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(54) **Device for joining two modular electrical units**

Vorrichtung zum Verbinden von zwei modularen elektrischen Einheiten

Dispositif pour relier deux unités modulaires électriques

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(73) Proprietor: **BTICINO S.P.A.**
20154 Milano (IT)

(72) Inventor: **Purgato, Flavio**
21039 Valganna (Varese) (IT)

(74) Representative: **Maggioni, Claudio et al**
Jacobacci & Partners S.p.A.,
Via Senato, 8
20121 Milano (IT)

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Description

[0001] The present invention relates to a device for joining two modular electrical units, especially boxlike units intended to be installed side by side on a supporting rail, as defined in the preamble of claim 1 and known from DE 1 919 180 U.

[0002] As is known, much use is made in modern electrical cabinets of modular electrical units in which each performs one particular function. By combining these units in appropriate ways it is possible to create complex structures that perform the sum of the different functions. For example, a multiplicity of identical single-pole circuit breaker modules can be joined together to form, according to need, a two-pole or three-pole or four-pole circuit breaker. The circuit breakers, which generally provide peak current protection (known as thermal/magnetic circuit breakers) can be accompanied by protective devices sensitive to differential currents, indicating devices, remote actuating devices, etc.

[0003] Modular-units must satisfy many different requirements, mostly governed by precise international standards. For example, the units must be easy to join together and, once joined, must be difficult to separate without using specially designed tools.

[0004] In addition, the devices used to join the units must as far as possible be simple, cheap to produce and take up little space and must not affect the processes and costs of production of the actual units. Nor must they occupy much space on the faces of non-juxtaposed units, in order not to interfere with the clamping, electrical interconnection, actuating and/or indicating parts which already occupy these faces.

[0005] Many different devices for joining two modular electrical units are known. For instance publication EP 0375568 describes one such device which consists of a hook that projects from one of the units and engages a special seat provided in the other unit, and of a rotatably fastening pin mounted on one of the units and engaging in a seat provided in the other unit. Publication EP 0626712 discloses another such unit having complementary pins and seats on juxtaposed faces of two units, along with sliders with engaging teeth recessed into one of the units and able to slide in the plane of the juxtaposed faces and corresponding engagement seats in the other unit.

[0006] Known joining devices tend to be complicated in their structure and require special fastening elements (rotating hooks, sliders) which have to be produced separately to relatively tight manufacturing tolerances.

[0007] The object of the present invention is to provide a device for joining modular electrical units that is extremely simple, occupies little space and requires no separate components that would be critical in structure and manufacture.

[0008] This object is achieved as defined and characterized in general in the first claim.

[0009] The invention will be understood more clearly

from the following detailed description of two embodiments serving as non-restrictive examples. The description refers to the attached drawing, in which

Figure 1 is an exploded perspective view of two modular electrical units to be joined together with a joining device according to the invention,

Figure 2 shows a perspective view from below of two electrical units similar to those of Figure 1 that are to be joined together with a joining device in accordance with a variant of the invention and

Figure 3 shows an enlarged detail of Figure 2 in cross-section.

[0010] Each of the two electrical units to be joined together consists essentially of a body, preferably made of moulded plastic in two shells, which contains electrical and mechanical parts. The body is in the general form of a rectangular parallelepiped, with a rear face designed to be connected to a mounting rail by means of suitable fixing teeth, a front face on the opposite side from the rear face, two opposing lateral faces, an upper face and a lower face.

[0011] The electrical units are constructed in such a way that their perpendicular lateral faces are juxtaposed to the mounting rail. There are usually more than two modular units arranged next to each other in an electrical cabinet.

[0012] Figure 1 shows a first electrical unit 1, for example a differential actuator, on whose front face 2 there are a control lever 3 and two cylindrical apertures 4, 5 for housing the clamping screws of two electrical connection terminals, not visible, in which two conductor ends are clamped after being inserted into the terminals through two entrance apertures 6, 7 present on the face 8, conventionally termed the upper face.

[0013] Two outlet conductor ends 9, 10 for interconnection with the second unit, e.g. a two-pole circuit breaker 12, pass out of the upper face and are partly protected by a guard 11.

[0014] The two-pole circuit breaker 12 is made up of two single-pole circuit breakers arranged next to each other and joined by a joining device according to the invention. It is provided on its front face 13 with a control lever 14, a first pair of cylindrical apertures 15, 16 for housing two clamping screws for entrance terminals, and with a second pair of cylindrical apertures, of which only 17 is visible, for housing two clamping screws for outlet terminals. The conductor ends 9, 10 have access to the entrance terminals of the circuit breaker 12 through two apertures 18, 19 in the upper face 20 of the circuit breaker.

[0015] If the differential actuator 1 and the circuit breaker 12 are juxtaposed with their respective lateral faces 21 and 22 in contact, the two units are interconnected functionally in a known way by means of a pin 23 which passes out of a slot 24 in the wall 21 and into a corresponding slot 25 in the wall 22, opening the circuit

breaker by the tripping of the differential protective means and, if required, matching the state of the circuit breaker to that of the differential protective means.

[0016] The function of the device forming the subject of the present invention is to enable the firm joining of the two modular units 1 and 12 for their successive mounting in the form of a single assembly on a supporting rail.

[0017] To this end the differential actuator 1 and the circuit breaker 12 each include joining elements on faces other than the lateral faces that are to be juxtaposed. In this example two joining elements 40, 41 are provided for each unit, one on the front face, 2 and 13 respectively, and one on the rear face, in such positions as to join in pairs with the corresponding joining elements of the other unit when the two units are juxtaposed. The joining elements are all identical in this example, but could also be identical only within each pair. Each is formed by a projection integral with the container body of the respective unit and has one side flush with a lateral face of the unit and a groove on the inner side.

[0018] A joining device according to the invention consists of a pair of joining elements on two units in corresponding positions as described above and of a retaining element, in this example a spring steel ring 42, 43 able to fit round both joining elements of the pair and hold them firmly together. One pair of joining elements on two juxtaposed units has the general form of a cylinder with an enlargement at its free end. This enlargement, or head of the pair, preferably has rounded edges.

[0019] All that is required to join two units is to place them with their lateral faces next to each other and, preferably with a suitable tool, force the ring 42, 43 over the free head of each pair of joining elements, initially expanding it to allow it to pass over the head and then engaging it in the grooves of the elements which form a seat for the ring.

[0020] A joining device with the ring mounted, indicated generally by the numeral 30, is shown in Figure 1 on the two-pole circuit breaker 12 which, as stated, consists of two juxtaposed single-pole circuit breakers.

[0021] Two joining devices are sufficient for firmly joining two units, but more can of course be provided, if necessary.

[0022] Each unit may conveniently be provided with joining elements adjacent to each of the lateral faces to be juxtaposed, each such element being in an identical position for each unit, so that all units having the same modular structure can be joined to each other.

[0023] Figure 2 shows two modular electrical units 31 and 32 similar to those of Figure 1 for mounting side by side on a mounting rail (not shown). The unit 31 has joining elements exactly the same as those on the units shown in Figure 1 and are therefore labelled with the same reference numbers, whereas unit 32 has joining elements (only one being visible in the drawing) labelled 33, in accordance with a variant of the invention. As will be seen, in this variant the retaining element, still in the

form of a ring, labelled 34, is permanently attached to the joining element. More particularly, as will be seen clearly in Figure 3, the joining element 33 is shaped like a bridge integral with the container body of the unit. The ring 34, preferably a split ring made of steel wire, is inserted into the bridge by appropriate elastic deformation. The advantage of this variant is that the retaining element is an integral part of one of the units to be juxtaposed, and so is always available for mounting.

[0024] As can be seen from the above description, the joining device according to the invention is extremely compact and consists of parts that are easy to manufacture: it is therefore very inexpensive. In particular, the joining elements can be moulded together with the two shells that make up the container body of each unit and the retaining means are very common split rings made of steel wire, or open spring washers.

[0025] The assembly of the units is also extremely simple and can easily be done by automatic machines, while their removal is difficult if one does not have a specially designed tool.

Claims

1. Device for joining two modular electrical units (1, 12) intended to be mounted with two respective lateral faces (21, 22) juxtaposed, comprising at least two pairs of joining elements (40, 41) and, for each pair of joining elements (40, 41), a retaining element (42, 43) able to engage with both joining elements of the pair and hold them firmly together, each joining element being located on one face, other than the face to be juxtaposed, of one of the units, **characterised in that** the faces on which the joining elements (40, 41) are located are faces of the units adjoining the faces to be juxtaposed, each joining element is in a position in which, when the two units are mounted, the joining element of one of the units is adjacent to the joining element of the other unit and the retaining element (42, 43) is so shaped to fit around both joining elements (40, 41).
2. Joining device according to Claim 1, in which the retaining element is a spring ring (42, 43).
3. Joining device according to Claim 1 or 2, in which each of the joining elements (40, 41) is integral with the container body of the respective unit (1, 12) and is in the shape of a projection defined on one side by a surface which is flush with a lateral face (21, 22) of the respective unit and has a seat for the retaining element (42, 43).
4. Joining device according to Claim 3, in which each pair of joining elements (40, 41) on two juxtaposed units (1, 12) is in the general shape of a cylinder with an enlargement at its free end.

5. Joining device according to Claim 4, in which the enlargement has a rounded edge.
6. Joining device according to Claim 1 or 2, in which the retaining element (34) is permanently attached to one of the joining elements (33) of the pair.
7. Joining device according to Claim 6, in which the joining elements (41, 33) of a pair are integral with the container body of the respective unit (31, 32), one (41) being in the shape of a projection defined by a surface which is flush with a lateral face of the respective unit having a seat for the retaining element (34), and the other (33) being in the shape of a bridge to which the retaining element (34) is fastened.

Patentansprüche

1. Vorrichtung zum Verbinden von zwei modularen elektrischen Einheiten (1, 12), die vorgesehen sind, um mit zwei jeweiligen Seitenflächen (21, 22) befestigt zu werden, die nebeneinander angeordnet sind, die zumindest zwei Paare von Verbindungselementen (40, 41) und für jedes Paar von Verbindungselementen (40, 41) ein Halteelement (42, 43) aufweist, das in der Lage ist, in beide Verbindungselemente des Paares Eingriff zu nehmen und dieselben fest zusammenzuhalten, wobei jedes Verbindungselement an einer anderen Fläche von einer der Einheiten angeordnet ist, als der Fläche, die benachbart sein soll, **dadurch gekennzeichnet, daß** die Flächen, an denen die Verbindungselemente (40, 41) angeordnet sind, Flächen der Einheiten sind, die an die Flächen angrenzen, die nebeneinander angeordnet sein sollen, wobei jedes Verbindungselement in einer Position vorliegt, in der, wenn die zwei Einheiten befestigt sind, das Verbindungselement von einer der Einheiten benachbart zu dem Verbindungselement der anderen Einheit ist und das Halteelement (42, 43) so geformt ist, um um beide Verbindungselemente (40, 41) zu passen.
2. Verbindungsvorrichtung gemäß Anspruch 1, bei der das Halteelement ein Federring (42, 43) ist.
3. Verbindungsvorrichtung gemäß Anspruch 1 oder 2, bei der jedes der Verbindungselemente (40, 41) einstückig zu dem Behälterkörper der jeweiligen Einheit (1, 12) ist und in der Form eines Vorsprungs vorliegt, der an einer Seite durch eine Oberfläche definiert ist, die bündig mit einer Seitenfläche (21, 22) der jeweiligen Einheit ist und eine Auflage für das Halteelement (42, 43) aufweist.
4. Verbindungsvorrichtung gemäß Anspruch 3, bei der jedes Paar von Verbindungselementen (40, 41) an

zwei nebeneinander angeordneten Einheiten (1, 12) in der allgemeinen Form eines Zylinders mit einer Erweiterung an dessen freiem Ende vorliegt.

5. Verbindungsvorrichtung gemäß Anspruch 4, bei der die Erweiterung eine abgerundete Kante aufweist.
6. Verbindungsvorrichtung gemäß Anspruch 1 oder 2, bei der das Halteelement (34) permanent an einem der Verbindungselemente (33) des Paares angebracht ist.
7. Verbindungsvorrichtung gemäß Anspruch 6, bei der die Verbindungselemente (41, 33) eines Paares einstückig zu dem Behälterkörper der jeweiligen Einheit (31, 32) sind, wobei eines derselben (41) in der Form eines Vorsprungs vorliegt, der durch eine Oberfläche definiert ist, die bündig mit einer Seitenfläche der jeweiligen Einheit ist und eine Auflage für das Halteelement (34) aufweist, und wobei das andere (33) derselben in der Form einer Brücke vorliegt, an der das Halteelement (34) befestigt ist.

Revendications

1. Dispositif pour relier deux unités électriques modulaires (1, 12) destinées à être montées avec deux faces latérales respectives (21, 22) juxtaposées, comprenant au moins deux paires d'éléments de liaison (40, 41) et, pour chaque pair d'éléments de liaison (40, 41), un élément de maintien (42, 43) capable de se mettre en prise avec les deux éléments de liaison de la pair et de les maintenir fermement l'un avec l'autre, chaque élément de liaison étant situé sur une face, autre que la face devant être juxtaposée, de l'une des unités, **caractérisé en ce que** les faces sur lesquelles les éléments de liaison (40, 41) sont situés sont des faces des unités contiguës aux faces devant être juxtaposées, chaque élément de liaison est dans une position dans laquelle, lorsque les deux unités sont montées, l'élément de liaison de l'une des unités est adjacent à l'élément de liaison de l'autre unité et l'élément de maintien (42, 43) est formé de manière à s'ajuster autour des deux éléments de liaison (40, 41).
2. Dispositif de liaison selon la revendication 1, dans lequel l'élément de maintien est une bague élastique (42, 43).
3. Dispositif de liaison selon la revendication 1 ou 2, dans lequel chacun des éléments de liaison (40, 41) est d'un seul tenant avec le corps de logement de l'unité (1, 12) respective et présente la forme d'une protubérance définie d'un côté par une surface qui est à niveau avec une face latérale (21, 22) de l'unité respective et comporte un support pour l'élément

de maintien (42, 43).

4. Dispositif de liaison selon la revendication 3, dans lequel chaque pair d'éléments de liaison (40, 41) sur deux unités juxtaposées (1, 12) a la forme générale d'un cylindre comportant une partie élargie au niveau de son extrémité libre. 5
5. Dispositif de liaison selon la revendication 4, dans lequel la partie élargie présente un bord arrondi. 10
6. Dispositif de liaison selon la revendication 1 ou 2, dans lequel l'élément de maintien (34) est fixé en permanence à l'un des éléments de liaison (33) de la pair. 15
7. Dispositif de liaison selon la revendication 6, dans lequel les éléments de liaison (41, 33) d'une pair sont d'un seul tenant avec le corps de logement de l'unité (31, 32) respective, l'un présentant la forme d'un protubérance définie par une surface qui est à niveau avec une face latérale de l'unité respective comportant un support pour l'élément de maintien (34), et l'autre (33) présentant la forme d'un pont auquel l'élément de maintien (34) est fixé. 20 25

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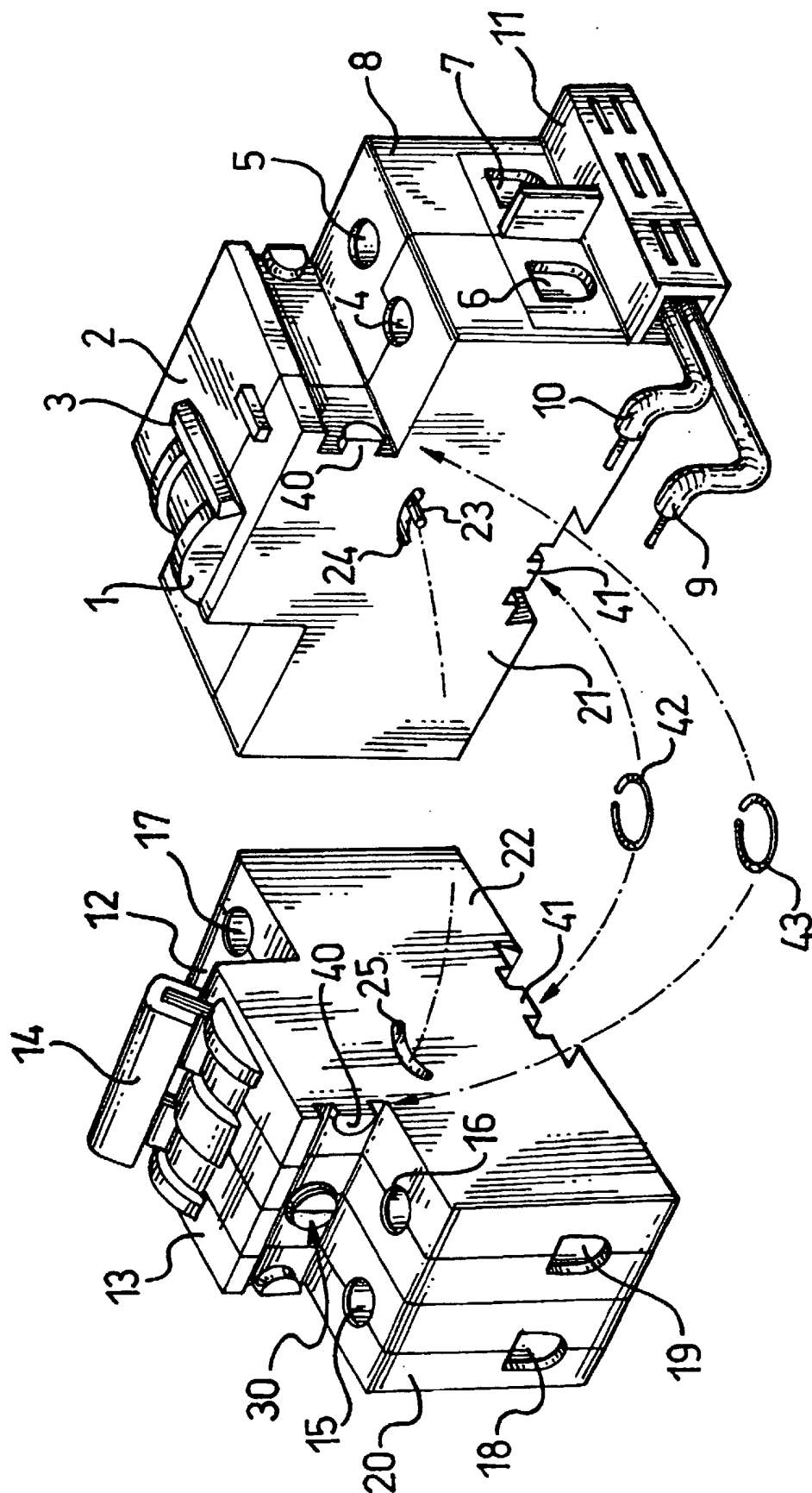


FIG. 1

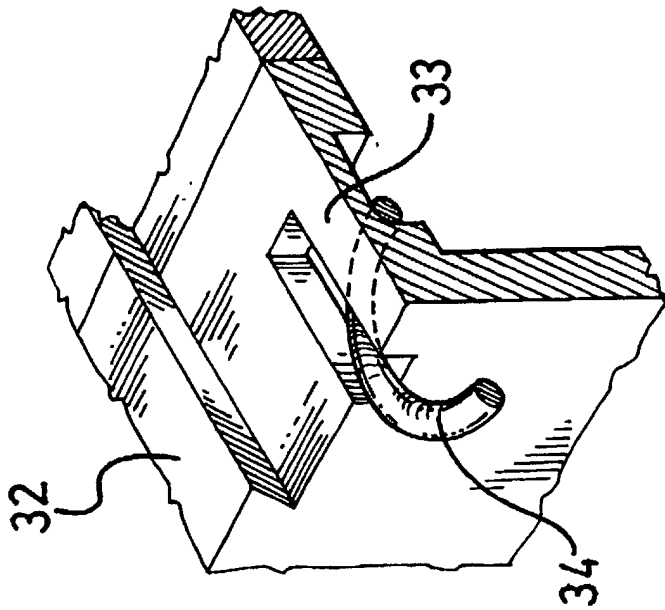


FIG. 3

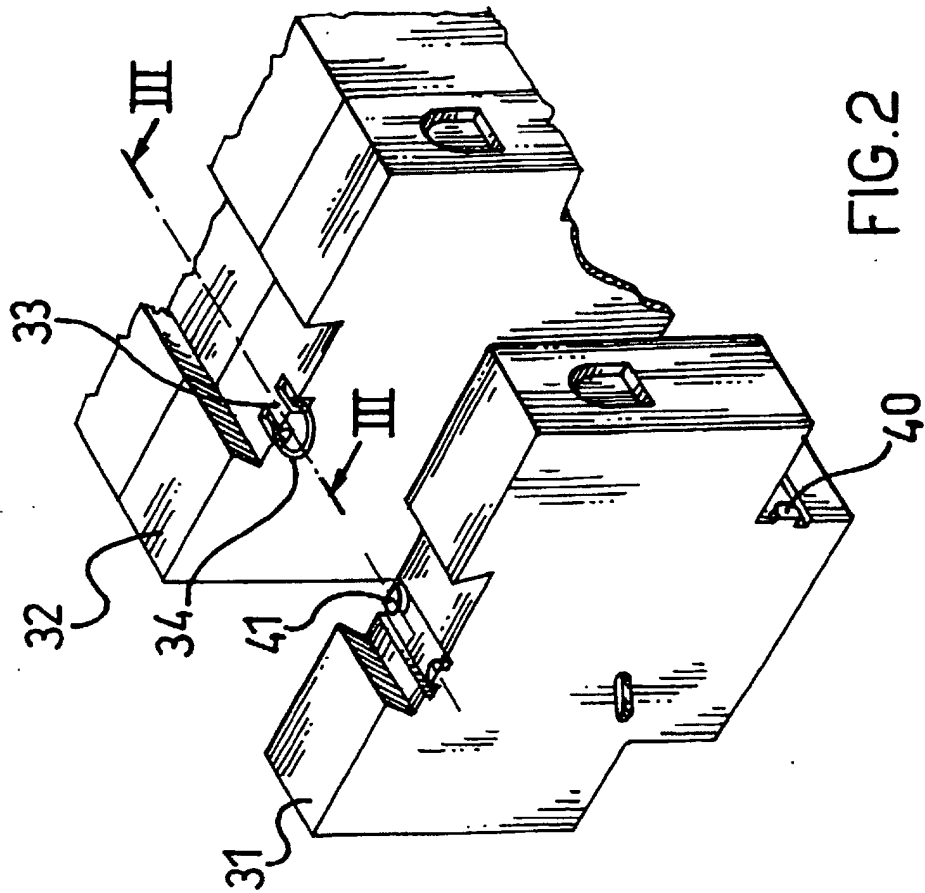


FIG. 2