and the like,  
and particularly relates to a support device for applying  
an electrical apparatus to an apparatus-mounting rail.

A reference herein to a patent document or other  
10 matter which is given as prior art is not to be taken as  
an admission that that document or matter was, in  
Australia, known or that the information it contains was  
part of the common general knowledge as at the priority  
date of any of the claims.

15 A lot of electrical apparatuses, both for use in  
civil systems and for use in industrial systems, are  
intended for installation in suitable containment and  
support structures, which are called electrical  
switchboards or cabinets. A typical electrical  
20 switchboard known to the Applicant consists of a box-like  
framework defining an inner chamber for housing  
electrical apparatuses. Generally, this box-like  
framework comprises walls, or wall portions, that are  
formed by panels, such as made of sheet metal.

25 Rails, called the apparatus-mounting rails, that are  
usually arranged in the vicinity of the switchboard

bottom panel are used to mount electrical apparatuses within an electrical switchboard.

To apply an electrical apparatus to an apparatus-mounting rail, a support plate is used, which practically  
5 acts as a terminal block, intended to be interposed between the electrical apparatus and the apparatus-mounting rail, and including means for fixing the electrical apparatus to the plate and coupling means for  
10 applying the assembly consisting of the electrical apparatus and plate to the apparatus-mounting rail.

In order to apply an electrical apparatus to an apparatus-mounting rail using a support plate as described above, screws, bolts or similar fixing means are required to be used. This entails labour- and time-  
15 consuming operations, with the operator being forced to operate with both hands when screws and bolts are used, or on the other hand, with an expensive construction of the body or frame of the electrical apparatus, when stud bolts are used, and obviously also entails having screws,  
20 bolts, or other small items available, which can be easily lost, and tooling therefor.

Accordingly, it would be desirable to provide a support device, which can overcome or at least alleviate one or more of the problems described above.

25 According to the present invention, there is provided a support device for applying an electrical

apparatus to an apparatus-mounting rail, the support device including fixing means suitable to co-operate with conjugated fixing means provided within said electrical apparatus to removably fix said electrical apparatus to the support device, said fixing means including:

5

- coupling means provided at two opposite ends of the support device, the coupling means being suitable to engage said electrical apparatus following a relative sliding, along a sliding direction between the electrical

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- apparatus and the support device to pass from a release position to a coupling position;
- snap-locking elastic means suitable to operate when said coupling position has been reached, said elastic means being such as to allow said relative sliding from

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- the release position to the coupling position and such as to prevent said relative sliding when said coupling position has been reached;
- wherein said snap-locking elastic means occupy an intermediate position, along said sliding direction,

20

- between the coupling means.

According to the present invention, there is also provided a set of parts to be applied to an apparatus-mounting rail, including an electrical apparatus; and a support device as described above for applying said

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electrical apparatus to said rail.

Advantageously, the present invention can facilitate

the operations of applying an electrical apparatus to an apparatus-mounting rail by eliminating the use of tools or instruments during this application.

The invention will be better understood from the following detailed description of an embodiment thereof, which is given by way of example and thus not to be considered limitative in any way, with reference to the annexed drawings, in which:

- 10 - Fig. 1 shows a support device in accordance with the present invention, an electrical apparatus and an apparatus-mounting rail in a view in which the three above-mentioned pieces are separated from each other;
- Fig. 2 shows a perspective view of a set of parts including the support device and the electrical apparatus 15 in Fig. 1, wherein said parts are not assembled to each other and wherein the front sides of the support device and electrical apparatus can be seen;
- Fig. 3 shows another perspective view of the set of parts in Fig. 2, with non-assembled parts, wherein the 20 rear sides of the support device and electrical apparatus can be seen;
- Fig. 4 shows the set of parts in Fig. 2, in the assembled configuration during the coupling to the apparatus-mounting rail in Fig. 1; and

- Fig. 5 shows the electrical apparatus in Fig. 1 applied by means of the support device in Fig. 1 to the apparatus-mounting rail in Fig. 1.

In the figures, equal or similar elements will be designated with the same numerals.

In Fig. 1, a particularly preferred embodiment is shown of a support device 1 in accordance with the present invention, which is shown together with an electrical apparatus 2 and an apparatus-mounting rail 3.

Particularly, in the example in Fig. 1, the electrical apparatus 2 is a modular apparatus that is embodied, in a non-limiting manner, by a switch 2 being commonly called a molded-case switch. A molded-case switch, contrarily to a so-called "open" switch, includes a box-like body made of insulating material, globally designated with 4, which also has a bearing function for the inner mechanisms of switch 2. A molded-case switch is generally used in the fields of industrial automation and advanced tertiary services, in order to cutoff currents, such as also having a value to 1500 A.

The switch 2 can be removably applied via the support device 1 to an apparatus-mounting rail 3, such as fixed to a bottom panel of an electrical switchboard (the panel and switchboard are not shown in the figures). The apparatus-mounting rail 3 is, for example, a standard

rail, such as a DIN rail, and consists of a metal profiled section having a bottom wall and two opposite side walls defining a channel 7. Each of the two side walls of the apparatus-mounting rail 3 is provided with a  
5 respective projecting edge 5, 6, which practically acts as a coupling edge to which the support device 1 can be coupled. Furthermore, the assembly of the two edges 5 and 6 practically forms a guide.

It should be observed that the switch 2 and  
10 apparatus-mounting rail 3 as described above are only a particular, non-limiting example of electrical apparatus and apparatus-mounting rail, whereby it should be considered that a support device according to the present invention can be used for connecting electrical  
15 apparatuses to respective rails of types other than those specifically described herein.

In the example, the box-like body 4 of the switch 2 includes a front side 8, from which a control lever 9 (shown in Fig. 2) protrudes, and a rear side 10 that,  
20 when the switch 2 is fixed to the support device 1, faces the latter.

The support device 1 includes a main body 11 having a front side 12 intended to face the switch 2 and a rear side 13 intended to face the apparatus-mounting rail 3.  
25 Preferably, as in the example illustrated in the figures,

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the main body 11 of the support device 1 is essentially plate-like and more preferably is a body having a hollow or lightened structure, practically shaped as a frame having a plurality of lightening holes, either through  
5 holes or not.

Preferably, the main body 11 of the support device 1 is made of hard plastics, such as by means of injection moulding.

The support device 1 includes fixing means 14, 15,  
10 16 suitable to co-operate with the switch 2, and particularly with conjugated fixing means 24, 25, 26 that are provided within the switch 2 in order to removably fix the switch 2 to the support device 1.

Advantageously, these fixing means 14, 15, 16  
15 include:

- coupling means 14, 15 suitable to engage the switch 2 following a relative sliding between the switch 2 and the support device 1 to pass from a release position to a coupling position; and
- 20 - snap-locking elastic means 16 suitable to operate when said coupling portion has been reached, the snap-locking elastic means 16 being such as to allow the relative sliding between the switch 2 and the support device 1 from the release position to the coupling position and  
25 such as to prevent a relative sliding between these

pieces after the coupling position has been reached.

Preferably, the coupling means 14, 15 include coupling means that are substantially provided at two opposite ends of the body 11 of the support device 1. In the particularly preferred embodiment as shown in the figures, particularly, the coupling means 14, 15 include upper hooks 14 and lower hooks 15 that protrude from the front side 12 of the main body 11 of the support device 1 and are suitable to co-operate with corresponding conjugated coupling means 24, 25 that are provided within the box-like body 4 of the switch 1. The conjugated coupling means 24, 25 are, in the example herein and in a non-limiting manner, openings 24 that are innerly counter-shaped relative to the upper hooks 14 and provided within the box-like body 4 of switch 2, and cross-beams 25 suitable to be fitted within the lower hooks 15.

With reference to Fig. 2, in the example illustrated herein, starting from a release position to reach the coupling position between the switch 2 and the support device 1, an axial movement (arrow  $A_m$ ) of the two bodies 4 and 11 towards each other is required to be carried out first, and then the one of the two bodies is required to slide relative to the other in the vertical direction (arrow  $V_m$ ).

As will be appreciated by those skilled in the art, in an alternative embodiment, the hooks 14, 15 may be provided on the switch 2, whereas complementary coupling means may be provided on the support device 1, which are suitable to co-operate with these hooks. In a further embodiment, the hooks 14, 15 may also be distributed between the support device 1 and the switch 2.

Referring back to Fig. 1, in a particularly preferred embodiment, the snap-locking elastic means 16 of the support device 1 preferably occupy an intermediate position between the upper coupling means 14 and the lower coupling means 15. More preferably, these snap-locking elastic means 16 include at least one flexible tooth 16, having an end portion joined to the main body 11 of the support device 1 and a projecting end 21 distal from the main body 11 of the support device 1. Due to the flexibility of tooth 16, this projecting end 21, when the coupling position has been reached between the coupling means 14, 15 and the complementary coupling means 24, 25, is such as to snap within a respective cavity 26 provided within the main body 4 of switch 2, in order to be engaged within this cavity 26 and prevent a further relative sliding between the switch 2 and support device 1.

Particularly, the end 21 of the flexible tooth 16 is

such as to counteract the rear side 10 of switch 2 when the switch 2 is axially moving towards the support device 1 and during the relative sliding between them to reach the coupling position. Practically, in this relative sliding, the flexible tooth 16 adopts a backward position relative to the rest condition thereof, thereby accumulating elastic energy, which is released when the switch 2 and support device 1 adopt the coupling position.

10 Preferably, as illustrated in the figures, the snap-locking elastic means 16 particularly include a pair of parallel flexible teeth 16 that are joined by a cross-beam 22 (shown in Fig. 3) that can be accessed from the rear side 13 of the support device 1 in order to unlock  
15 the flexible teeth 16 from the respective cavities 26, in order to remove the switch 2 from the support device 1.

With reference to Fig. 3, the support device 1 further includes coupling means 30, 31, 32 to allow removably coupling the support device 1 to the apparatus-  
20 mounting rail 3.

In the particularly preferred embodiment as shown in the figures, these coupling means 30, 31, 32 include at least two opposite coupling elements 30, 31, of which at least one 30 is stationary relative to the main body 11  
25 of the support device 1 and of which the other 31 is

movable relative to the latter. These opposite coupling elements 30, 31 are suitable to co-operate with a respective coupling edge 5, 6 of the apparatus-mounting rail 3, by acting as pincers on these edges 5, 6 such as  
5 to couple the support device 1 to the apparatus-mounting rail 3.

In the particular embodiment as illustrated in the figures, which is to be considered as being merely illustrative, the coupling movable element 31 is embodied  
10 by a projecting tab 31. In this embodiment, a pair of stationary coupling elements 30 in the form of hooks 30 is further provided.

Preferably, the movable coupling element 31 is integral with an end portion of an auxiliary plate 32  
15 that is slidably and elastically fastened to the main body 11 of the support device 1. The sliding direction and orientations of the auxiliary plate 32 are indicated in Fig. 3 by means of the arrow S<sub>m</sub>.

Preferably, the opposite end of the auxiliary plate  
20 32 projects from the main body 11 of the support device 1 such as to provide gripping means 33 to allow an operator to move the movable coupling element 31 (Fig. 4, direction and orientation of arrow S<sub>ma</sub>), in contrast with the elastic action of a spring 35, away from the  
25 stationary coupling element 30. Thereby, with reference

to Fig. 4, the assembled set of parts 1, 2 consisting of the support device 1 and switch 2 can be advantageously coupled to the apparatus-mounting rail 3, without using tools.

5 Finally, in Fig. 5, the switch 2 is shown as being applied to the apparatus-mounting rail 3 by means of the support device 1.

Advantageously, a support device in accordance with the present invention can allow an electrical apparatus  
10 to be rapidly and easily applied to an apparatus-mounting rail. Further advantageously, the operations of removing the electrical apparatus from the apparatus-mounting rail can be also carried out in an entirely manual manner.

Obviously, to the support device described above,  
15 those skilled in the art, aiming at satisfying contingent and specific requirements, may carry out a number of modifications and variations, all being however contemplated within the scope of protection of the invention, such as defined in the annexed claims.

**The claims defining the present invention are as follows:**

1. A support device for applying an electrical apparatus to an apparatus-mounting rail, the support device including fixing means suitable to co-operate with
- 5 conjugated fixing means provided within said electrical apparatus to removably fix said electrical apparatus to the support device, said fixing means including:
- coupling means provided at two opposite ends of the support device, the coupling means being suitable to

10 engage said electrical apparatus following a relative sliding, along a sliding direction between the electrical apparatus and the support device to pass from a release position to a coupling position;

  - snap-locking elastic means suitable to operate when

15 said coupling position has been reached, said elastic means being such as to allow said relative sliding from the release position to the coupling position and such as to prevent said relative sliding when said coupling position has been reached;
- 20 wherein said snap-locking elastic means occupy an intermediate position, along said sliding direction, between the coupling means.
2. A support device according to claim 1, wherein said snap-locking elastic means include at least one flexible
- 25 tooth having an end joined to said support device and a projecting end distal to said support device, said

projecting end being arranged as to be engaged in said coupling position within a respective cavity that is provided within said electrical apparatus.

3. A support device according to claims 2, wherein said  
5 at least one flexible tooth is arranged to counteract against a wall of said electrical apparatus to adopt a backward position during said sliding and a forward position in said coupling position.

4. A support device according to claim 2 or 3, wherein  
10 said at least one flexible tooth includes first and second flexible teeth that are parallel to each other and connected by a cross-beam.

5. A support device according to claim 1, wherein said  
15 coupling means include at least one hook projecting from said support device and suitable to be engaged with a respective conjugated and counter-shaped coupling means provided within said electrical apparatus.

6. A support device according to claim 1, including a  
20 substantially plate-like main body suitable to be interposed between said rail and said electrical apparatus.

7. A support device according to claim 1, further including coupling means to removably couple said support device to said rail.

25 8. A support device according to claim 6 or 7, wherein said coupling means include at least two opposite

coupling elements of which at least one coupling element is stationary relative to the main body of the support device, and of which the other coupling element is movable relative to the main body.

- 5 9. A support device according to claim 8, further including an auxiliary plate that is slidably and elastically fastened to said main body, and wherein said coupling element which is movable is substantially arranged at an end portion of said auxiliary plate.
- 10 10. A set of parts to be applied to an apparatus-mounting rail, including:
- an electrical apparatus; and
  - a support device for applying said electrical apparatus to said rail, according to any one of the preceding
- 15 claims.
11. A support device according to any one of the embodiments substantially as herein described and illustrated.

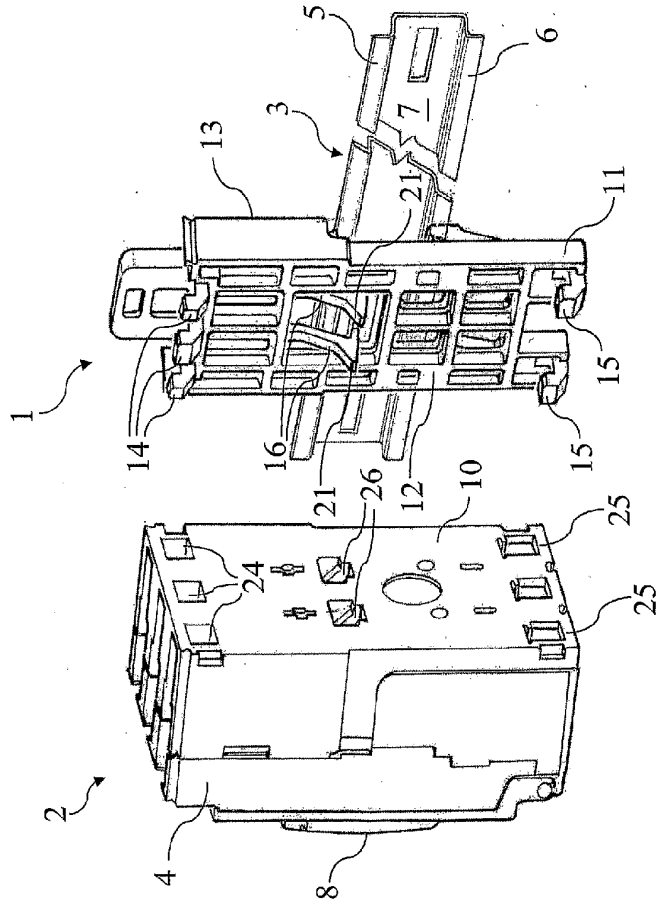


Fig. 1

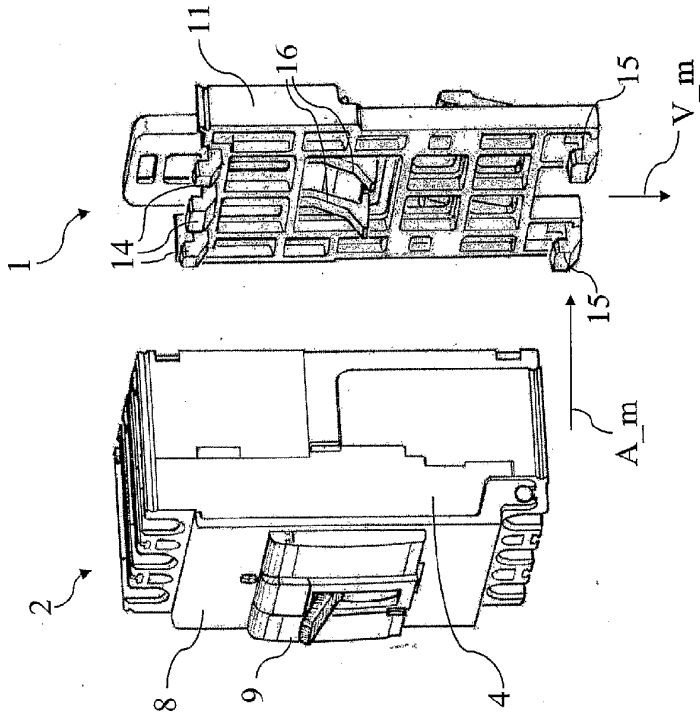


Fig. 2

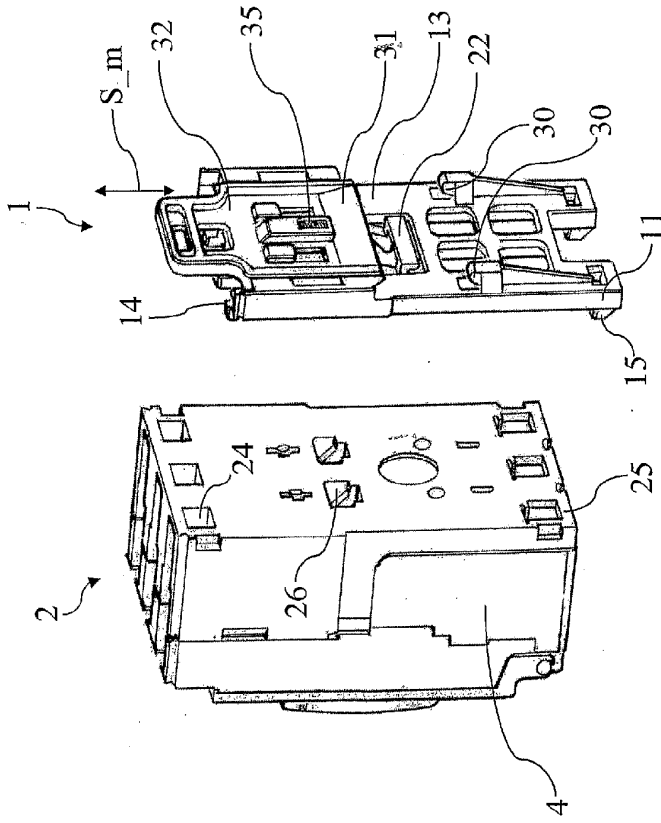


Fig. 3

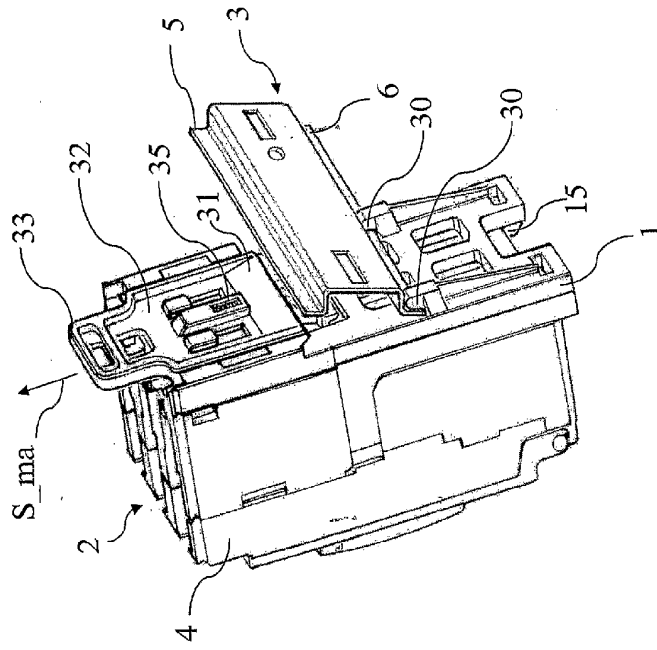


Fig. 4

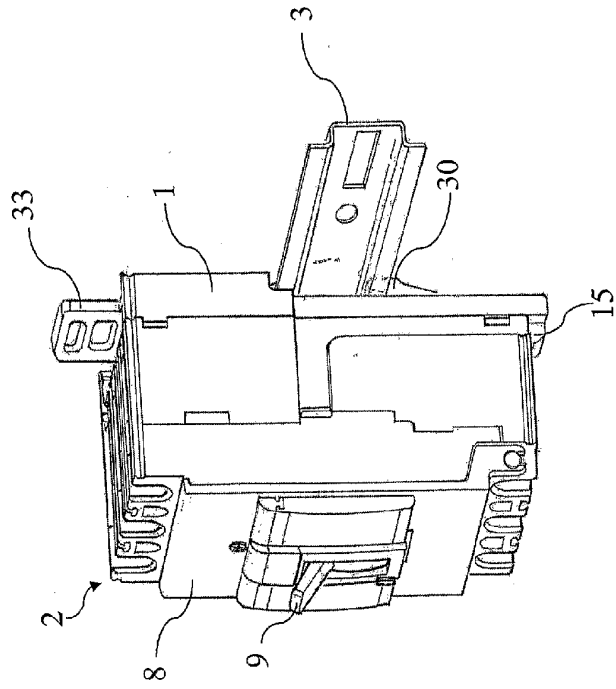


Fig. 5