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(71) Applicants:
• **Tyco Electronics-Simel**
21220 Gevrey Chambertin (FR)
• **Tyco Electronics Raychem GmbH**
85521 Ottobrunn (DE)

(72) Inventors:
• **Peltier, Bruno**
21850, ST APOLLINAIRE (FR)
• **Pfeiffer, Bernhard**
12309, BERLIN (DE)
• **Dolling, Manfred**
04934, HOHENLEIPISCH (DE)

(74) Representative: **Kurtz, Laurent Charles Edmond Santarelli,**
14 avenue de la Grande Armée,
BP 237
75822 Paris Cedex 17 (FR)

(54) **Branch connector with optimized contact for the connecting elements**

(57) A branch connector (10) for connecting each of the conductors of a feeder cable to each of the conductors of a branch cable, including two jaws (11a, 11b) made from insulating material, for placing the connector onto the feeder cable and connected together by translation using clamping means for clamping said jaws onto the conductors of the feeder cable, and several branching elements (12a, 12b) for connecting the conductors of the feeder cable to the conductors of the branch cable, and including a body, made from insulating material, which

has a projecting section (14a, 14b), also made from insulating material, and by which the branching element is designed to engage laterally between the two jaws in order to define a receptacle with each of the adjacent jaws for the insertion of a conductor of the feeder cable, and a metal contact part per receptacle which is partly superposed on said projecting section, and is designed for establishing an electrical connection between this conductor of the feeder cable and a conductor of the branch cable connected to the branching element.

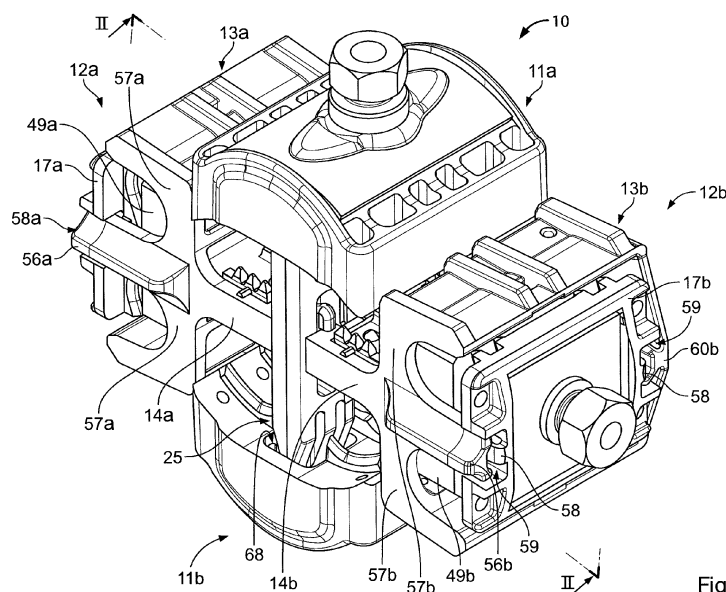


Fig. 1

Description

[0001] The present invention generally relates to branch connectors designed for establishing an electrical connection between a first cable, or feeder cable, which cable is generally already installed, and a second cable, or branch cable, to be connected to said feeder cable.

[0002] These types of branch connectors are notably used in the field of electrical connections to a buried feeder cable in a building which must be supplied with electrical power. A process is already known from American patent n° US4527854 for connecting the bifurcation conductors to the cores of an electrical cable under voltage, according to this process the cable cores are separated by a spacer part, and contact parts provided with contact points, blades, or similar means, are connected to the bifurcation conductors and are brought into a conduction connection with the cable cores by a clamping ring, this process providing positioning of the contact parts apart from the clamping ring in a predetermined common plane of a transverse section of the cable, between the cores, the bifurcation conductors being previously or subsequently connected to the contact parts, as well as the subsequent transfer of the clamping ring to a position encircling the contact parts and the compression of the cable cores against the contact parts by clamping together the parts of the clamping ring.

[0003] The contact parts are retained by snapping into the predetermined positions by means of the spacer part introduced between the cable cores. To this end, these contact parts have feet shaped appendages made from electrically conducting material and which are provided with the aforementioned blades, points, or similar means, whereas the spacer part has a twin channel profile with longitudinal edges, the mutual distance of which essentially corresponds to the width of the appendages.

[0004] This type of connector is preferred as it allows, due to the fact that the contact parts snap into place between the conductors of the feeder cable, a maximum contact zone to be targeted between the contact parts and the conductors of the feeder cable.

[0005] However, this type of embodiment does not take into account the fact that the conductors (cores) of the feeder cable are, in practice, generally twisted, which means that they do not extend parallel to each other and that, locally, they extend obliquely relative to the extension axis of the feeder cable by itself. Consequently, when this type of branch connector is used with this type of cable, the contact between the contact parts and the conductors of this cable is far from being optimal, mainly due to the presence of the spacer part which extends, in the assembled condition, between the contact parts, over the entire width of the cable and along a certain length, and thus hinders said contact parts from intimately bearing against the adjacent conductors of the cable by following their respective inclines.

[0006] Furthermore, the clamping means implemented on this type of connector are relatively numerous and

some of them are difficult to access when the branch connector has to be installed on a cable located in a trough.

[0007] The purpose of the invention is to propose a branch connector of the same type, but which has improved performance in terms of the electrical contact and which also provides other advantages.

[0008] In general, the purpose of the invention is a branch connector for connecting each of the conductors of a feeder cable to each of the conductors of a branch cable, including two jaws made from insulating material, designed for placing the connector onto the feeder cable and connected together by translation using clamping means designed for clamping said jaws onto the conductors of the feeder cable, and several branching elements designed for connecting the conductors of the feeder cable to the conductors of the branch cable, characterised in that each branching element includes a body, made from insulating material, which has a projecting section, which section is also made from insulating material, and by which the branching element is designed to engage laterally between the two jaws in order to define a receptacle with each of the adjacent jaws, which receptacle is designed for the insertion of a conductor of the feeder cable, and a metal contact part per receptacle which is partly superposed on said projecting section, and is designed for establishing an electrical connection between this conductor of the feeder cable and a conductor of the branch cable connected to the branching element.

[0009] As the branching element is provided with a projecting section made from insulating material to which the contact part is superposed, the use of a spacer part is not necessary. In this way, the branching element allows the incline to be followed in the best possible manner relative to the horizontal of the one or more associated conductors, due to the fact that the principle cable is twisted, and as a result, establishes an optimal electrical contact.

[0010] According to specific provisions, possibly combined:

- each branching element includes a secondary jaw also made from insulating material, which jaw is mounted in a mobile manner to the body by means of second clamping means and defines with this body at least one receptacle designed for the insertion of a conductor of the branch cable.
- the first and second clamping means respectively include a first and a second threaded rod assembled in a detachable manner in a cross wise layout and in that the principal jaws and the branching elements are respectively engaged with each of said first and second threaded rods.
- one of the threaded rods includes a means of passage for the other rod for assembly, preferably that of the branching elements.
- the means of passage is an eyelet.
- the other rod is in the form of a bolt.

- the first and second clamping means include programmed torque limiting nuts, designed to co-operate with the threaded rods.
- the branch connector further includes a vertical separator provided with means forming a passage for each of the threaded rods.
- the separator has the general form of a wedge.
- the separator includes a longitudinal body tapering, viewed in a transversal direction, toward its free ends.
- each branching element is mounted for free rotation on the associated threaded rod and has a projection with at least one boss and the vertical separator has a recess for engagement of an associated boss, configured so as to limit the rotation of the branching element, preferably by 10° either side of a horizontal plane.
- there are two branching elements, each generally oriented at a right angle relative to the principal jaws.
- each branching element defines, with its associated secondary jaw, two receptacles, each of which is designed for the insertion of a conductor of the branch cable, and in that it defines a receptacle with each of the principal jaws designed for the insertion of a conductor of the feeder cable and, consequently, includes two metal contact parts each interfering with a receptacle of the branching element and an adjacent receptacle for the conductor of the feeder cable.
- each branching element includes a plate from which projects, on one side, two parallel walls which together delimit two receptacles for the insertion of the conductors of the branch cable and, on the opposite side, a projecting section holding the section of the one or more contact parts designed to co-operate with a conductor of the feeder cable, the plate being open for the passage of each contact part with a view to allowing said part to interfere with an associated receptacle for the insertion of a branch conductor via another section.
- each contact part has, as a single piece, a base extended by at least one tab extending square relative to the base, both of which are preferably symmetrically disposed relative to a median plane of the part, and the base, as well as the one or more tabs, includes, on the sides opposite the parts, teeth for perforating the insulation of the conductor.
- the branch connector includes at least one block made from insulating material designed to cover the perforation teeth of the one or more conductors of the branch cable and to be perforated by said perforation teeth by the clamping force of the secondary jaw.
- the branch connector includes means of intervention designed to elastically bias each principal jaw toward its position for clamping a feeder cable conductor or each secondary jaw toward its position for clamping a conductor of the branch cable, or even both.
- the means of intervention by elastic bias include, for

each jaw, a plate performing a spring function, which plate is perforated for passage of the clamping means associated with this jaw and which is interposed between each jaw and the adjacent clamping means acting thereon.

- with regard to the projecting section of the body of the branching element, the contact part or each contact part is embedded in a hollow therein, the contact part and the hollow having complementary shapes by which the contact part is retained on the branching element.
- the branch connector includes means of coupling the first and second clamping means to their respective jaws, preferably by a positive snap on connection and/or press fitting.

[0011] The features and advantages of the invention will become apparent upon reading the following description, provided by way of example, with reference to the appended schematic drawings, wherein:

- figure 1 is a perspective view of a branch connector according to the invention;
- figure 2 is a longitudinal cut-out view of this connector, along line II-II of figure 1, the conductors of a feeder cable and a branch cable having been added highly schematically by means of a dotted line relative to figure 1, whereas the foam blocks of the branching elements have not been shown in this figure 2 for the sake of clarity;
- figure 3 is a perspective view of the clamping means and the plates which perform a spring function, which comprise this branch connector according to the invention;
- figure 4 is a perspective view of a contact part of the connector according to the invention;
- figure 5 is a perspective view of a branching element of the connector according to the invention, without the jaw and contact parts which are normally fitted to this element;
- figure 6 is a perspective view, similar to figure 5, with the jaw and the contact parts fitted to the branching elements;
- figures 7 is a perspective view of a vertical separator also included in this connector;
- figure 8 is a side view of the aforementioned separator and of one of the branching elements which is also included in the connector; and
- figure 9 is an exploded perspective view of a branching element according to an embodiment of the invention.

[0012] In general, in the embodiments shown in these figures, and more specifically in figures 1 and 2, the branch connector 10 according to the invention includes two principal jaws 11a, 11b, identical herein, made from insulating material, designed for connecting this connector 10 to a feeder cable, connected together by translation

using the first clamping means described in further detail hereafter and designed to be clamped to the conductors of this feeder cable; as well as two branching elements 12a, 12b, in this case also identical and designed for connection of the conductors of the feeder cable to the conductors of a branch cable.

[0013] Each branching element 12a, 12b, includes a body made from insulating material and which has a projecting section 14a, 14b, which is also made from insulating material and by which the branching element 12a, 12b, is designed to laterally engage between the two principal jaws 11a, 11b, in order to define receptacles with said principal jaws, which receptacles are designed for the insertion of the conductors of the feeder cable.

[0014] In the embodiments more specifically shown in figures 1 to 8, there are four such receptacles, numbered 15a-15d, each of which is designed to receive one of the four conductors 16a-16d of a feeder cable, schematically represented by the dotted lines in figure 2.

[0015] This involves, for example, the conductors of a low voltage cable including three phase conductors plus a neutral conductor.

[0016] In practice, these conductors 16a-16d form, in this case, viewed in a transversal direction, four complementary sectors each forming a quadrant.

[0017] In addition to the body 13a, 13b, each branching element 12a, 12b, also includes a secondary jaw 17a, 17b, made from insulating material and which is distinct from the principal jaws 11a, 11b.

[0018] Each of these secondary jaws 17a, 17b is mounted in a mobile manner onto the body 13a, 13b of the corresponding branching element 12a, 12b, under the control of second clamping means, described in more detail hereafter, in order to define, with this body 13a, 13b, at least one receptacle designed for the insertion of a conductor of the branch cable.

[0019] As there are four conductors 16a-16d of the feeder cable, in the embodiment described and shown, there are also four conductors of the branch cable (refer to numbered references 18a-18d in figure 2) and, consequently, the secondary jaws 17a, 17b form a corresponding number of receptacles 19a-19d with the associated bodies 13a, 13b.

[0020] In order to establish an electrical connection between each conductor 16a-16d of the feeder cable and a conductor 18a-18d of the branch cable connected to the branching elements 12a, 12b, four metal contacts parts 20a-20d are provided for the respective electrical connections.

[0021] As can be seen notably in figure 2, the four contacts parts 20a-20d, identical herein, are each partly superposed on the projecting section 14a, 14b of the branching element 12a, 12b to which it is mounted, with a view, on the one hand, to interfering with a receptacle 15a-15d of the principal conductor of the feeder cable and, on the other hand, interfering by another section, with an adjacent receptacle 19a-19d of the branch cable conductor.

[0022] In the embodiment more specifically shown in figures 1 to 8, the first and second clamping means include, respectively, a first and a second threaded rod 21, 22, assembled in a detachable manner in the form of a cross and on each of which the principal jaws 11a, 11b and the branching elements 12a, 12b are respectively engaged. These first and second clamping means include, in addition, programmed torque limiting nuts 23a, 23b, 24, in this case there are three nuts which are designed to co-operate with the threaded rods 21, 22.

[0023] Furthermore, a vertical separator 25 is provided to co-operate with the branching elements 12a, 12b, as described hereafter.

[0024] As will be seen hereafter, the intervention means designed to elastically bias each principal jaw 11a, 11b and each secondary jaw 17a, 17b toward its respective clamping position on a conductor, are also provided on the branch connector 10 according to the invention.

[0025] In the embodiment more specifically shown in figures 1 to 8, the rod 22, to which the branching elements 12a, 12b are engaged, includes means for passage of the rod 21, in this case being shown in the form of an eyelet 26; figure 3.

[0026] This is, more specifically, a rod 22 made from forged steel, threaded either side of the eyelet, at each free end and along a length which is sufficient for clamping each secondary jaw 17a, 17b with a corresponding nut 23a, 23b. These nuts are identical and each is in the form of a base nut including a control head 27a, 27b connected by a break section 28a, 28b to a base 29a, 29b, which base is extended by a tapped shaft 30a, 30b, for screwing the nut 23a, 23b to one of the ends of the threaded rod 22.

[0027] Each shaft 30a, 30b is terminated by a collar 31a, 31b at its free end for assembly of the nuts 23a, 23b and respective secondary jaws 17a, 17b by positive snap-on connection. It can also be seen that each control head 27a, 27b has a polygon shaped section, which in this case is hexagonal, for activation from outside, whereas it is internally hollow in the extension of the tapped shaft 30a, 30b in order to facilitate its detachment from the assembly formed by the base and the tapped shaft under the effect of a predetermined torque.

[0028] The nut 24 has the same structure as that of nuts 23a, 23b and will not therefore be described in further detail herein. It is, in the same way as these nuts 23a, 23b, herein manufactured from steel.

[0029] In practice it is screwed to the other threaded rod 21 which is in the form of a round head bolt extended with a square 32, figure 3, the function of which will be described hereafter.

[0030] As can also be seen in figure 3, the means of intervention by elastic bias include, for each principal jaw 11a, 11b, a plate 33a, 33b providing a spring function, in other words, a flexible pressure plate, and which is interposed, to this end, between this jaw 11a, 11b, and an adjacent clamping means, which clamping means for jaw

11a, is the nut 24, and, more specifically, its base 29c, and for jaw 11b, is the screw head 21.

[0031] In practice, each of these plates 33a, 33b, in this case manufactured from steel, has a central opening 34a, 34b for passage of the adjacent clamping means which act thereon.

[0032] This central opening 34a, 34b is located at the centre of a removable section 35a, 35b of the plate 33a, 33b, which is generally oblong along the length of the plate and which originates from a stamp of the plate 33a, 33b, in order to apply its spring function to each of these plates 33a, 33b.

[0033] Each of these plates 33a, 33b is also arched along its width so as to co-operate in an optimal manner by pressure against the external convex contour opposite the associated jaw 11a, 11b. The central opening 34b has a square section for cooperating with the square 32 of the screw 21 and thus prevent the rotation of the screw 21. The two plates 33a, 33b are identical, except for the central opening 34a, provided to allow the nut 24 to pass.

[0034] It can also be seen that the collar 31c at the free end of the tapped shaft 30c of the nut 24 allows positive snap-on connection of this nut 24 and of the body of the jaw 11a by means of cooperating shapes (not visible in the drawings), with the advantage of pre-assembly of the parts and, consequently, easier final assembly. As previously mentioned, the same applies to the collars 31a, 31b of the nuts 23a, 23b, which collars are designed to co-operate with the annular projections 36a, 36b each forming a snap-on notch in a corresponding shaft 37a, 37b of each secondary jaw 17a, 17b. This shaft 37a, 37b internally extends, in practice, the central opening which is arranged in the body of each secondary jaw 17a, 17b for passage of the associated nut 23a, 23b.

[0035] Similarly, in order to couple each principal jaw 11a, 11b to the round head screw 21, a tapered ring 38a, 38b, taken from a mould of material with the body of the jaw 11a, 11b extends axially in the central bore 39a, 39b of each jaw receiving the clamping means (screw and/or nut) in order to co-operate by press-fitting with this screw.

[0036] Furthermore, the means of intervention by elastic bias include, for each secondary jaw 17a, 17b a plate 40a, 40b also performing a spring function and which is interposed, to this end, between the jaw 17a, 17b and an adjacent clamping means, that is nut 23a or nut 23b and, more specifically, the base 29a, 29b of each nut.

[0037] In order to complete its spring function, each of these plates 40a, 40b is also slightly arched in an idle state.

[0038] It should be noted in this respect that the secondary jaws 17a, 17b are shown in figures 1 and 2, during clamping, whereas the principal jaws 11a, 11b are shown in the maximum clamping position, the position in which the principal jaws penetrate a section at their level, in the space formed between the branching elements 12a, 12b, the threaded rods 21, 22, respectively receiving the principal jaws 11a, 11b and the branching elements 12a, 12b form, to this end, a right angle.

[0039] It can also be seen that each plate 40a, 40b associated with a secondary jaw 17a, 17b is housed in a cover 41a, 41b arranged on the back of said plate, the flat base of the cover forming a bearing surface for the plate. Each of these plates 40a, 40b also has a central opening 42a, 42b for the passage of the associated nut 23a, 23b and may be coupled to its jaw using a captive link (not shown on the figures).

[0040] In order to be able to perform clamping in an optimal manner, both the principal jaws 11a, 11b and the secondary jaws 17a, 17b are each provided, for each conductor, with sharp-edged curved blades, which, in practice, in the case of the embodiment shown in figures 1 to 9, involves four parallel rows 43a, 43b per principal jaw 11a, 11b and four parallel rows 44a, 44b per secondary jaw 17a, 17b (on opposite sides of the shaft 37a, 37b).

[0041] These blades are designed to perforate the insulation of these conductors in order to prevent any progressive loosening associated with creep in the material.

[0042] Opposite these blades each contact part 20a - 20d has, figure 4, in a single piece, a base 45 extended by two tabs 46 extending square relative to this base 45, at the longitudinal ends thereof, by being symmetrically disposed relative to a median plane of the part. Each of these tabs 46 includes, on the sides opposite the part, teeth 47, 48 for perforating the insulation of the conductor for which it is designed to establish an electrical connection.

[0043] These teeth 47, 48 for perforating the insulation respectively interfere, to this end, with the receiving receptacles of the corresponding conductors 15a-15d and 19a-19d.

[0044] More specifically, each tab 46 is provided with two parallel rows 47 of three perforation teeth extending along the longitudinal edges of each tab 46, whereas the base is provided, in the extension of each tab 46, with a row 48 of four teeth forming a cradle for the conductor of the branch cable with which the tab is designed to co-operate, that is, a row 48 at each longitudinal end of the base 45.

[0045] In order to prevent any contact with an element under voltage, in this case each contact part 20a-20d, blocks made from insulating material 49a, 49b are housed in the receiving receptacles 19a-19d of the conductors of the branching elements 12a, 12b in order to cover the perforation teeth, the selected insulating material being foam so as to be able to be perforated by these teeth under the clamping effect of the corresponding secondary jaw 17a, 17b (see figure 1, this is the only figure which shows these blocks for the sake of clarity).

[0046] As can be seen notably in figure 5, with regard to the projecting section 14a, 14b of the body of each branching element 12a, 12b, each contact part 20a-20d is housed in a hollow 49 which is arranged in this projecting section, the contact part 20a-20d and the hollow 49 having complementary forms by which each contact part 20a-20d is retained on its branching element 12a, 12b. In this case this is, for each tab 46 of the contact

part 20a-20d, a hole 50 arranged therein (see figure 4) and which is designed to be engaged on a stud of material 51 projecting from the base of the hollow 49 receiving the tab and two lugs 52 with an oblique abutment surface, opposite each other in each hollow 49, so as to laterally tighten on each tab 46. The studs, as well as the lugs, are made from a single piece with the branching element 12a, 12b from a mould of plastic material.

[0047] The plastic material which constitutes the principal jaws 11a, 11b of the branching elements 12a, 12b and the vertical separator 25 is, in this instance, made from 6.6 polyamide loaded with glass fibres.

[0048] Each body 13a, 13b, and branching element 12a, 12b further includes, in order to define with the secondary jaw 17a, 17b associated with the receiving receptacles 19a-19d of the conductors of the branch cables, a plate 53a, 53b from which projects, on one side, the projecting section 14a, 14b, having the section of the contact part designed to co-operate with a conductor of the feeder cable and, on the opposite side, two walls 54a, 54b extending along the longitudinal edges of the plate 53a, 53b and which are connected together, at a longitudinal end, by a transverse flange 55a, 55b.

[0049] At the opposite longitudinal end a guide tab 56a, 56b projects from the plate 53a, 53b and extends parallel to these longitudinal walls 54a, 54b at half distance from each of these walls, and connects to each of them by a cradle 57a, 57b for the conductor designed to be inserted in the receptacle 19a-19d that is formed by the longitudinal wall 54a, 54b, the transverse flange 55a, 55b, the plate 53a, 53b and the tab 56a, 56b, each cradle 57a, 57b being generally located in alignment with the two cradles formed in the teeth 48 for perforating the contact part 20a-20d.

[0050] This guide tab 56a, 56b is chamfered to form a sliding guide rail for the associated secondary jaw 17a, 17b which includes, to this end, an additional rib 58 projecting from the base of a cut 59 arranged in the secondary jaw 17a, 17b on each side thereof.

[0051] Each transverse flange 55a, 55b has, similarly, a rail 60a, 60b for guiding the opposing rib 58a, 58b of the secondary jaw 17a, 17b, and which also forms, by projecting on the internal surface of this flange, a section of a cradle 61a-61d in addition to those formed by the contact part 20a-20d and the tab 56a, 56b with the longitudinal walls 54a, 54b.

[0052] It can also be seen, in figures 5 and 6, that the plate has, on either side of the projecting section, four parallelepiped openings 62 per branching element 12a, 12b, for the passage of each of the tabs 46 of the contact parts 20a-20d, which parts are placed against the plate 53a, 53b by the base 45.

[0053] The branching elements 12a, 12b also have a central bore 63a, 63b traversing, from one end to the other, the projecting section 14a, 14b and the plate 53a, 53b and exiting at one of its ends in a well 64a, 64b projecting from the internal surface of the plate 53a, 53b and, at its opposite end, in a flared end section 65a, 65b.

[0054] A rib (not shown on the figures) also projects from the internal surface of each plate 53a, 53b either side of each well 64a, 64b. It extends parallel to the longitudinal walls 54a, 54b in order to form an abutment surface for the base 45 of each contact part 20a-20d.

[0055] In the embodiment shown in figures 1 to 8, each branching element 12a, 12b is mounted for free rotation on the associated threaded rod 22 and includes two bosses 66 which project from the projecting section 14a, 14b.

[0056] The vertical separator, which in this case is in the shape of a wedge, includes, in an additional manner, according to figures 7 and 8, a recess 67 for engaging a boss 66 on each of the two opposing branching elements 12a, 12b.

[0057] As can be seen in figure 8, each of these recesses 67 is configured so as to limit the rotation of the branching element 12a, 12b, preferably by 10° either side of a horizontal plane.

[0058] The vertical separator 25 also has a general configuration in the shape of an H, the ends of the lateral branches of which penetrate, during assembly of the branch connector, the recesses arranged in the principal jaws 11a, 11b, one of which can be seen in figure 1 and is identified by reference 68.

[0059] The longitudinal body of the vertical separator 25 which forms this H-shape also extends, viewed in a transversal direction, toward its free ends, as can be seen in figure 7, in order to engage in an optimal manner between the conductors of the feeder cable.

[0060] Its median section which connects the lateral branches of the H-shape is formed by two parallel spacers 69, from each of which projects a well 70 which extends toward the opposite well.

[0061] These wells 70 are designed for the passage of the threaded rod 21, whereas the free space between them allows the passage of the threaded rod 22 and, more specifically, its eyelet 26.

[0062] The branch connector 10 thus produced may be installed, in general, by implementing the following steps:

1. Removing the outer sheath from the feeder cable;
2. Separating the conductors of the feeder cable 16a-16d in a first direction and inserting the vertical separator 25 from below, between these conductors;
3. Separating the conductors of the feeder cable 16a-16d in the other direction with a spacer tool on each side;
4. Inserting a branching element 12a, 12b from the side, with the threaded rod 22 between the conductors of the feeder cable;
5. Inserting the other branching element 12a, 12b from the side between the conductors of the feeder cable;
6. Inserting the lower pressure plate 33b and the threaded rod 21 and the principal lower jaw 11b from below through the conductors of the feeder cable and the eyelet 26 of the threaded rod 22;

7. Installing the upper pressure plate 33a with the principal jaw 11a on the threaded rod 21 and clamping the connector to the feeder cable by means of the nut 24, until its control head is broken;
8. Removing a secondary jaw 17a, 17b with its pressure plate 40a, 40b in order to install two connectors 18a-18d of the branch cable and subsequently reinstalling this jaw and its pressure plate and lightly hand tightening by means of a nut 27a, 27b;
9. Following the same installation process with the other branching element 12a, 12b;
10. Tightening the nuts 27a, 27b until their control heads are broken.

[0063] This type of branch connector 10 notably has the following advantages:

1. Ease of installation due to a minimum number of nuts to be clamped, these nuts also being easily accessible for tightening (no concealed tightening);
2. The total number of parts is reduced to a minimum, which parts are advantageously preassembled by means of the couplings described above;
3. Most of the parts are identical due to the symmetry of the branch connector, the advantage of which is a reduction in the manufacturing costs;
4. The optimal contact of the contact parts with the conductors of the feeder cable due to the insert between them and the possible rotation of the branching element allowing them to follow the incline relative to the horizontal of the one or more associated conductors;
5. Balanced clamping due to the assembly of the principal jaws and the branching elements on two threaded rods assembled in the shape of a cross;
6. Compliance with the "IP2X" safety standards, even when installing the branch connector in the first instance onto the principal conductor, as shown above.

[0064] In summary, the branch connector according to the invention is both easy and quick to install, cheap to manufacture and is safe for the installer.

[0065] Of course, the present invention is not limited to the form of an embodiment described and shown, but encapsulates all variants for completion and/or combinations of their miscellaneous elements.

[0066] In particular, the threaded rod 22 provided with an eyelet 26 may be replaced by two screws each associated with a nut, as shown in figure 9. This shows this type of screw 122 designed to co-operate with a branching element 112, similar to those previously described, that is, which is notably designed to house two contact

parts 120a and 120b and to co-operate with a secondary jaw 117. A nut 127 is also provided to co-operate by clamping with the screw 122.

[0067] As a variant, this screw 122 may be arranged to co-operate via its head with the jaw 117, whereas the nut 127 will be arranged on the plate side of the branching element 112, for example, in the form of a captive nut.

[0068] The vertical arrangement of this type of screw may also be envisaged by implementing jaws arranged either side of a central plate receiving the contact parts and against which each of the jaws will be clamped using the screw and nut associated therewith.

[0069] In other words, the screw and its nut will be arranged, according to this embodiment, perpendicular to the arrangement which it occupies in figure 9.

[0070] Furthermore, each contact part will be produced, according to this embodiment, without right angles. The contact part will be simply constituted by a strip of metal provided with perforating teeth at both of its longitudinal ends.

[0071] In a further embodiment, the rod with the eyelet may have the form of two parts cooperating with each other in the same way as a forked assembly.

[0072] Contact parts may also be envisaged which have perforating teeth which are of different heights, or even asymmetric jaws for receiving conductors with different sections.

[0073] If a three sector cable is used, for example, provision may also be made for blocking one of the receptacles.

[0074] In addition, the means of intervention may also have the form of spring washers.

Claims

1. A branch connector (10) for connecting each of the conductors of a feeder cable to each of the conductors of a branch cable, including two jaws (11a, 11b) made from insulating material, designed for placing the connector onto the feeder cable and connected together by translation using clamping means (21, 24) designed for clamping said jaws onto the conductors of the feeder cable, and several branching elements (12a, 12b) designed for connecting the conductors of the feeder cable to the conductors of the branch cable, **characterised in that** each branching element includes a body, made from insulating material, which has a projecting section (14a, 14b), which section is also made from insulating material, and by which the branching element is designed to engage laterally between the two jaws (11a, 11b) in order to define a receptacle (15a, 15d) with each of the adjacent jaws, which receptacle is designed for the insertion of a conductor (16a - 16d) of the feeder cable, and a metal contact part (20a - 20d) per receptacle which is partly superposed on said projecting section, and is designed for estab-

lishing an electrical connection between this conductor of the feeder cable and a conductor (18a - 18d) of the branch cable connected to the branching element.

2. The branch connector according to claim 1, **characterised in that** each branching element includes a secondary jaw (17a, 17b) also made from insulating material, which jaw is mounted in a mobile manner to the body by means of second clamping means (22, 27a, 27b) and defines with this body at least one receptacle (19a - 19d) designed for the insertion of a conductor of the branch cable.
3. The branch connector according to claim 2, **characterised in that** the first and second clamping means respectively include a first and a second threaded rod (21, 22) assembled in a detachable manner in a cross wise layout and **in that** the principal jaws and the branching elements are respectively engaged with each of said first and second threaded rods.
4. The branch connector according to claim 3, **characterised in that** one of the threaded rods includes a means of passage (26) for the other rod for assembly, preferably that of the branching elements.
5. The branch connector according to claim 4, **characterised in that** the means of passage is an eyelet.
6. The branch connector according to claims 4 or 5, **characterised in that** the other rod is in the form of a bolt.
7. The branch connector according to any one of claims 3 to 6, **characterised in that** the first and second clamping means include programmed torque limiting nuts (24, 27a, 27b), designed to co-operate with the threaded rods.
8. The branch connector according to any one of claims 3 to 7, **characterised in that** it further includes a vertical separator (25) provided with means forming a passage for each of the threaded rods.
9. The branch connector according to claim 8, **characterised in that** the separator has the general form of a wedge.
10. The branch connector according to claims 8 or 9, **characterised in that** the separator includes a longitudinal body tapering, viewed in a transversal direction, toward its free ends.
11. The branch connector according to any one of claims 8 to 10, **characterised in that** each branching element is mounted for free rotation on the associated threaded rod and has a projection with at least one

boss (66) and the vertical separator has a recess (67) for engagement of an associated boss, configured so as to limit the rotation of the branching element, preferably by 10° either side of a horizontal plane.

12. The branch connector according to any one of claims 1 to 11, **characterised in that** there are two branching elements, each generally oriented at a right angle relative to the principal jaws.
13. The branch connector according to any one of claims 2 to 12, **characterised in that** each branching element defines, with its associated secondary jaw, two receptacles, each of which is designed for the insertion of a conductor of the branch cable, and **in that** it defines a receptacle with each of the principal jaws designed for the insertion of a conductor of the feeder cable and, consequently, includes two metal contact parts each interfering with a receptacle of the branching element and an adjacent receptacle for the conductor of the feeder cable.
14. The branch connector according to any one of claims 1 to 13, **characterised in that** each branching element includes a plate (53a, 53b) from which project, on one side, two parallel walls (54a, 54b) which together delimit two receptacles for the insertion of the conductors of the branch cable and, on the opposite side, a projecting section (14a, 14b) holding the section of the one or more contact parts designed to co-operate with a conductor of the feeder cable, the plate being open for the passage of each contact part with a view to allowing said part to interfere with an associated receptacle for the insertion of a branch conductor via another section.
15. The branch connector according to any one of claims 1 to 14, **characterised in that** each contact part has, as a single piece, a base (45) extended by at least one tab (46) extending square relative to the base, both of which are preferably symmetrically disposed relative to a median plane of the part and the base, as well as the or each tab including, on the sides opposite the parts, teeth (47, 48) for perforating the insulation of the conductor.
16. The branch connector according to claim 15, **characterised in that** it includes at least one block (49a, 49b) made from insulating material designed to cover the perforation teeth of the one or more conductors of the branch cable and to be perforated by said perforation teeth by the clamping force of the secondary jaw.
17. The branch connector according to any one of claims 2 to 16, **characterised in that** it includes means of intervention (33a, 33b, 40a, 40b) designed to elas-

tically bias each principal jaw toward its position for clamping a feeder cable conductor or each secondary jaw toward its position for clamping a conductor of the branch cable, or even both.

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18. The branch connector according to claim 17, **characterised in that** the means of intervention by elastic bias include, for each jaw, a plate performing a spring function, which plate is perforated for passage of the clamping means associated with this jaw and which is interposed between this jaw and the adjacent clamping means acting thereon. 10
19. The branch connector according to any one of claims 1 to 18, **characterised in that**, with regard to the projecting section of the body of the branching element, the contact part or each contact part is embedded in a hollow (49) therein, the contact part and the hollow having complementary shapes by which the contact part is retained on the branching element. 15 20
20. The branch connector according to anyone of claims 2 to 19, **characterised in that** it includes means (31a - 31c, 38a, 38b) of coupling the first and second clamping means to their respective jaws, preferably by a positive snap on connection and/or press fitting. 25

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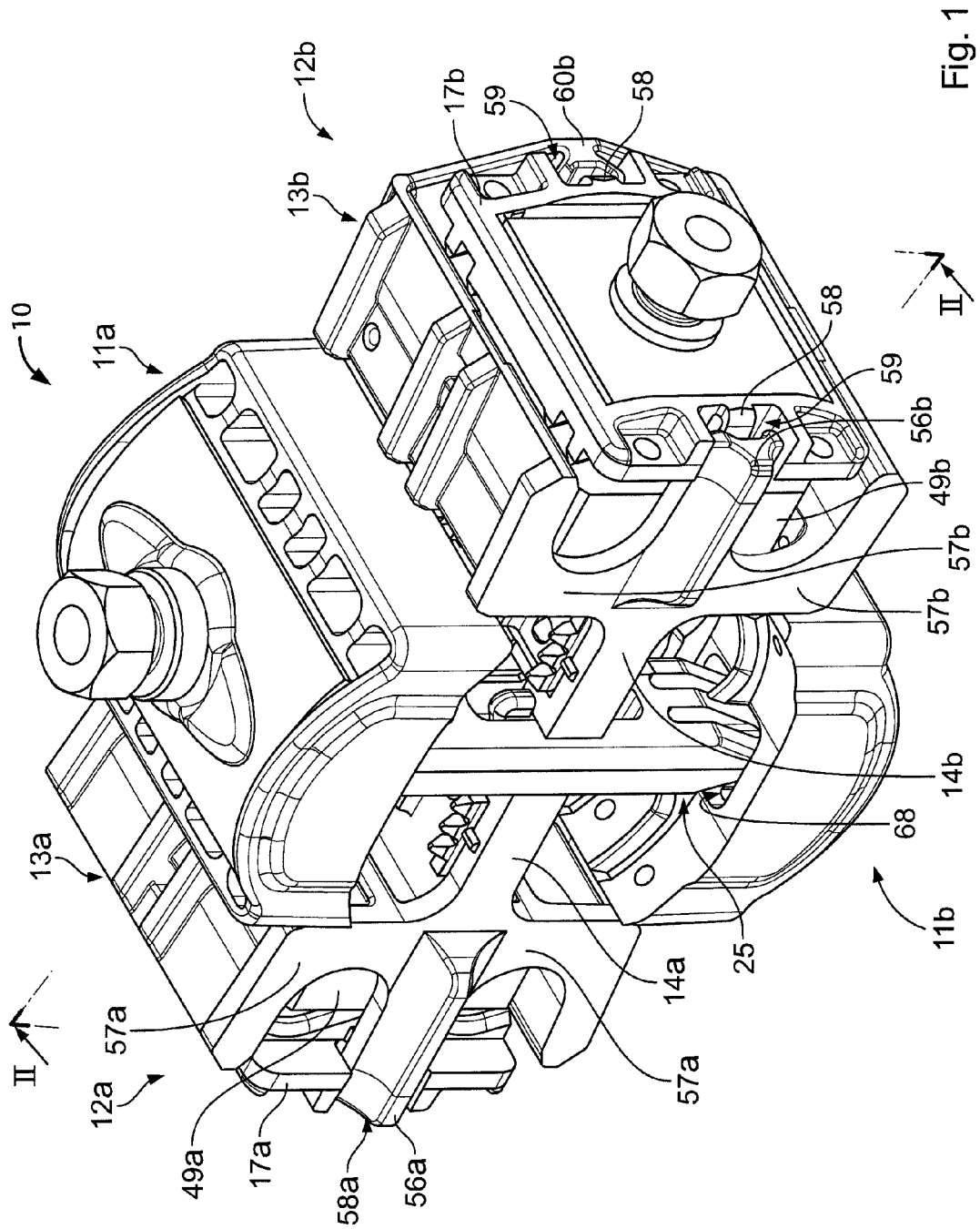


Fig. 1

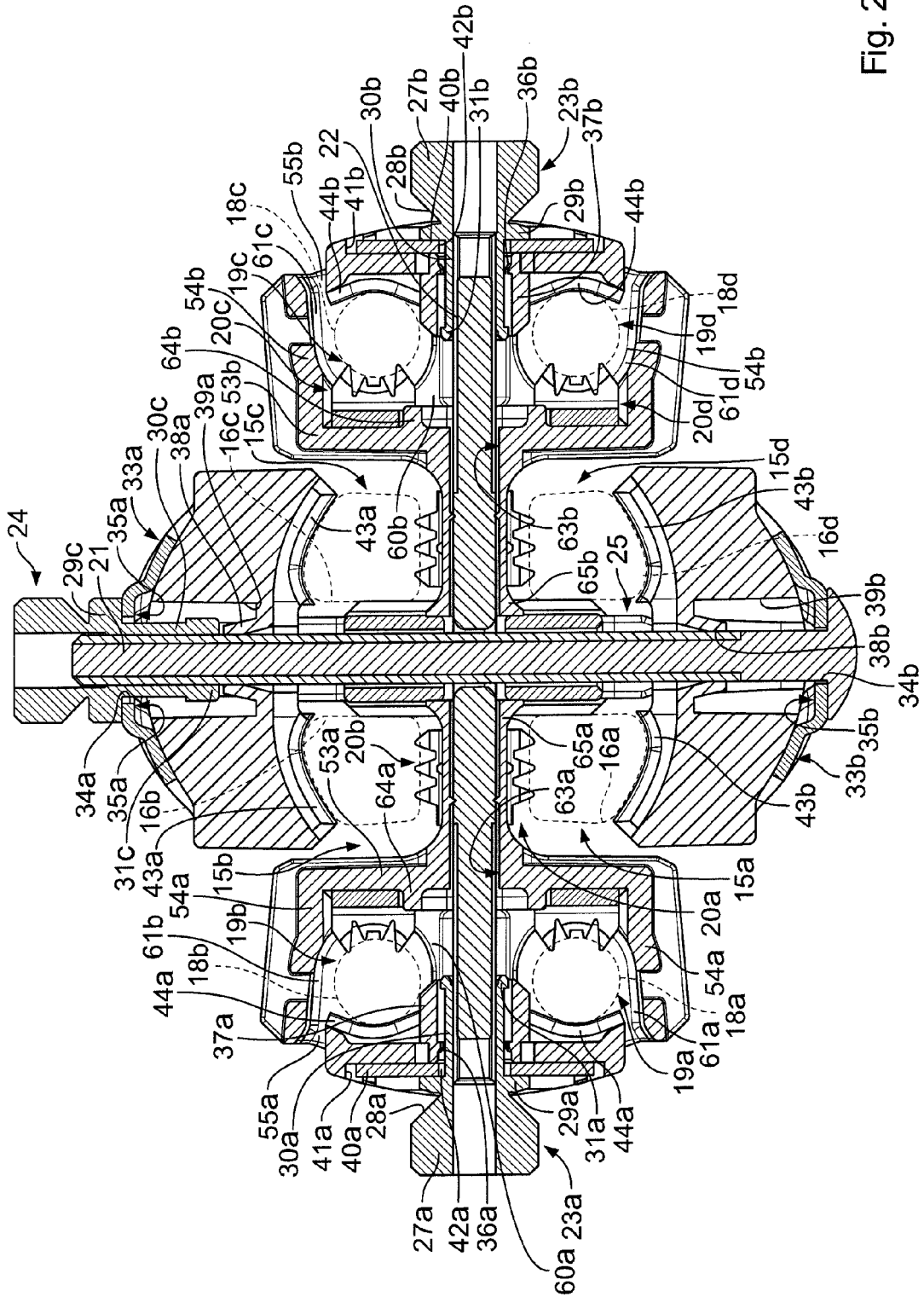


Fig. 2

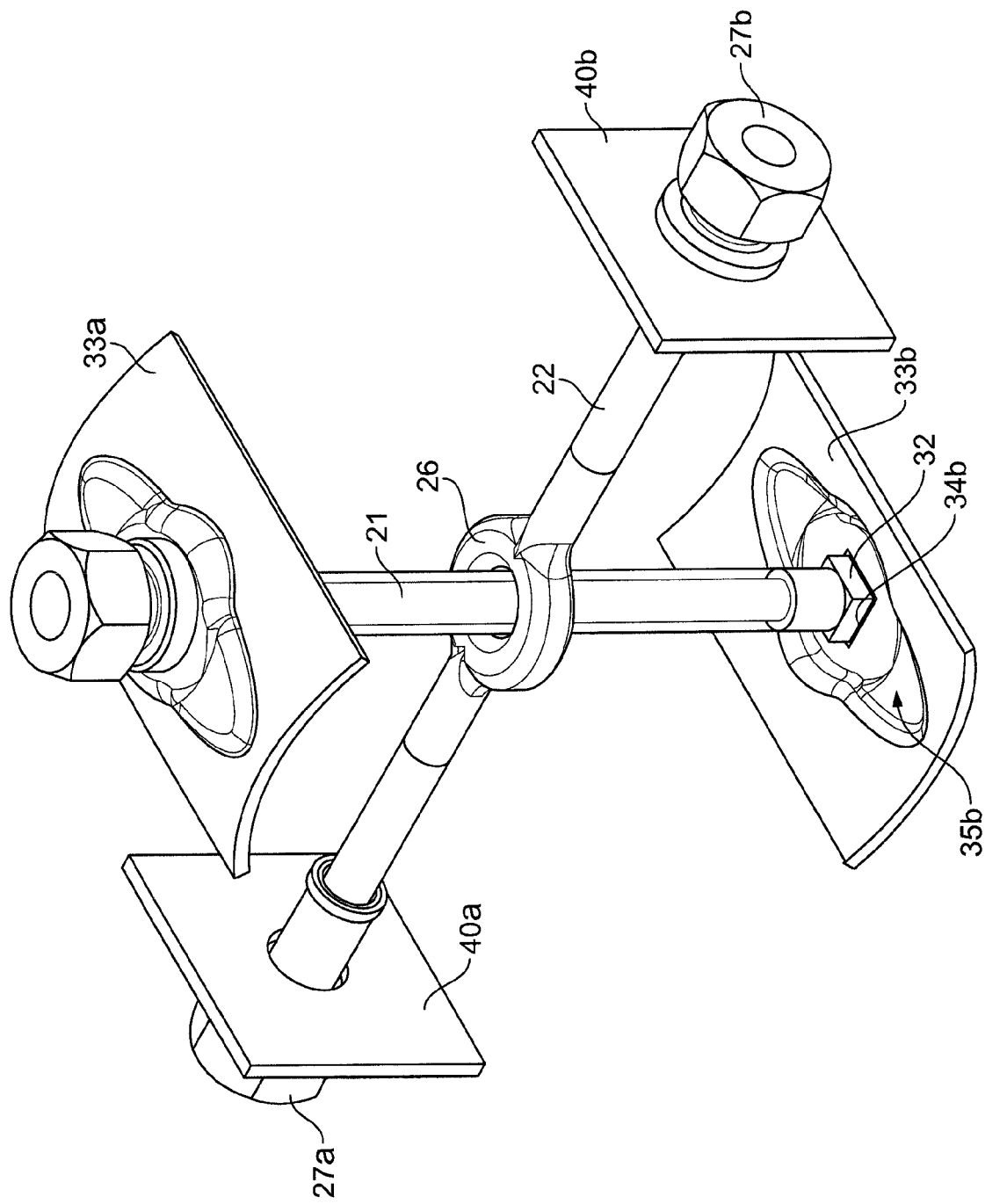


Fig. 3

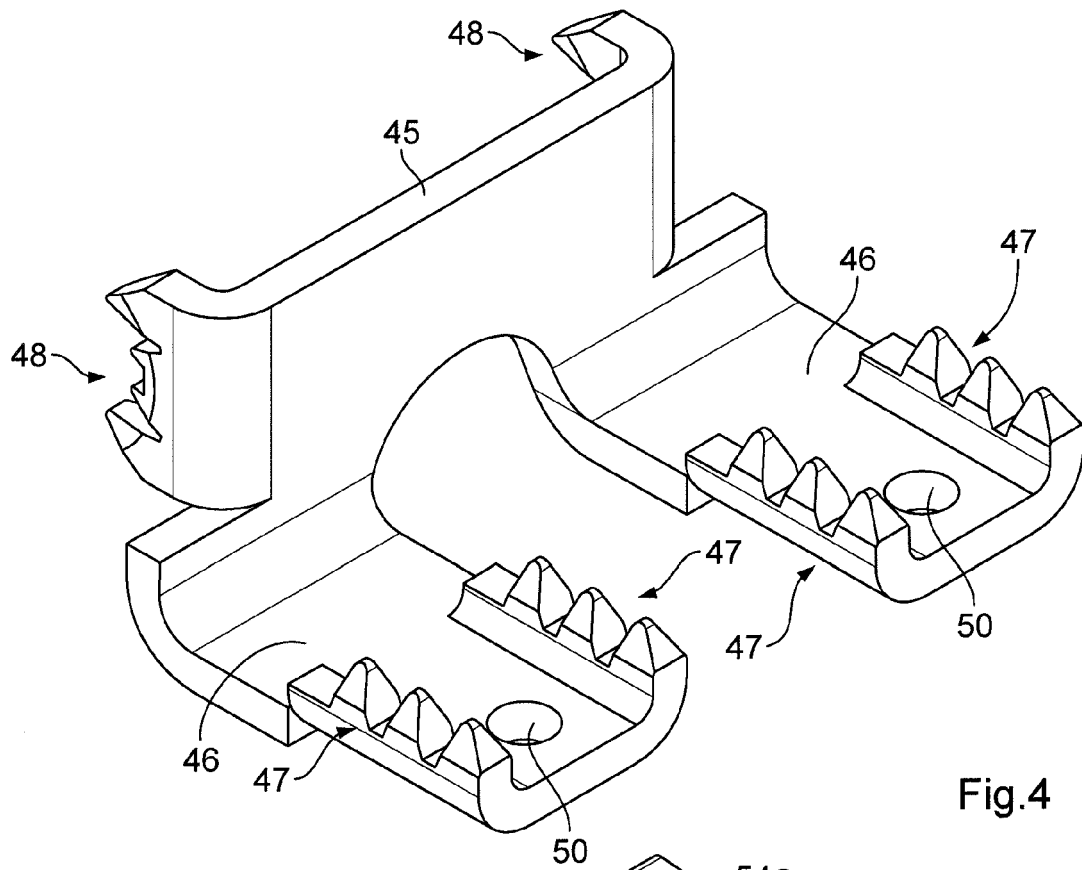


Fig. 4

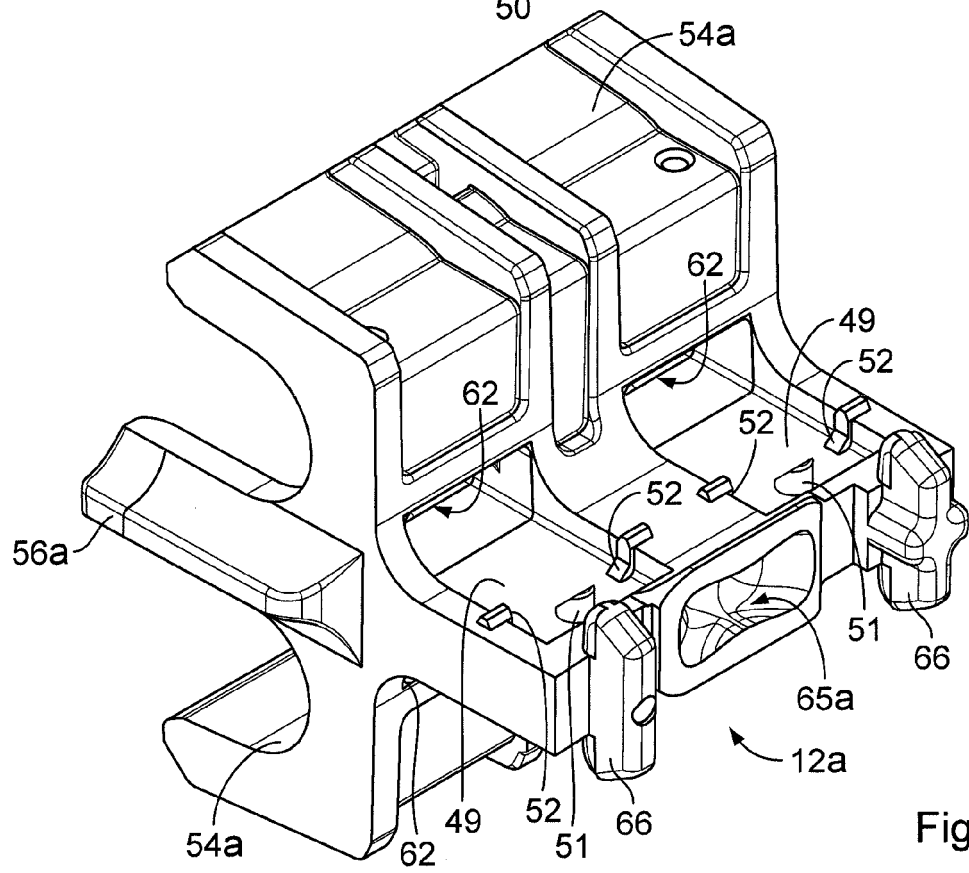


Fig. 5

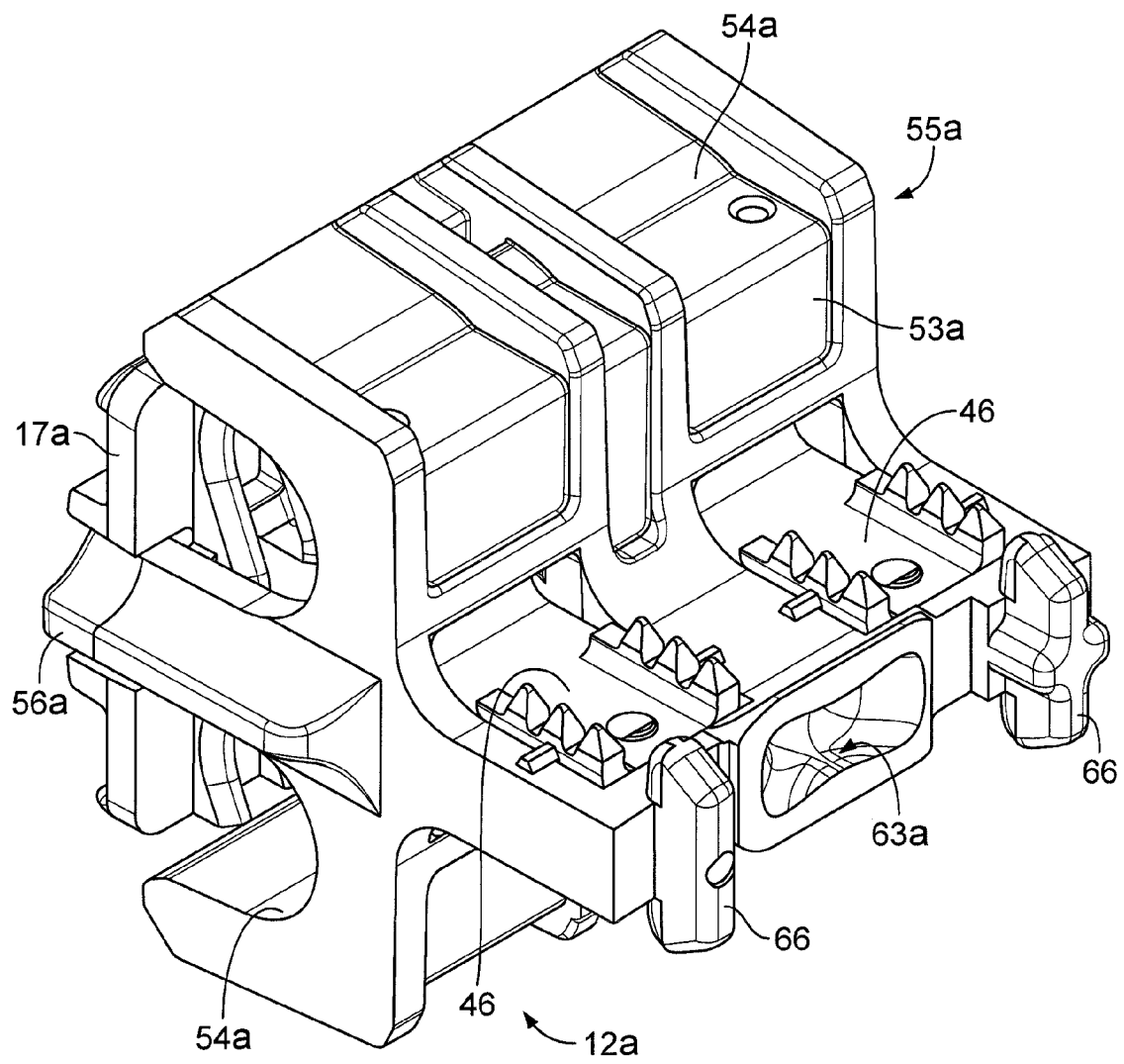


Fig.6

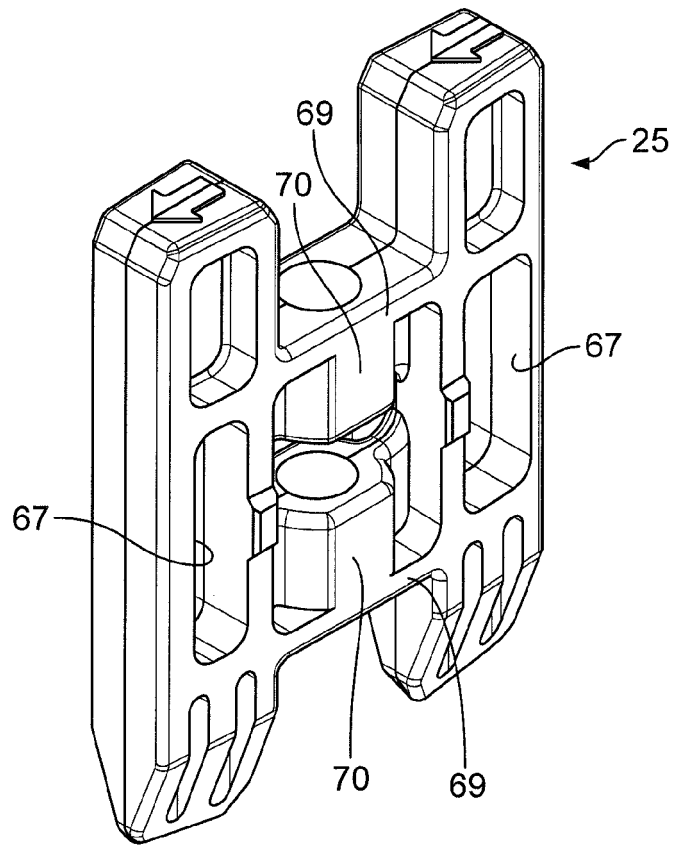


Fig.7

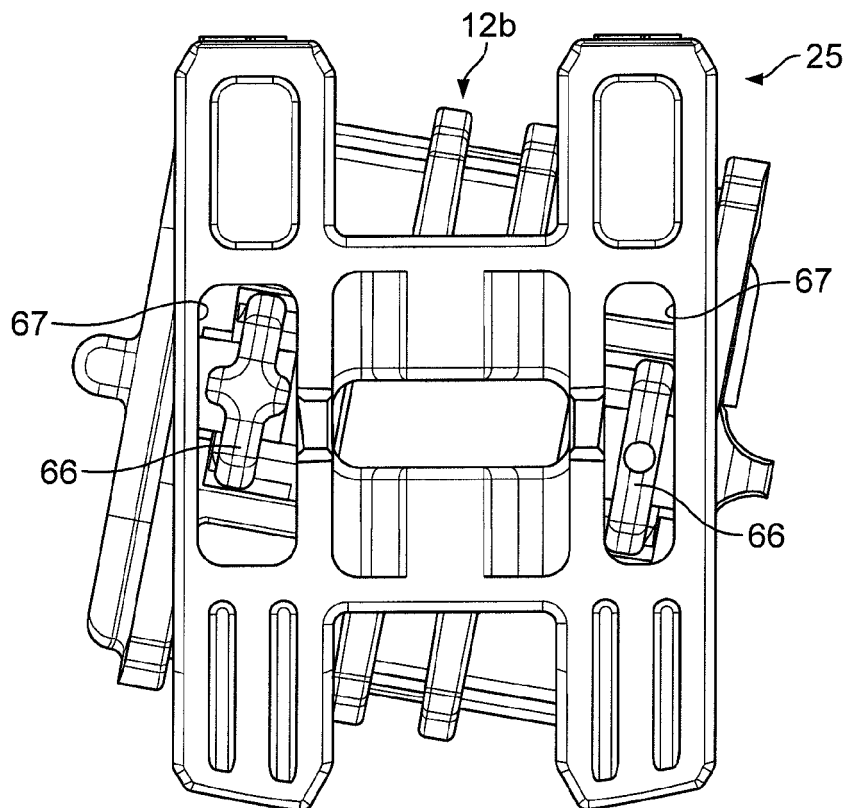


Fig.8

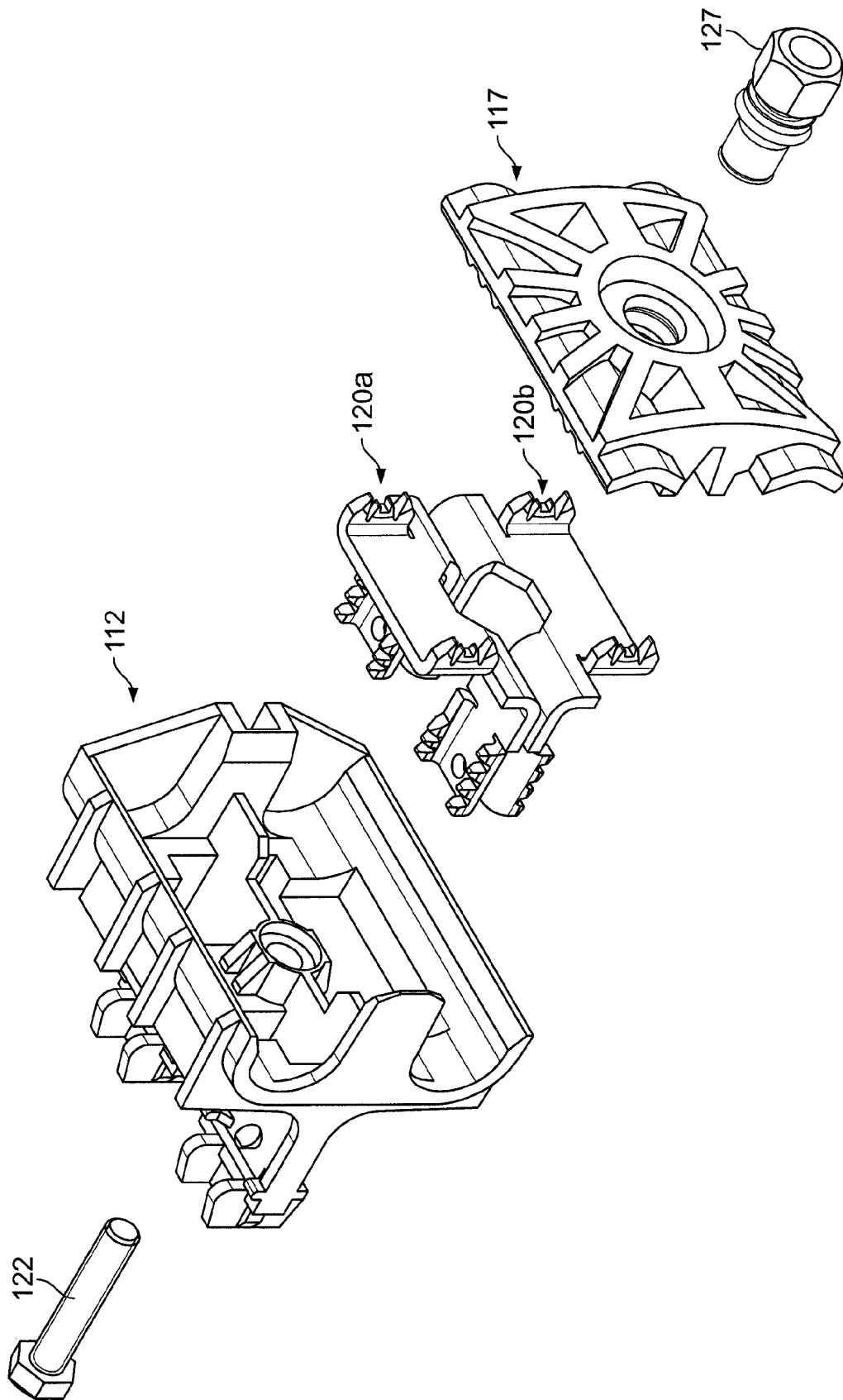


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 11 15 5610

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A	EP 1 691 449 A2 (PFISTERER KONTAKTSYST GMBH [DE]) 16 August 2006 (2006-08-16) * abstract * * paragraph [0022] - paragraph [0043]; figures 1-3,5,6 *	1-20	
A	EP 1 885 025 A2 (PFISTERER KONTAKTSYST GMBH [DE]) 6 February 2008 (2008-02-06) * abstract * * paragraph [0034] - paragraph [0039]; figures 1-2 *	1-20	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 June 2011	Examiner Warneck, Nicolas
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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06-06-2011

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