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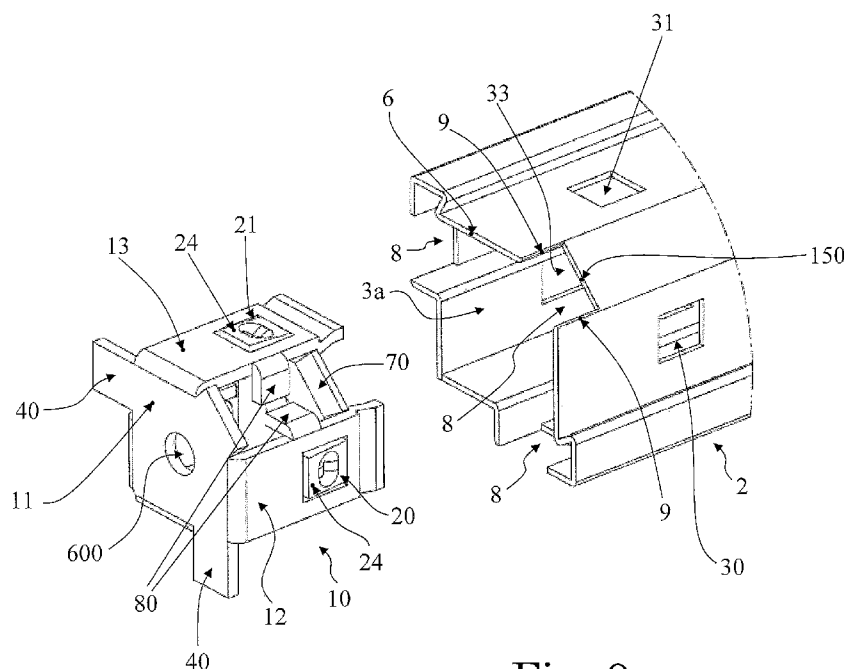


Fig. 9

(57) Abstract: A frame assembly for a switchboard, comprising: - a hollow member which extends lengthwise along a reference axis; - at least one connecting element which is adapted to be at least partially inserted into the hollow member along the reference axis, and which is adapted to operatively connect the assembly to a corresponding joint element of the frame. The connecting element and the hollow member comprise first coupling means and second coupling means, respectively, which are adapted to couple the connecting element and the hollow member to each other in a snap-fit way.

ASSEMBLY FOR A FRAME OF AN ELECTRICAL CABINET

The present invention relates to a frame assembly of a switchboard.

- 5 As known, a switchboard, such as a distribution or automation switchboard, comprises a frame which defines an internal space for housing one or more electric or electronic components and/or elements of the switchboard.

For example, the frame of a low voltage distribution switchboard houses circuit breakers, bus bars, control buttons, cable conduits, supporting guides, et cetera.

- 10 Furthermore, the frame constitutes a structural skeleton to which various components and/or accessories of the switchboard, such as the supporting elements for its electric or electronics elements, cladding panels, the top cover, the base, the door, et cetera, are operatively connected.

- Generally, the frame has a substantially parallelepiped structure which is defined by frame members which are arranged substantially horizontally, commonly known as cross-members or
15 rails, and by frame elements which are arranged vertically and are commonly known as uprights.

According to a known solution, these frame members are mutually coupled by four joint elements at the corners of the parallelepiped structure; in particular, each frame member, constituted only by an its own hollow elongated body, is connected to a corresponding corner joint element by means of a plurality of fixing screws or by welding.

- 20 In order to allow adequate connection and avoid relative displacements between the frame members and the corresponding corner joint elements, a large number of fixing screw (at least two for each coupling between a frame member and the corner joint element) and/or massive and structurally complex corner joint elements are used.

- The elements required for assembling the frame are packaged and delivered to customers; the use
25 of massive and structurally complex corner joint elements implies a cumbersome and expensive packaging.

Therefore, an assembling of the frame is a difficult and expensive operation, requiring long execution times and also implying cumbersome and expensive packaging solutions.

- In light of above, at the current state of the art, although known solutions perform in a rather
30 satisfying way, there is still reason and desire for further improvements.

Such desire is fulfilled by an assembly for the frame of a switchboard, comprising a hollow

member which extends lengthwise along a reference axis, and at least one connecting element which is adapted to be at least partially inserted into the hollow member along the reference axis, and which is adapted to operatively connect the assembly to a corresponding joint element of the frame. The at least one connecting element and the hollow member comprise first coupling means and second coupling means, respectively, which are adapted to couple the connecting element and the hollow member to each other in a snap-fit way.

Another aspect of the present disclosure is to provide a frame for a switchboard comprising at least one joint element connected to at least one assembly as defined by the annexed claims and disclosed in the following description, which is operatively connected to the joint element by means of the connecting element inserted into its hollow member.

Another aspect to the present disclosure is to provide a switchboard comprising a frame as the frame defined in the annexed claims and disclosed in the following description.

Further characteristics and advantages will be more apparent from the description of an exemplary, but non-exclusive, embodiment of a frame assembly, and related frame and switchboard, illustrated only for non-limitative exemplary purposes in the accompanying drawings, wherein:

- figure 1 is a front perspective view of the hollow member of a frame assembly according to the present invention;
- figure 1a is a detailed view of a portion of the hollow member illustrated in figure 1;
- figure 2 is a rear perspective view of the hollow member illustrated in figure 1;
- figures 3 and 4 are a first perspective view and a second perspective view, respectively, of an assembled connecting element associable to a frame assembly according to the present invention, wherein a movable plate of such connecting element is in a first position;
- figures 5 and 6 are a first perspective view and a second perspective view, respectively, of the assembled connecting element of figures 3 and 4, wherein its movable plate is in a second position;
- figures 7 and 8 are a first exploded view and a second exploded view, respectively, of the components of the connecting element of figures 3-6;
- figure 9 is an exploded view of the components of a frame assembly according to the present invention, namely the connecting element of figures 3-4 and the hollow member of figures 1-2;

- figures 10 and 11 are a first perspective and a second perspective view, respectively, of a three-way joint element of a frame according to the present invention;
- figure 12 illustrates the three-way joint element of figures 10 and 11 which is connected to two frame assemblies according to the present invention, and which is in phase of connection with a third frame assembly according to the present invention by means of a fixing screw.
- figure 13 is a perspective view of a frame having a plurality of frame assemblies mutually coupled by corner joint elements according to the present invention;
- figure 14 is a perspective view of a switchboard comprising a frame according to the present invention.

It should be noted that in the detailed description that follows, identical or similar components, either from a structural and/or functional point of view, have the same reference numerals, regardless of whether they are shown in different embodiments; it should also be noted that in order to clearly and concisely describe the present invention, the drawings may not necessarily be to scale and certain features of the disclosure may be shown in somewhat schematic form.

Further, when the term “adapted” is used herein while referring to any component as a whole, or to any part of a component, or to a whole combinations of components, or even to any part of a combination of components, it has to be understood that it means and encompasses the structure, and/or configuration and/or shape and/or positioning of the related component or part thereof, or combinations of components or part thereof, such term refers to.

Further, the term “transversal” or “transversally” is used herein to describe the position of one or more first parts and/or components relative to other second parts and/or components, so as to encompass all the positions where such first parts and/or components are not parallel with respect to the other second parts and/or components; hence, the meaning of “transversal” or “transversally” is not in any way herein limited to the particular case where such first parts and/or components are perpendicular to the second parts and/or components.

With reference to the above cited figures, the present disclosure is related to an assembly 1 for the frame 100 of a switchboard 200, hereinafter indicated for sake of simplicity as “frame assembly 1”.

In particular, with reference to figure 13, the frame 100 is assembled by mutually coupling a plurality of frame assemblies 1 through corresponding joint elements 101.

The frame assembly 1 comprises a hollow member 2 which extends lengthwise along a reference

axis which is depicted by a dot line and indicated by numeral reference 500 in figures 1 and 2; in particular, an upper edge 6 and a lower edge 7 delimit the lengthwise extension of the hollow member 2 along the reference axis 500.

The hollow member 2 is preferably made of metal material, such as for example zinc coated metal sheet or stainless steel.

In the exemplary embodiment illustrated in figures 1, 1a and 2 the hollow member 2 comprises at least: a central wall 68; a central corner defined by a wall 62 and a wall 63, wherein the central corner faces the central wall 68; a first lateral corner defined by a wall 64 and a wall 65, wherein the wall 64 connects the wall 65 to the wall 63; a second lateral corner defined by a wall 66 and a wall 67, wherein the wall 66 connects the wall 67 to wall 62; a wall 60 and a wall 61 connected to the opposed ends of the central wall 68, wherein the wall 60 is arranged transversally to the wall 62, and the wall 61 is arranged transversally to the wall 63.

The frame assembly 1 advantageously comprises at least one connecting element 10 which is adapted to be at least partially inserted into its hollow member 2, along the reference axis 500; in practice, the connecting element 10 is inserted lengthwise into the hollow member 2, i.e. along an inserting direction substantially defined by the reference axis 500.

For example, the connecting element 10 is inserted lengthwise into the hollow member 2 through a corresponding opening 3a, 3b of the hollow member 2 itself, opening 3a, 3b which is defined transversal to the reference axis 500.

The connecting element 10 is adapted to operatively connect the frame assembly 1 to a corresponding joint element 101 of the frame 100.

In order to keep the connecting element 10 stably inserted into the hollow member 2, the connecting element 10 and the hollow member 2 advantageously comprise first coupling means 20, 21, 22, 23 and second coupling means 30, 31, 32, 33, respectively, which are adapted to couple the connecting element 10 and the hollow member 2 to each other in a snap-fit way.

Hence, the frame assembly 1 is realized by inserting lengthwise the connecting element 10 into the hollow member 2, and by snap-fit coupling such hollow member 2 with the inserted connecting element 10.

Preferably, the frame assembly 1 comprises a couple of connecting elements 10.

For instance, with reference to figures 1-2, a first connecting element 10 can be inserted into the hollow member 2 through a first opening 3a defined transversally to the reference axis 500 at an

upper end 4 of the hollow member 2, and a second connecting element 10 can be inserted into the hollow member 2 through a second opening 3b defined transversally to the reference axis 500 at a lower end 5 of the hollow member 2.

Accordingly, the second coupling means 30, 31, 32, 33 are defined at an upper portion 501 and at a lower portion 502, respectively, of the hollow member 2, so as to be adapted for operatively interacting with the corresponding first coupling means 20, 21, 22, 23 of the two inserted connecting elements 10.

The frame assembly 1 assembled in such a way can be operatively connected, by means of its two connecting elements 10, to a corresponding couple of joint elements 101 which are disposed in the frame 100 at the opposed ends 4 and 5 of the hollow member 2.

According to the exemplary embodiment illustrated in figures 3-9, the first coupling means of the connecting element 10 comprise at least one elastic portion 20, 21, 22, 23 adapted to be elastically deformed by the hollow member 2 during the insertion of the connecting element 10 along the reference axis 500.

The second coupling means of the hollow member 2 comprise a hole 30, 31, 32, 33 corresponding to said at least one elastic portion 20, 21, 22, 23; in particular, such hole 30, 31, 32, 33 is defined in the hollow member 2 for coupling with the corresponding elastic portion 20, 21, 22, 23 and causing its return to a rest position.

This snap-fit coupling between the elastic portion 20, 21, 22, 23 and the corresponding hole 30, 31, 32, 33 determines the end of the inserting operation of the connecting element 10 into the hollowed body 2 and realizes the frame assembly 1.

Preferably, the connecting element 10 comprises a base 11 which, when inserted into the hollow member 2, is transversal to the reference axis 500.

According to the exemplary embodiment illustrated in figures 1, 1a and 2, each of the delimiting edges 6 and 7 of the hollow member 2 is shaped so as to define at least one cavity 8 having two lateral walls 9 extending along the reference axis 500, and a base wall 150 transversally connecting the two lateral walls 9.

Accordingly, the base 11 of the connecting element 10 advantageously comprises at least one coupling portion 40 adapted to be inserted into and coupled with a corresponding cavity 8 defined by the edge 6 or the edge 7, when the connecting element 10 is inserted lengthwise into the hollow member 2.

In this way, upon the snap-fit coupling between the hollow member 2 and the connecting element 10, the coupling portion 40 of the base 11 remains inserted into the corresponding cavity 8. In this way a relative rotation between the hollow member 2 and connecting element 10 is avoided.

5 According to the exemplary embodiment of figures 3-9, the connecting element 10 further comprises one or more walls 12, 13, 14, 15 which protrude transversally from the base 11.

The at least one elastic portion 20, 21, 22, 23 of the first coupling means is defined in a corresponding one of the walls 12, 13, 14, 15 of the connecting element 10.

10 Preferably, the connecting element 10 comprises at least one couple of walls 13-14, 12-15 which protrude transversally from the base 11 faced to each other.

Preferably, the base 11 and the walls 12, 13, 14, 15 of the connecting element 10 are made as a single piece, for example by bending a metal sheet, such as low carbon steel.

15 According to the exemplary embodiment illustrated in figures 3-9, each of the walls 12, 13, 14, 15 protrudes transversally from the base 11 so as to face a corresponding wall 60, 61, 62, 63 of the hollow member 2, when the connecting element 10 is inserted into the hollow member 2 along the reference axis 500.

20 The elastic portion 20, 21, 22, 23 associated to one of the walls 12, 13, 14, 15 is adapted to be compressed by the internal surface of the corresponding facing wall 60, 61, 62, 63 of the hollow member 2, during the insertion of the connecting element 10 into the hollow member 2 itself, until its free to return in its rest position by coupling to the corresponding hole 30, 31, 32, 33 defined in such facing wall 60, 61, 62, 63.

In the exemplary embodiment of figures 1-2, the second coupling means of the hollowed body 2 comprise a first hole 30, a second hole 31, a third hole 32 and a fourth hole 33 which are defined in the wall 60, the wall 61, the wall 62 and the wall 63, respectively, of the hollow member 2.

25 In particular, such holes 30, 31, 32 and 33 are defined in the corresponding walls 60, 61, 62 and 63 at both the upper and lower portions 501 and 502 of the hollow member 2, for allowing the snap-fit coupling between the hollow member 2 itself and two connecting elements 10 inserted through the openings 3a and 3b.

30 Furthermore, each of the delimiting edges 6 and 7 of the hollow member 2 is shaped so as to define three cavities 8: a first cavity 8 at the central wall 68 of the hollow member 2, a second cavity 8 at the wall 65, and a third cavity 8 at the wall 67.

The exemplary connecting element 10 illustrated in figures 3-9 is adapted to be inserted into and snap-fit coupled to the hollow body 2 illustrated in figures 1-2, so as to realize the frame assembly 1 illustrated for example in figure 12.

The base 11 of such connecting element 10 comprises a central portion 41, and three coupling portions 40 which protrude from the central portion 41.

In particular, the three coupling portions 40 protrude from the central portion 41 so as to lay on the same plane of the central portion 41 and are adapted to be inserted into the corresponding three cavities 8 defined by the edge 6 of the hollow member 2 (if the connecting element 10 is inserted into the hollow member 2 through the opening 3a, as illustrated for example in figures 9 and 12), or by the edge 7 of the hollow member 2 (if the connecting element 10 is inserted into the hollow member 2 through the opening 3b).

The exemplary connecting element 10 illustrated in figures 3-9 comprises the first wall 12, the second wall 13, the third wall 14 and the fourth wall 15 protruding transversally from corresponding edges of the base 11, in such a way that the walls 12 and 15 face to each other, and the walls 13 and 14 face to each other and are arranged transversally to the walls 12 and 15.

The walls 12, 13, 14 and 15 protrude transversally from the corresponding edges of the base 11 in such a way to face the walls 60, 61, 62 and 63, respectively, of the hollow member 2, when the connecting element 10 is inserted into the hollow member 2 along the reference axis 500.

The first coupling means of the connecting element 10 comprise a first elastic tab 20, a second elastic tab 21, a third elastic tab 22, and a fourth elastic tab 23, which for sake of simplicity are hereinafter indicated in the description as "tab 20", "tab 21", "tab 22" and "tab 23", respectively.

The tab 20 is associated to a window 50 defined in the wall 12, the tab 21 is associated to a window 51 defined in the wall 13, the tab 22 is associated to a window 52 defined in the wall 14, the tab 23 is associated to a window 53 defined in the wall 15 of the connecting element 10.

In particular, each of the tabs 20, 21, 22, 23 is hinged to an edge of the associated window 50, 51, 52, 53, so as to be deformable between the rest and compressed positions, and between the rest position and an extended position.

The elastic tabs 20, 21, 22, 23 in the rest position are configured to protrude at least partially outwards from the associated windows 50, 51, 52, 53 so as to present a contact surface 24; preferably, the contact surface 24 is an inclined contact surface 24.

In particular, during the lengthwise insertion of the connecting element 10 into the hollow

member 2, the contact surface 24 of the tab 20 is adapted to slide on the internal surface of the corresponding wall 60 of the hollow member 2 (facing the wall 12 of the connecting element 10), the contact surface 24 of the tab 21 is adapted to slide on the internal surface of the corresponding wall 61 of the hollow member 2 (facing the wall 13 of the connecting element 10), the contact surface 24 of the tab 22 is adapted to slide on the internal surface of the corresponding wall 62 of the hollow member 2 (facing the wall 14 of the connecting element 10), and the contact surface 24 of the tab 23 is adapted to slide on the internal surface of the corresponding wall 63 of the hollow member 2 (facing the wall 15 of the connecting element 10).

The contact between the surfaces 24 of the tabs 20, 21, 22 and 23 and the internal surface of the corresponding walls 60, 61, 62 and 63 of the hollow member 2 is suitable to causes the compression of such tabs 20, 21, 22, 23, until they are free to return in the rest position by coupling to the holes 30, 31, 32 and 23 defined in the corresponding walls 60, 61, 62 and 63.

Preferably, the connecting element 10 of the frame assembly 1 according to the present invention is adapted to be operatively coupled to a screw 300 for screwing the frame assembly 1 to the corresponding joint element 101 of the frame 100.

According to the exemplary embodiment illustrated in figures 3-9, the connecting element 10 comprises a shaped component 70, for example a plate 70 in the embodiment of figures 3-9, which is inserted between and operatively coupled to the facing walls 12 and 15, and to the facing walls 13 and 14 of the connecting element 10.

Preferably, the shaped component 70 is made of metal material and is manufactured separately with respect to the other components of the connecting element 10; then, it is inserted between and coupled to the walls 12-15, in order to assemble the connecting element 10.

The shaped component 70 has a through hole 71 which is adapted to be operatively coupled to the screw 300 for fixing the frame assembly 1 to the corresponding joint element 101; preferably, the through hole 71 is a threaded hole 71.

A through hole 600 is also defined in the base 11 of the connecting element 10, for allowing the passage of the fixing screw 300 into the hollow member 2 towards the shaped component 70, in particular towards its through hole 71.

Preferably, the shaped component 70 is movable inserted between and operatively coupled to the walls 12-15 of the connecting element 10; in practice, the walls 12-15 are adapted to provide a

guide for the movement of the shaped component 70.

The shaped component 70 is adapted to operatively interact with the fixing screw 300, during a screwing between the frame assembly 1 and the corresponding joint element 101 of the frame 100, in such a way to move towards the base 11 of the connecting element 10.

- 5 The shaped component 70 is also adapted to operatively interact with the fixing screw 300, during an unscrewing of the frame assembly 1 from the corresponding joint element 101, in such a way to move opposed with respect to the base 11.

Preferably, first abutting means 80 are associated to the walls 12-15 of the connecting element 10 and are adapted to interrupt the movement of the shaped component 70 towards the base 11 at a
10 predetermined final position, corresponding to the end of the screwing between the frame assembly 1 and the joint element 101.

In such a final position, an adequate mechanical connection between the frame assembly 1 and the joint element 101 is assured by the coupling between the screw 300 and the shaped component 70, because the shaped component 70 is coupled to the walls 12-15 of the connecting
15 element 10 which in turn are snap-fit coupled to the hollow member 2.

Second abutting means 90 are associated to the walls 12-15 of the connecting element 10 and are adapted to interrupt a movement of the shaped component 70 opposed to the base 11, so as to avoid a removal of the shaped component 70 from the walls 12-15. In this way, the abutting means 90 improve the stability of the overall structure of the assembled connecting element 10.

- 20 According to the exemplary embodiment of figures 3-9, the elastic portions 20, 21, 22 and 23 defined in the walls 12, 13, 14 and 15 of the connecting element 10 are adapted to operatively interact with the shaped component 70 moving towards the base 11.

In particular, the elastic portions 20, 21, 22, 23 in the rest position are adapted to define an abutting surface for the shaped component 70, surface which is defined between the abutting
25 means 80 and the abutting means 90. In this way, upon the connecting element 10 has been assembled by inserting the shaped component 70 between the walls 12-15, such shaped component 70 initially remains in the space comprised between the abutting surfaces defined by the elastic portions 20, 21, 22, 23 in the rest position and the abutting means 90.

30 Considering the frame assembly 1, the elastic portions 20, 21, 22, 23 in the rest position and coupled to the corresponding holes 30, 31, 32, 33 of the hollow member 2 are adapted to operatively interact with the shaped component 70 moving towards the base 11 under actuation

of the fixing screw 300, in such a way to extend from the rest position through the corresponding holes 30, 31, 32, 33.

In other words, the shaped component 70 under actuation of the fixing screw 300 abuts against the elastic portions 20, 21, 22, 23 and exerts thereon a force suitable for causing their extension through the corresponding holes 30, 31, 32, 33.

Such a deformation of the elastic portions 20, 21, 22, 23 from the rest to the extended position allows the shaped component 70 continuing its movement towards the base 11, and it improves the snap-fit coupling already present between the hollow member 2 and the connecting element 10 inserted therein.

Furthermore, the shaped component 70 is adapted to operatively interact with the elastic portions 20, 21, 22, 23 also when it is in its final position, in such a way to hold such elastic portions 20, 21, 22, 23 in their extended position through the corresponding holes 30, 31, 32, 33.

In this way, the mechanical coupling between the frame assembly 1 and the joint element 101 of the frame 100 is further improved.

In particular, the shaped component 70 in the final position is stably coupled to the screw 300, and in turn it stably holds the elastic portions 20, 21, 22, 23 extended through the corresponding holes 30, 31, 32, 33. In this way, an undesired disengagement between the connecting element 10 and the hollow member 2, due for example to an external intervention on the elastic portions 20, 21, 23, 24 through the holes 30, 31, 32, 33, is avoided.

In the exemplary embodiment illustrated in figures 3-9, the abutting means 80 of the connecting element 10 comprise one leg 80 protruding from each of the walls 12-15 inwards to the space comprises between such walls 12-15; in particular, a leg 80 protrudes from wall 12 towards the faced wall 15, a leg 80 protrudes from wall 15 towards the faced wall 12; a leg 80 protrudes from wall 13 towards the faced wall 14, and a leg 80 protrudes from wall 14 towards the faced wall 13.

Alternatively, the abutting means 80 can be realized by a spacer inserted between the walls 12-15 of the connecting element 10.

The abutting means 90 comprise teeth 90 which protrude from corresponding ends of the walls 12-15 towards the internal space defined by such walls 12-15, so as to define an abutting surface for a movement of the plate 70 opposed to the base 11.

Each of the tabs 20, 21, 22, 23 comprises an indent 25 which is defined so as to protrude

inwards to the space comprised between the walls 12-15, when the tabs 20, 21, 22, 23 is in the rest position. In particular, the indent 25 of the tab 20 protrudes towards the wall 15, the indent 25 of the tab 23 protrudes towards the wall 12, the indent 25 of the tab 22 protrudes towards the wall 13, and the indent 25 of the tab 21 protrudes towards the wall 14.

5 The indents 25 realize an abutting surface for the plate 70, when the tabs 20, 21, 22, 23 are in the rest position; the abutting surface is defined between the legs 80 and the teeth 90.

With reference to figures 3-4, upon inserting the plate 70 between the walls 12-15 in order to assemble the connecting element 10, the plate 70 initially remains in the space comprised between the abutting surfaces realized by the indents 25 and the teeth 90.

10 Upon the snap-fit coupling between the connecting element 10 and the hollow member 2 in order to realize the frame assembly 1, the fixing screw 300 can be used for fixing the frame assembly 1 to the corresponding joint element 101 of the frame 100.

In particular, the screw 300 under turning for screwing the frame assembly 1 to the joint element 101 can operatively interact with the threaded hole 71 to drive the movement of the plate 70
15 towards the base 11.

The plate 70 under such an actuation by the screw 300 is able to abut against the indents 25, exerting thereon a force suitable to cause the extension of the tabs 20, 21, 22, 23 through the corresponding holes 30, 31, 32, 33 of the hollow member 2.

In this way, the plate 70 is able to continue its movement towards the base 11, until it is stopped
20 at the final position by the legs 80 of the connecting element 10, as illustrated for example in figures 5-6.

The plate 70 in the final position is adapted to still contact the indents 25 in such a way to hold the tabs 20, 21, 22, 23 in the extended position through the corresponding holes 30, 31, 32, 33.

An opposed turning of the fixing screw 300, for unscrewing of the frame assembly 1 from the
25 joint element 101, is suitable for driving the movement of the plate 70 opposed to the base 11, i.e. a movement away from the final position, until the connecting element 10 returns at the starting configuration, wherein the tabs 20, 21, 22, 23 are in the rest position and the plate 70 is placed between the abutting surfaces defined by the indents 25 and the teeth 90.

With reference to the exemplary embodiments illustrated in figures 13 and 14, the present
30 disclosure also relates to the frame 100 for an electrical switchboard 200, and to the related switchboard 200.

The frame 100 comprises at least one joint element 101 which is connected to at least one frame assembly 1; in particular, such frame assembly 1 is connected to the joint element 101 by means of the connecting element 10 inserted into and snap-fit coupled to the hollow member 2.

Preferably, the joint element 101 is adapted to mutually connect a plurality of frame assemblies 1.

For example, the joint element 101 comprises at least one through hole 102 which is adapted to be coupled to the fixing screw 300 for fixing the joint element 101 to the corresponding frame assembly 1; in particular, the fixing screw 300 passes through the hole 102 and is adapted to be operatively coupled to the connecting element 10 inserted into the hollow member 2 of the frame assembly 1.

Preferably, the joint element 101 comprises at least one shaped portion 103 which is adapted to be coupled to the hollow member 2 of a corresponding frame assembly 1, in such a way to position such frame assembly 1 onto the joint element 101 and to avoid, or at least limit, a relative rotation between the joint element 101 and the frame assembly 1.

In the exemplary embodiment illustrated in figure 13, the frame 100 has a substantially parallelepiped structure defined by mutually connecting a plurality of frame assembly 1 through four three-way joint elements 101 at the corners of the parallelepiped structure; such three-way joints elements 101 are hereinafter indicated as "corner elements 101" for sake of simplicity.

For example, the corner element 101 illustrated in figures 10-11 is adapted to mutually connect three frame assemblies 1 as per the exemplary embodiment illustrated in figure 12, in such a way that the three frame assemblies 1 are disposed mutually perpendicular.

In particular, the corner element 101 comprises three through holes 102 for fixing screws 300, which are defined across the three shaped portions 103 along three mutually perpendicular directions.

Each of the three shaped portions 103 comprises a flat top surface 104 and is adapted to be at least partially inserted into the hollow member 2 of the corresponding frame assembly 1, in such a way that the flat top surface 104 contacts the connecting element 10 already inserted into the hollow member 2.

In particular, the flat top surfaces 104 is adapted to contact the base 11 of the connecting element 10, so as the through hole 102 of the corner element 101 is aligned to the through hole 600 of the base 11; in this way, the aligned through holes 102, 600 allow the passage of the fixing screw

300 into the hollow member 2, towards the shaped component 70.

With reference to the exemplary embodiment illustrated in figures 10-12, the shaped portion 103 comprises a first lateral edge 105, a second lateral edge 106, a third lateral edge 107, a fourth lateral edge 108, a fifth lateral edge 109 and a sixth lateral edge 110 which are adapted to contact
5 the internal surface of the walls 61, 60, 64, 63, 62 and 66, respectively, of the hollow member 2.

The shaped portion 103 also comprises a first coupling part 111 between the lateral edges 105 and 106, a second coupling part 112 between the lateral edges 105 and 107, and a third coupling part 113 between the lateral edges 106 and 110.

Such coupling parts 111, 112 and 113 are adapted to be inserted into the cavities 8 of the walls
10 68, 65 and 67 of the hollow member 2; in particular, the coupling parts 111, 112, 113 are adapted to contact the coupling portions 40 of the base 11 of the connecting element 10, which are already inserted into the cavities 8.

In this way, a part from avoiding a relative rotation between the corner element 101 and the frame assemblies 1, the shaped portions 103 increases the mechanical connection between the
15 corner element 101 and frame assemblies.

The realizing of the frame assembly 1 according to the present invention, and its connection to the corresponding joint element 101 of the frame 100 are described with reference to the exemplary frame assembly 1 illustrated in figures 3-9 and the exemplary joint element 101 illustrated in figures 10-12.

First, with particular reference to figures 7-8, the connecting element 10 is assembled by
20 inserting the plate 70 between the facing walls 12-15 and 13-14 protruding from the base 11; in particular, upon such an insertion, the plate 70 is operatively connected movable to the walls 12-15.

With reference to figures 3-4, the plate 70 remains initially positioned between the abutting
25 surfaces defined by the legs 80 and the teeth 90 associated to the walls 12-15.

With particular reference to figures 9 and 12, the assembled connecting element 10 is inserted lengthwise into and snap-fit coupled with the hollow member 2 in order to assemble the frame assembly 1.

In particular, during the insertion of the connecting element 10 into the hollow member 2, the
30 contact surfaces 24 of the tabs 20, 21, 22 and 23 slide on the internal surface of the corresponding walls 60, 61, 62 and 63 of the hollow member 2, causing the compression of such

tabs 20, 21, 22 and 23.

The sliding contact between the surfaces 24 of the tabs 20-23 and the internal surface of the corresponding wall 60, 61, 62, 63 keeps the tabs 20, 21, 22, 23 compressed until they are free to return in the rest position by coupling to the corresponding holes 30, 31, 32 and 33 defined in the walls 60, 61, 62 and 63 of the hollow member 2.

This coupling between the tabs 20-23 and the corresponding holes 30-33 determines the end of the assembly of the frame assembly 1.

At the end of this assembling, the coupling portions 40 of the base 11 are inserted into the corresponding cavities 8 defined in the walls 65, 67 and 68 of the hollow member 2.

With reference to figure 12, the frame assembly 1 is operatively connected to the corresponding corner element 101 for realizing the frame 100.

First, the frame assembly 1 is positioned on the corner element 101 by coupling its hollow member 2 to the corresponding shaped portion 103 of the corner element 101.

In particular, the shaped portion 103 is inserted into the hollow member 2, until its flat top surfaces 104 contacts the base 11 of the connecting element 10 already inserted into the hollow member 2.

At the end of this coupling, the lateral edges 105, 106, 107, 108, 109, 110 of the shaped portion 103 contact the internal surfaces of the corresponding walls 61, 60, 64, 63, 62 and 66 of the hollow member 2, and the coupling parts 111, 112, 113 of the shaped portion 103 are inserted into the corresponding cavities 8 of the hollow member 2.

Then, the frame assembly 1 is screwed to the corner element 101 by means of the single fixing screw 300, which passes across the aligned through hole 102 of the corner element 101 and through hole 600 of the connecting element 10, until reaching the plate 70.

The fixing screw 300 under turning starts to operatively couple with the threaded hole 71 of the plate 70, so as to drive a movement thereof towards the base 11.

In particular, the plate 70 under actuation by the screw 300 abuts against the indents 25 of the tabs 20, 21, 22, 23 which are in the rest position and coupled to the corresponding holes 30, 31, 32, 33 of the hollow member 2. The force exerted by the plate 70 on the indents 25 causes the extension of the tabs 20, 21, 22, 23 through the corresponding holes 30, 31, 32, 33, allowing the plate itself 70 to continue its movement towards the base 11.

Such movement continues until the plate 70 is stopped at the final position by the legs 80,

causing the end of the fixing operation between the frame assembly 1 and the corner element 101.

The plate 70 in the final position still contacts the indents 25 and holds the tabs 20, 21, 22, 23 in the extended position through the corresponding holes 30, 31, 32, 33.

5 Considering the reverse unscrewing operation, the fixing screw 300 under turning drives the movement of the plate 70 away from the final position, towards the teeth 90, until the connecting element 10 returns at the starting configuration, wherein the tabs 20, 21, 22, 23 are coupled to the corresponding holes 30, 31, 32, 33 and in the rest position, and the plate 70 remains inserted between the abutting surfaces defined by the indents 25 of tabs 20-23 and the teeth 90.

10 In practice, it has been seen how the frame assembly 1 according to the present invention, and related frame 100 and switchboard 200, allow achieving the intended object offering some improvements over known solutions.

In particular, the frame assembly 1 is not only realized by the hollow member 2, but also it comprises the connecting element 10, inserted into the hollow member 2, for providing the
15 connection means to the corresponding joint element 101 of the frame 100.

The internal connecting element 10 is coupled to the hollow member 2 without using fixing screws (indeed, the connecting element 10 and the hollow member 2 are mutually coupled in a snap-fit way).

The snap-fit coupling between the hollow member 2 and the connecting element 10 is an
20 adequate stable coupling, allowing the delivery of the already assembled frame assemblies to the customer.

With reference to the exemplary embodiment illustrated in figure 12, the coupling between the connecting element 10 and hollow member 2 can be further improved providing the insertion of coupling portions 40 of the base 11 of the connecting element 10 into corresponding cavities 8
25 defined in the walls of the hollow member 2. Such an insertion avoids the relative rotation between the hollow member 2 and the connecting element 10 inserted therein.

The presence of the connecting element 10 already inserted into and coupled to the hollow member 2 of the frame assembly 1 allows:

- a simplification of the structure of the corresponding joint element 101; and
- 30 - an economic connecting operation between the frame assembly 1 and the joint element 101, while guaranteeing the required mechanical performances for such connection.

For instance, according to the exemplary embodiments disclosed above, the connecting operation between one frame assembly 1 and the joint element 101 requires only a single screw 300.

Also the operations required by the customer to assemble the frame 100 are reduced and simplified; in particular, the customer receives the frame assembly 1 already assembled so as to contain the connecting element 10, and therefore he has only to fix it to the joint element 101 with a single screwing.

A further advantage is related to the packaging for delivering the elements required for assembling the frame. In particular, the use of structurally simple joint elements, of frame assemblies already assembled with internal connecting elements, and the reduction of the required fixing screws imply optimized packaging solutions, particularly in term of dimensions and costs.

It is to be set forth that the frame 100 illustrated in figure 4 has only an exemplary purpose and the frame assemblies can be used to realize a frame 100 having a different shape and/or dimensions.

Furthermore, the three-way joint elements 101 can be adapted to mutually connect a single frame assembly 1 according to the present invention to other two frame members of different typology, such as frame members known in the art, or it can be adapted to mutually connect two frame assemblies according to the present invention to one frame member of different typology. Furthermore, even if in the exemplary embodiment of figures 3-9 is the connecting element 10 is illustrated which is adapted to be inserted into and snap-fit coupled to the exemplary hollow member 2 illustrated in figures 1-2, the connecting element 10 of the frame assembly 1 according to the present invention can be adapted to be inserted into and snap-fit coupled to hollow bodies 2 having a shape different with respect to the hollow member 2 illustrated in figures 1-2.

Even if the joint element 101 illustrated for example in figures 10-11 is adapted to be connected to the exemplary frame assembly 1 illustrated in figure 12, it is to be set forth that the joint element 101 according to the present invention can be adapted to be connected to a frame assembly 1 having a hollow member 2 with a shape different with respect to the hollow member 2 illustrated in figure 12.

Moreover, all parts/components can be replaced with other technically equivalent elements; in practice, the type of materials, and the dimensions, can be any according to needs and to the state of the art.

CLAIMS

1. An assembly (1) for the frame (100) of a switchboard (200), comprising a hollow member (2) which extends lengthwise along a reference axis (500), characterized in that it comprises at least one connecting element (10) which is adapted to be at least partially inserted into said hollow member (2) along said reference axis (500), and which is adapted to operatively connect said assembly (1) to a corresponding joint element (101) of the frame (100), wherein said at least one connecting element (10) and said hollow member (2) comprise first coupling means (20, 21, 22, 23) and second coupling means (30, 31, 32, 33), respectively, which are adapted to couple the connecting element (10) and the hollow member (2) to each other in a snap-fit way.
2. The assembly (1) according to claim 1, wherein said first coupling means comprise at least one elastic portion (20, 21, 22, 23) adapted to be elastically deformed by said hollow member (2) during the insertion of the connecting element (10) into the hollow member (2), and wherein said second coupling means comprise a corresponding hole (30, 31, 32, 33) which is defined in the hollow member (2) for coupling with said elastic portion (20, 21, 22, 23) and causing the return of the elastic portion to a rest position.
3. The assembly (1) according to claim 2, wherein said at least one connecting element (10) comprises a base (11) transversal with respect to said reference axis (500), and one or more walls (12, 13, 14, 15) protruding transversally from said base (11), said at least one elastic portion (20, 21, 22, 23) being defined in a corresponding wall (12, 13, 14, 15) of said one or more walls (12, 13, 14, 15).
4. The assembly (1) according to claim 3, wherein:
 - said hollow member (2) comprises an edge (6, 7) which is shaped so as to define at least one cavity (8) having two lateral walls (9) extending along said reference axis (500) and a base wall (150) transversally connecting said two lateral walls (9); and
 - said base (11) comprises a corresponding coupling portion (40) adapted to be inserted into said cavity (8).
5. The assembly (1) according to one or more of the preceding claims, wherein said at least one connecting element (10) is adapted to be operatively coupled to a screw (300) for screwing said assembly to said corresponding joint element (101) of the frame (100).

6. The assembly (1) according to claim 5, wherein:
 - said one or more walls (12, 13, 14, 15) comprise at least a first wall (12; 13) and a second wall (15; 14) which protrude transversally from said base (11) faced to each other; and
 - said at least one connecting element (10) comprises a shaped component (70) having a first through hole (71) adapted to be operatively coupled to said screw (300);said shaped component (70) begin inserted between and operatively coupled to said first and second walls (12-15; 13-14).
7. The assembly (1) according to claim 6, wherein said base (11) comprises a second through hole (600) for allowing the passage of said screw (3) towards said shaped component (70).
8. The assembly (1) according to claim 6 or claim 7, wherein said shaped component (70) is movable inserted between and operatively coupled to said first and second walls (12-15; 13-14) and is adapted to operatively interact with said screw (300) during a screwing between said assembly (1) and the corresponding joint element (101), in such a way that said shaped component (70) moves towards the base (11).
9. The assembly (1) according to claim 8, wherein first abutting means (80) are associated to said first and second walls (12-15; 13-14) and are adapted to interrupt said movement of the shaped component (70) towards the base (11) at a predetermined position.
10. The assembly (1) according to claim 8 or claim 9, wherein said shaped component (70) is adapted to operatively interact with said screw (300) during an unscrewing of said assembly from the corresponding joint element (101), in such a way that said shaped component (70) moves opposed with respect to the base (11).
11. The assembly (1) according to one or more of claims 8-10, wherein second abutting means (90) are associated to said first and second walls (12-15, 13-14) and are adapted to interrupt a movement of the shaped component (70) opposed with respect to the base (11).
12. The assembly (1) according to one or more of claims 8-11, wherein:
 - said at least one elastic portion (20, 21, 22, 23) comprises at least a first elastic portion (20; 21) and a second elastic portion (23, 22) which are defined in said first wall (12; 13) and second wall (15; 14), respectively;
 - said corresponding hole (30, 31, 32, 33) comprises a first hole (30; 31) corresponding to said first elastic portion (20; 21) and a second hole (33; 32) corresponding to said second elastic portion (23; 22); and

- said first and second elastic portions (20, 23; 21, 22) coupled to the corresponding first and second holes (30, 33; 31, 32) are adapted to operatively interact with said shaped component (70) moving towards the base (11), in such a way to extend from the rest position through said first and second corresponding holes (30, 33; 31, 32).
13. The assembly (1) according to claim 12, wherein said shaped component (70) is adapted to operatively interact with said first and second elastic portions (20, 23; 21, 22) when it is in said predetermined position, in such a way to hold the first and second elastic portions (20, 23; 21, 22) extended through the corresponding first and second holes (30, 33; 31, 32).
 14. A frame (100) for a switchboard (200), characterized in that it comprises at least one joint element (101) connected to at least one assembly (1) according to one or more of the preceding claims 1-13, said at least one assembly being operatively connected to the joint element (101) by means of said connecting element (10) inserted into its hollow member (2).
 15. A switchboard (200) characterized in that it comprises a frame (100) according to claim 14.

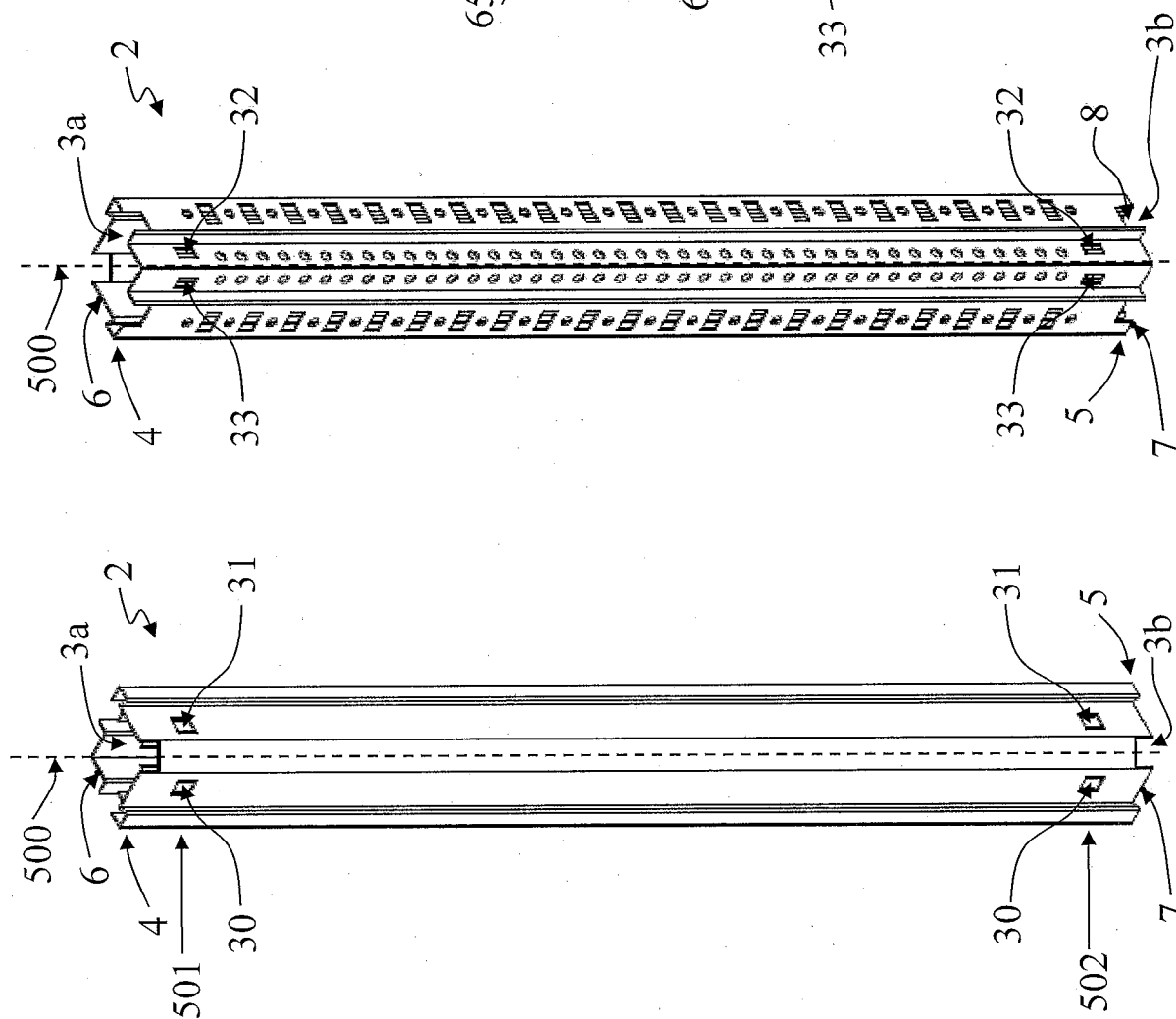


Fig. 1

Fig. 2

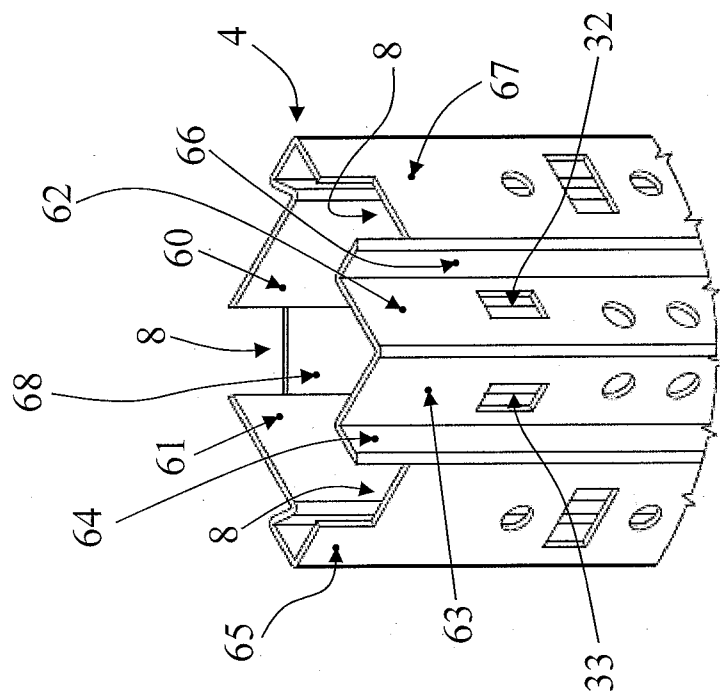


Fig. 1a

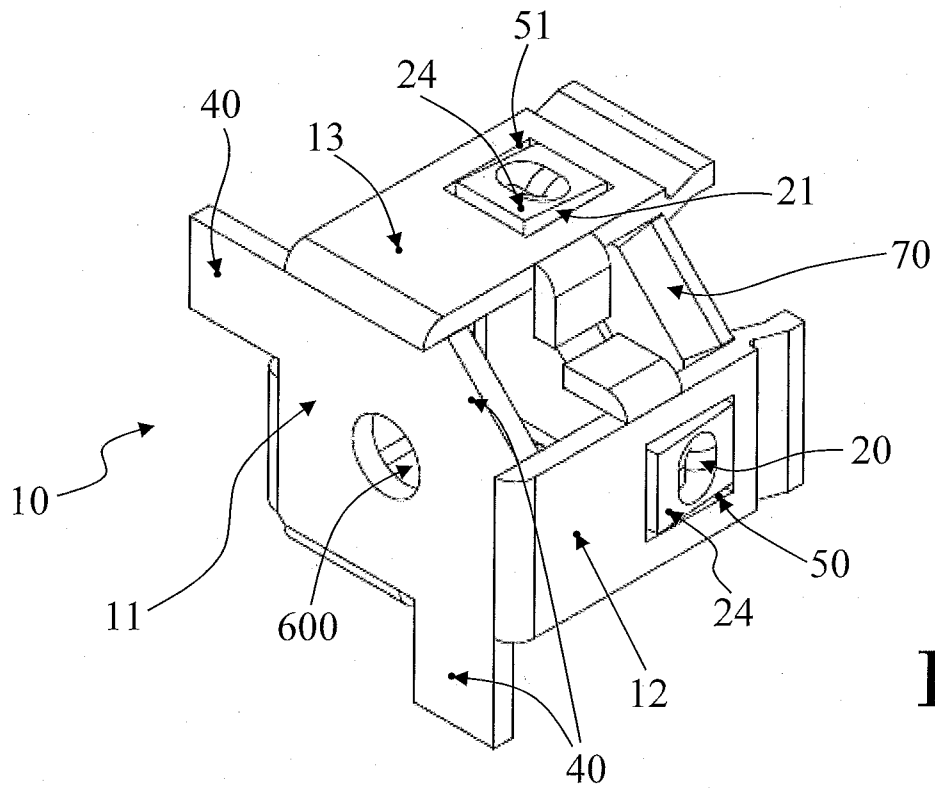


Fig. 3

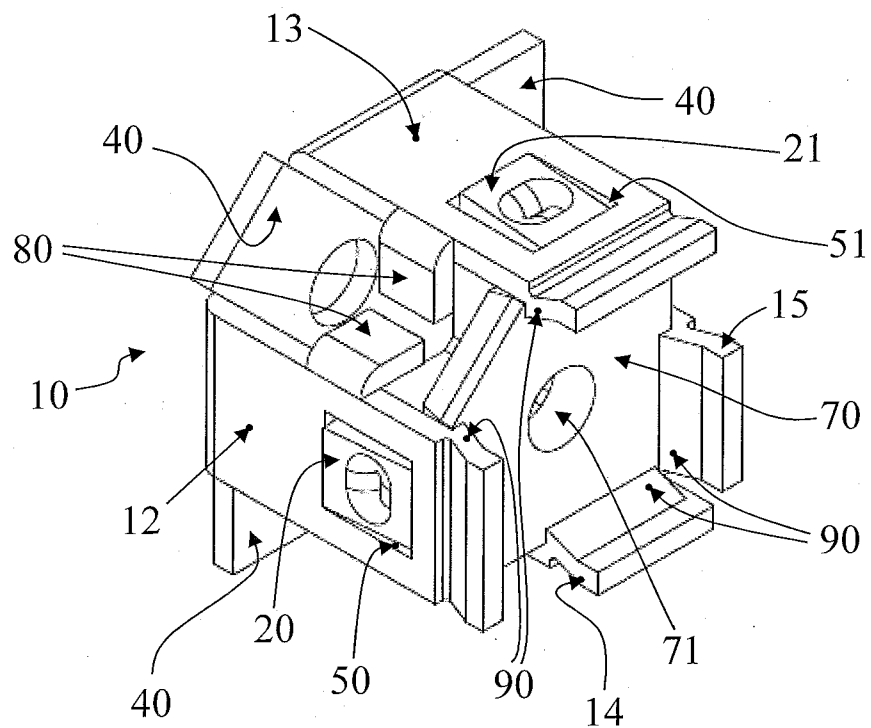


Fig. 4

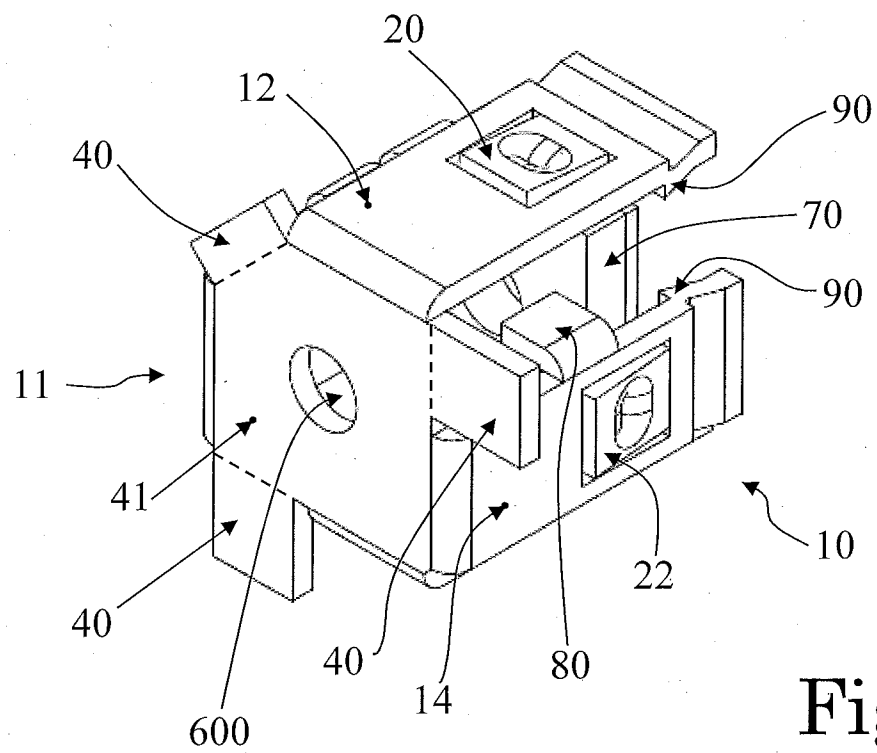


Fig. 5

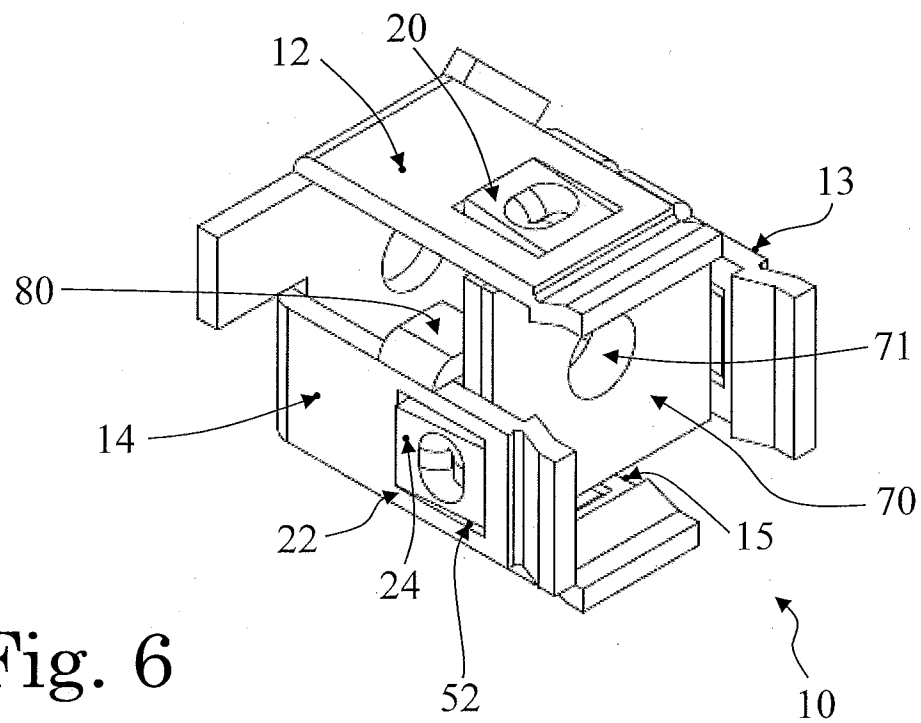


Fig. 6

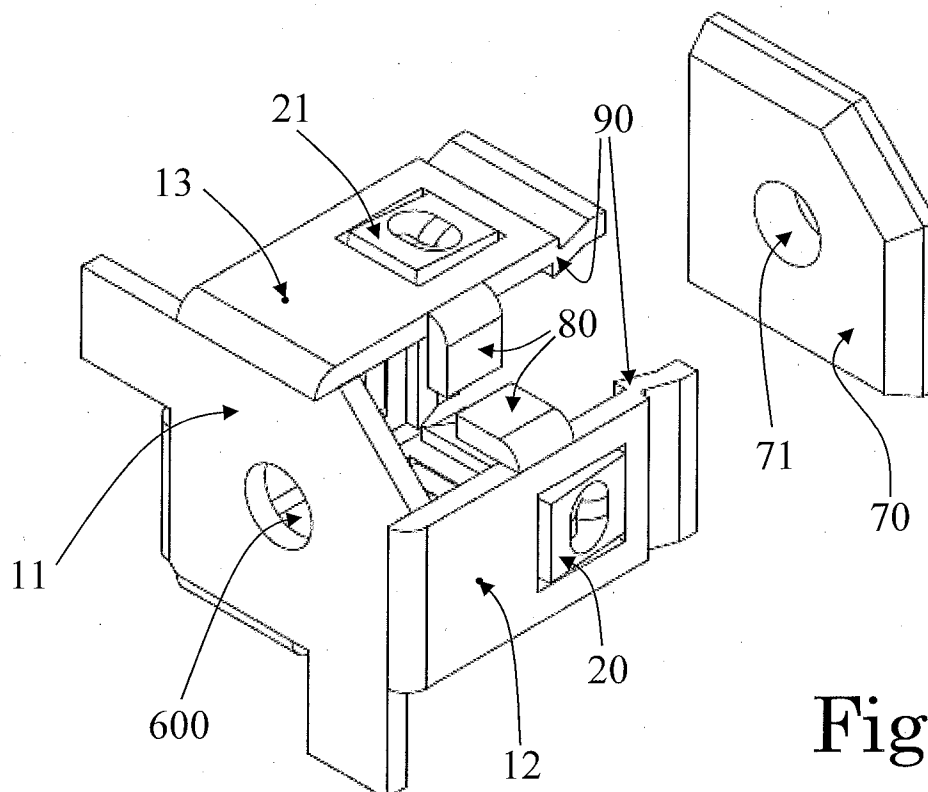


Fig. 7

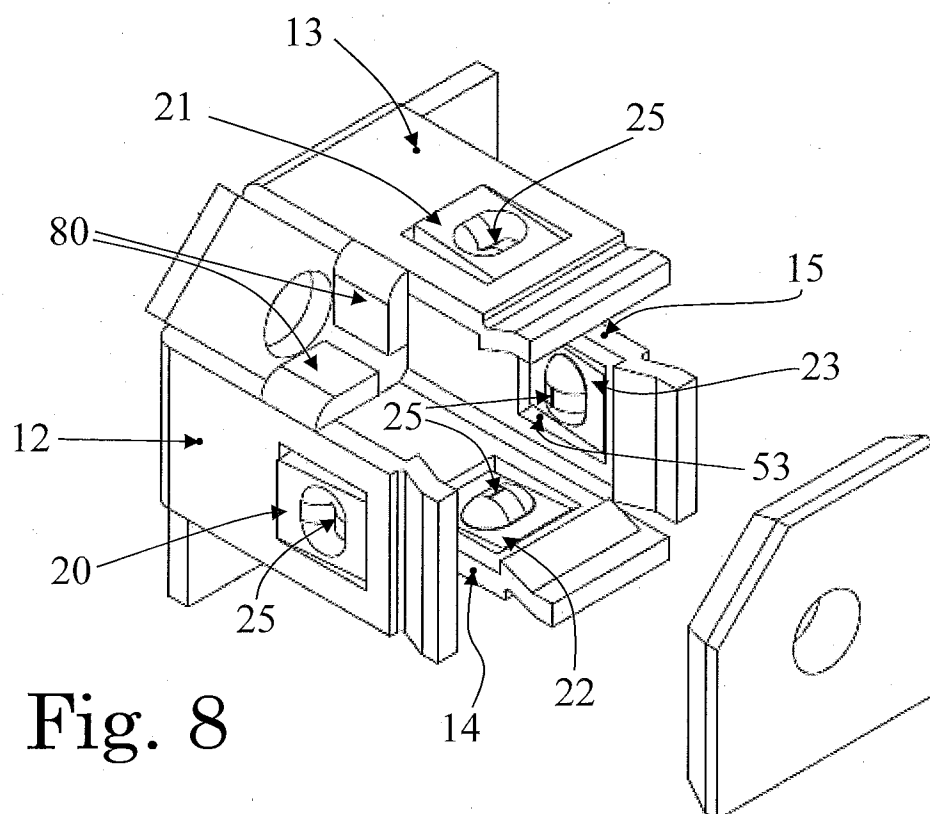
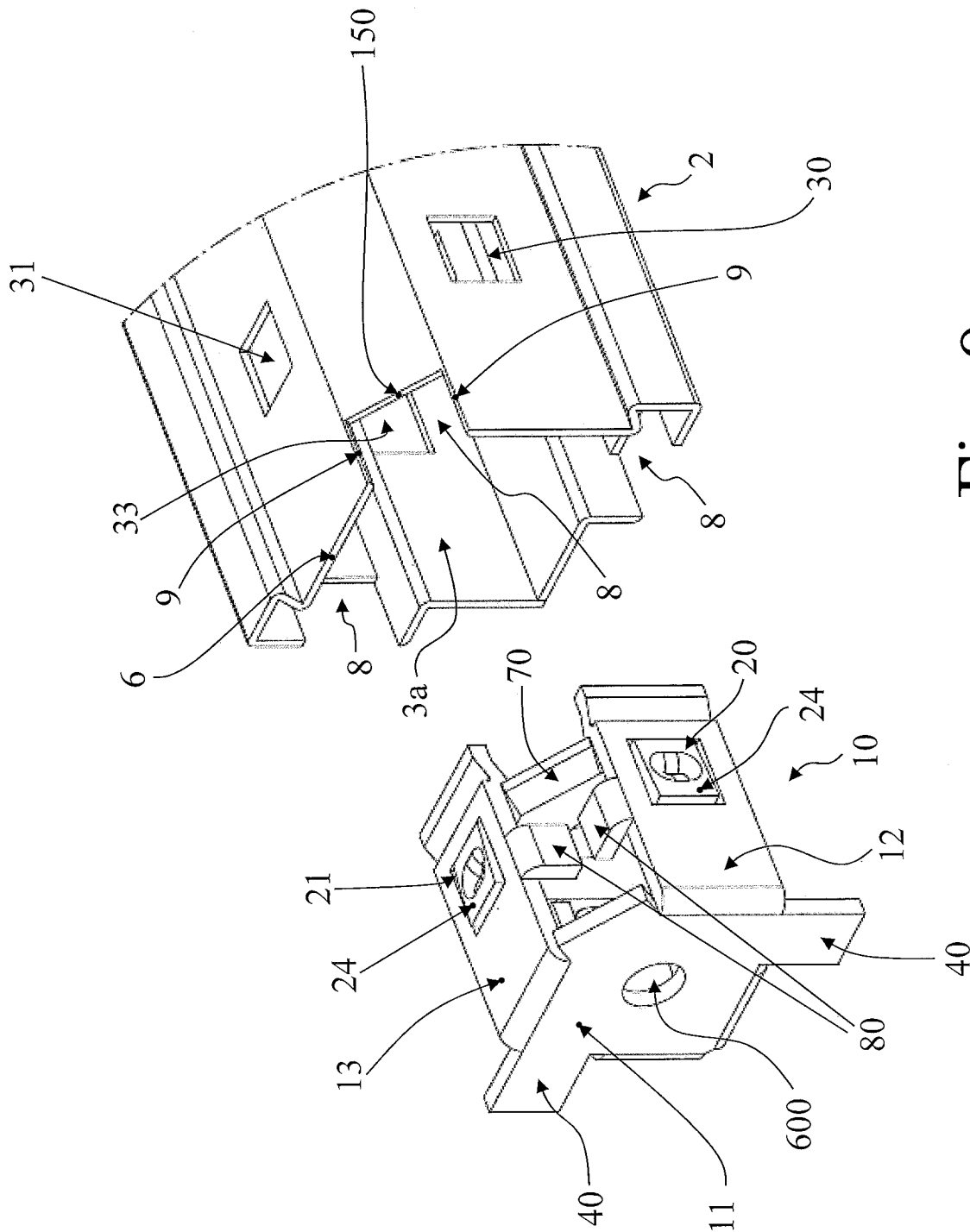


Fig. 8



Fi. 6

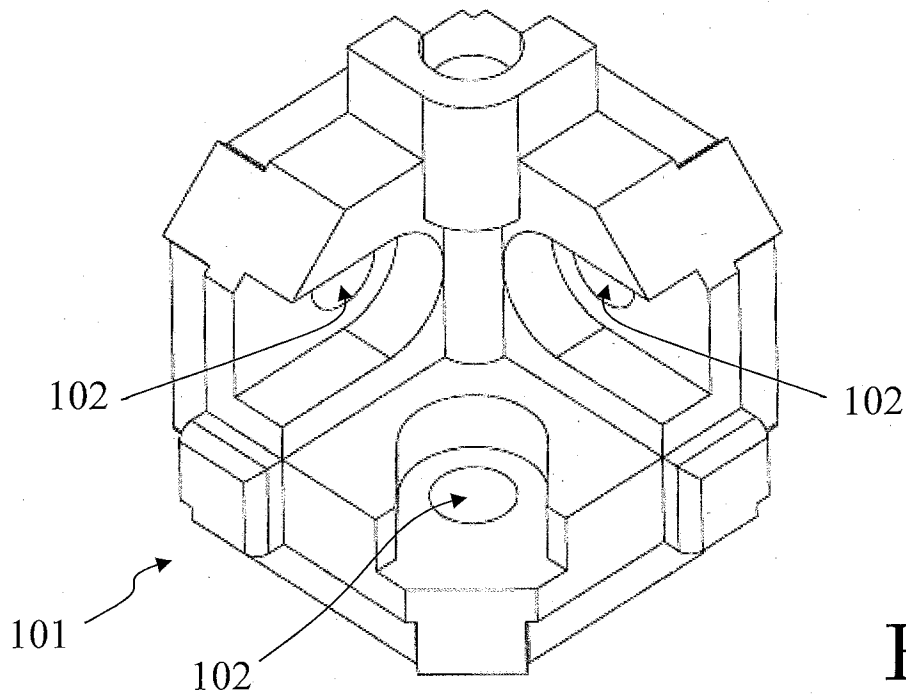


Fig. 10

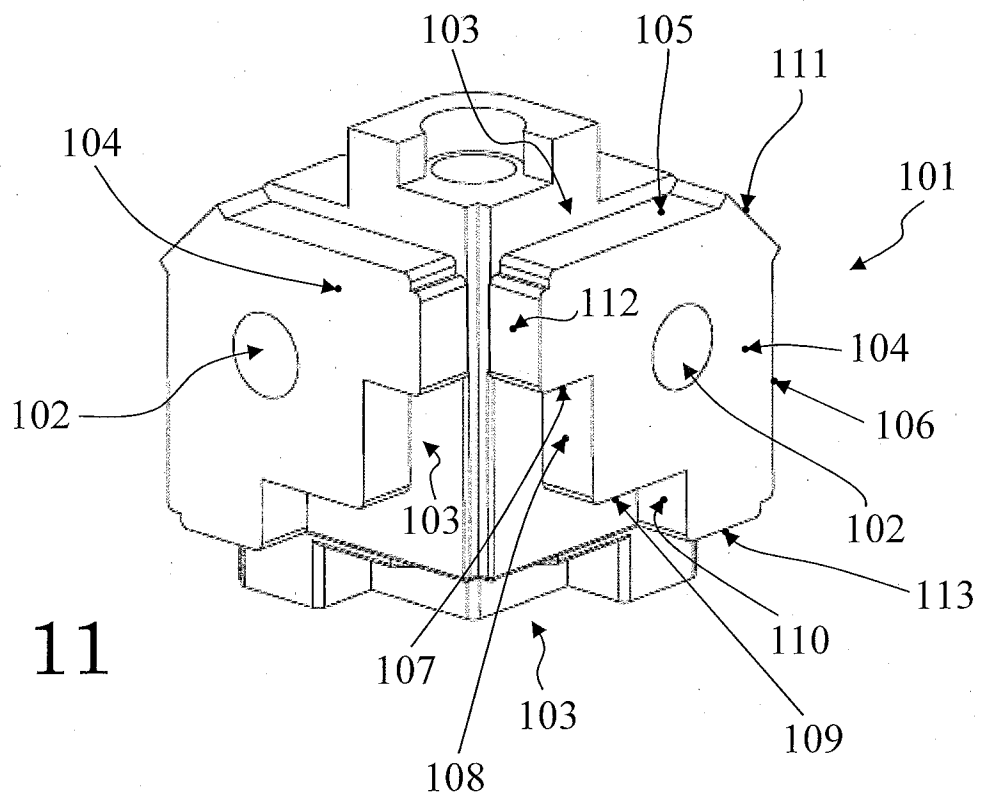


Fig. 11

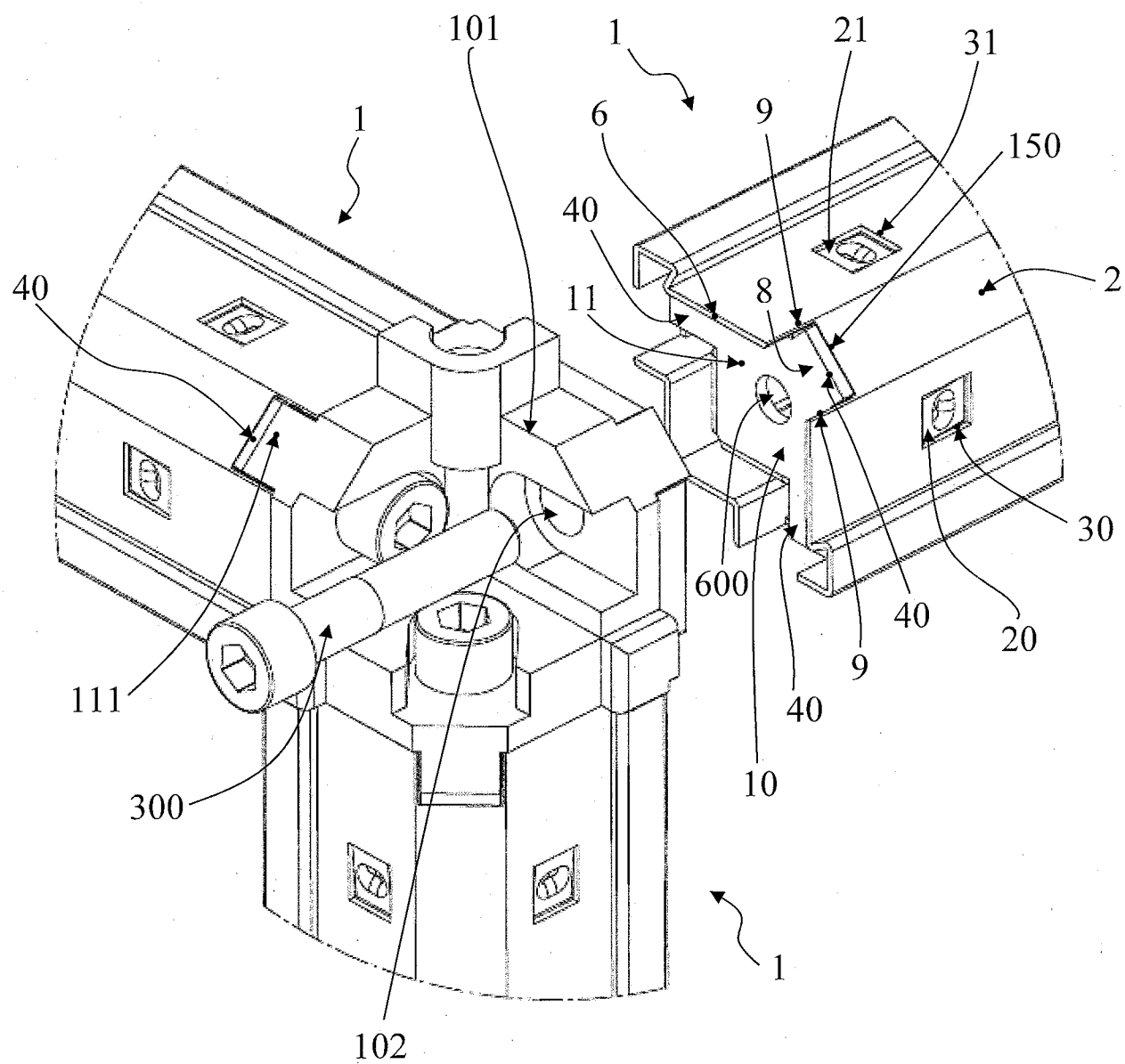


Fig. 12

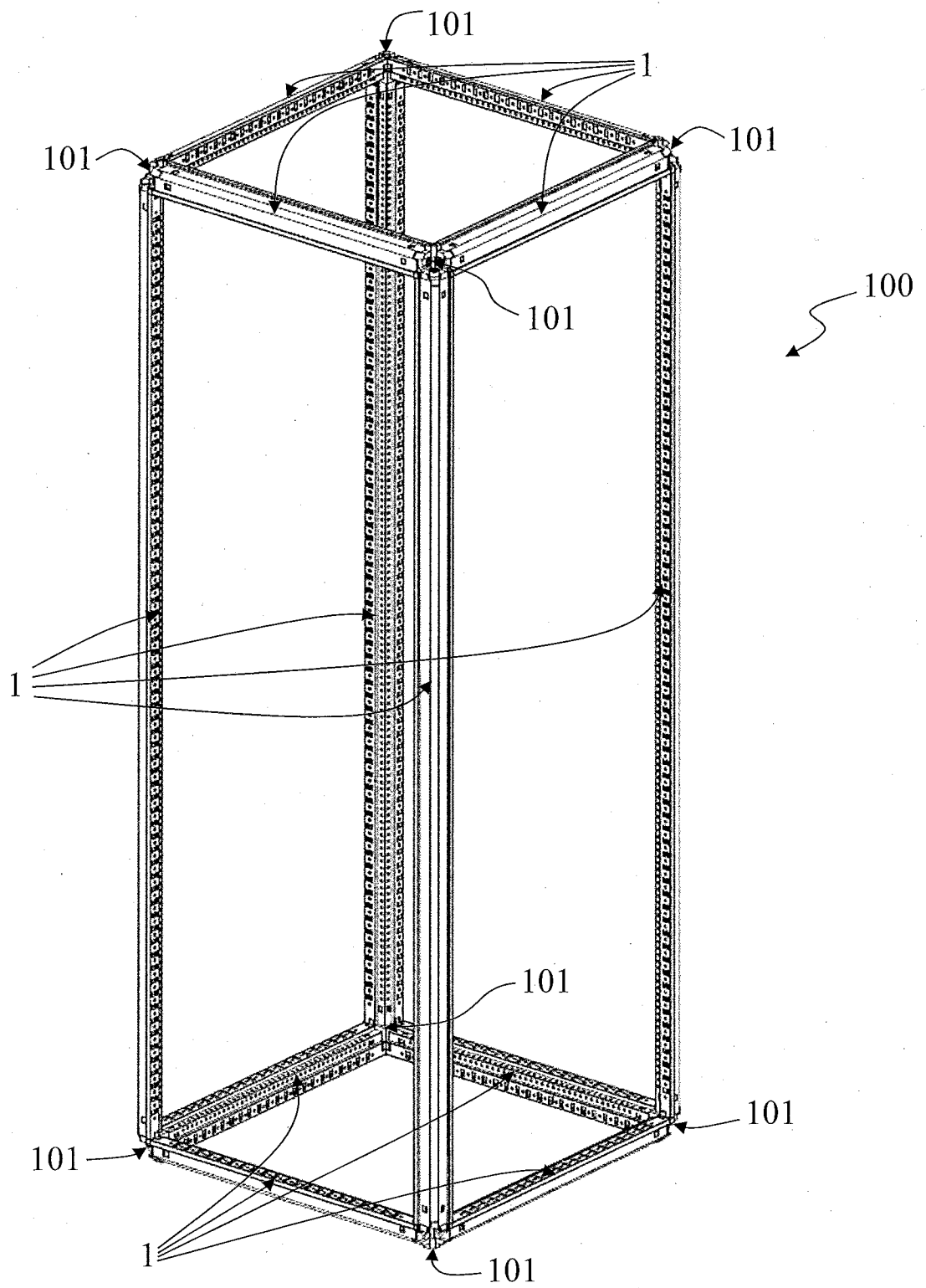


Fig. 13

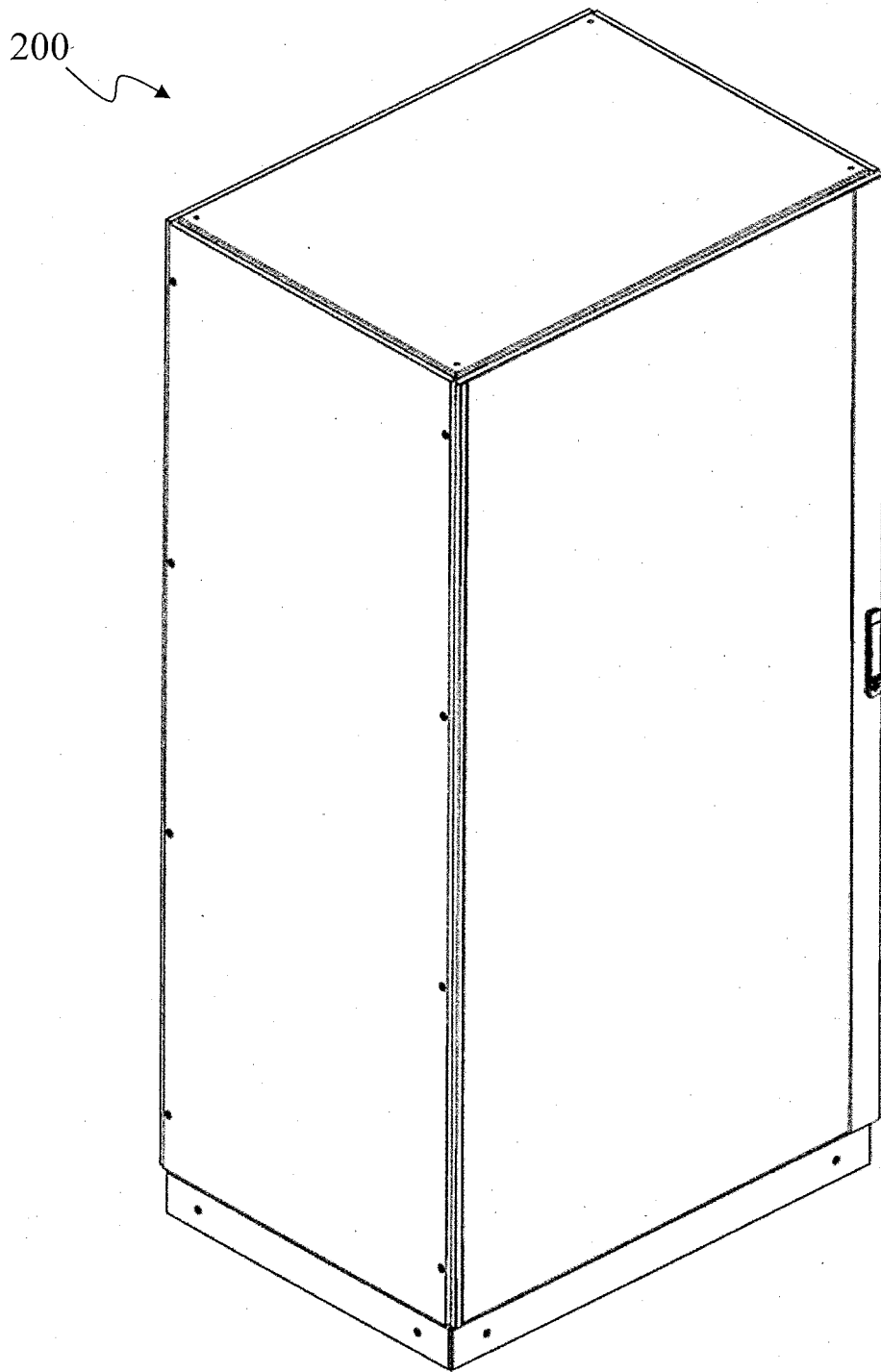


Fig. 14

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/063122

A. CLASSIFICATION OF SUBJECT MATTER INV. H02B1/01 ADD.														
According to International Patent Classification (IPC) or to both national classification and IPC														
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H02B														
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched														
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data														
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 6 902 068 B1 (FONTANA RODOLFO [IT] ET AL) 7 June 2005 (2005-06-07) column 3, line 53 - column 4, line 63; figures -----</td> <td>1-15</td> </tr> <tr> <td>X</td> <td>FR 2 642 799 A1 (MERLIN GERIN [FR]) 10 August 1990 (1990-08-10) page 7, paragraph 2; figures -----</td> <td>1,2,5-8, 14,15</td> </tr> <tr> <td>X</td> <td>US 3 603 628 A (SMITH EDWARD A ET AL) 7 September 1971 (1971-09-07) figures -----</td> <td>1-3</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 6 902 068 B1 (FONTANA RODOLFO [IT] ET AL) 7 June 2005 (2005-06-07) column 3, line 53 - column 4, line 63; figures -----	1-15	X	FR 2 642 799 A1 (MERLIN GERIN [FR]) 10 August 1990 (1990-08-10) page 7, paragraph 2; figures -----	1,2,5-8, 14,15	X	US 3 603 628 A (SMITH EDWARD A ET AL) 7 September 1971 (1971-09-07) figures -----	1-3
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X	US 3 603 628 A (SMITH EDWARD A ET AL) 7 September 1971 (1971-09-07) figures -----	1-3												
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25 September 2013		09/10/2013												
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		Castanheira Nunes, F												

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/063122

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