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(54) **Terminal board for the electrical interconnection of electrical cables**

(57) A terminal board for the electrical interconnection of electrical conductors (K), comprising a body (2) of electrically insulating material inside which tubular electrical connectors (3) are housed, electrically insulated from one another and configured so as to define open tubular elements and equipped with clamping screws (4). Advantageously, the body (2) is divided into two articu-

lated portions (9,10) articulated together through hinged connection means (6) to allow such a body (2) to pass from an extended configuration to an overlapped configuration in which said articulated portions (9,10) are substantially side-by-side extending on from one another and, respectively, are brought together overlapped one another.

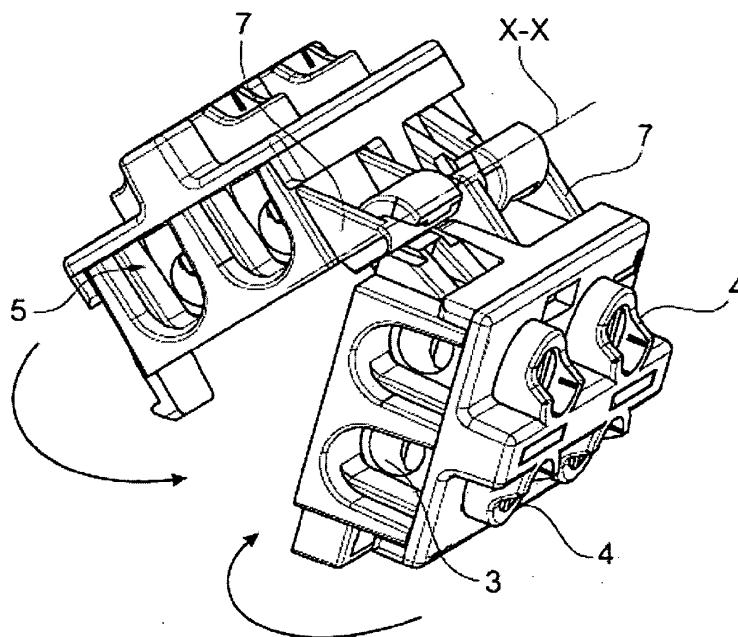


Fig. 3

Description

[0001] The present invention refers to a terminal board for the electrical interconnection of electrical conductors in accordance with the preamble of claim 1.

[0002] In electrical wiring it is known to use terminal boards, for example of the type known as mammoth, if it is necessary to electrically interconnect the ends of different electrical conductors.

[0003] Specifically there are multi-way terminal boards, for example three-way or four-way, should it be necessary to independently and selectively electrically interconnect the top ends of a first plurality of electrical conductors with the top ends of a second corresponding plurality of electrical conductors, thus having two, three or multi-way terminal boards.

[0004] Generally, electrical connectors are equipped with clamping means, for example using a screw, suitable for engaging the top end of the electrical conductors inserted in the electrical connectors themselves, ensuring that they do not come off.

[0005] In the case in which it is required to respect stringent technical insulation requirements, for example for use in the presence of sprays, the aforementioned terminal boards are housed inside containing cases that are assigned the task of ensuring the necessary degree of protection and/or insulation.

[0006] In addition to the characteristics of:

- good electrical conductivity between the top ends of the interconnected electrical conductors and
- good crimping/clamping of the top ends of the interconnected electrical conductors in order to avoid undesired accidental detachments,

the requirement that the aforementioned terminal boards must satisfy is to have a low bulk still with the possibility of connecting a certain number of pairs of electrical conductors.

[0007] Concerning this, it should be noted how currently in addition to two-way terminals (for example suitable for connecting the wires of the phase and of the neutral) and to three-way terminals (for example suitable for connecting the live, the neutral and the earth wire) there is great demand for multi-way terminal boards, for example four-way or six-way, capable of interconnecting a greater number of pairs of electrical conductors. Purely as an example, it should be noted how a four-way terminal board may be required when in addition to the live, the neutral and the earth line there is a line for a control signal or, as a further example, should it be required to selectively and independently feed two different devices within the same apparatus.

[0008] Terminal boards up to three-way have a linear arrangement in which the electrical connectors of the terminal board are arranged alongside one another, whereas, in order to contain the bulk, in terminal boards with a greater number of ways the electrical connectors are ar-

anged according to a modality that foresees dividing the electrical connectors into two overlapped groups of side-by-side electrical connectors. For example, in the case of a four-way terminal board, there are two overlapped pairs of electrical connectors side-by-side.

[0009] With regard to terminal boards with overlapped electrical connectors, it should be noted how the wiring operation of the various electrical conductors can be difficult since it is necessarily required to operate on the screw clamping means of the terminal board by acting on two opposite sides of the terminal board itself. Such an operation is difficult since very often the reduced space and the limited length of the electrical conductors to be connected do not make it possible to act on two sides of the terminal board and/or to rotate the terminal boards by 180°.

[0010] The requirement to be satisfied is therefore that of having a multi-way terminal board capable of simplifying the wiring operation between the top ends of the different electrical connectors also in conditions of restricted space where the use of tools such as a screwdriver is complicated.

[0011] The problem forming the basis of the present invention is to devise a terminal board for the electrical interconnection of electrical conductors that has structural and functional characteristics such as to satisfy the aforementioned requirement, at the same time avoiding the aforementioned drawbacks with reference to the prior art.

[0012] Such a problem is solved by a terminal board for the electrical interconnection of electrical conductors according to claim 1.

[0013] Further characteristics and advantages of the terminal board for the electrical interconnection of electrical conductors according to the present invention will become clearer from the following description of a preferred example embodiment, given for indicating and not limiting purposes, with reference to the attached figures, in which:

- figure 1 represents a perspective view of a terminal board according to the invention in closed configuration;
- figure 2 represents a perspective view of the terminal board of figure 1 in open configuration with an electrical conductor and the end of a screwdriver illustrated;
- figure 3 represents the terminal board of figure 1 during the passage from open configuration to closed configuration;
- figure 4 represents a perspective view of the terminal board of figure 1 in open configuration;
- figure 5 represents the terminal board of figure 5 seen from below;
- figure 6 represents a plan side view of the terminal board of figure 4 and
- figure 7 represents a flat plan view of the terminal board of figure 7.

[0014] With reference to the attached figures, reference numeral 1 globally indicates a terminal board for the electrical interconnection of electrical conductors K.

[0015] The terminal board 1 comprises a body 2 of electrically insulating material, for example a plastic material, inside which a plurality of electrical connectors 3 of electrically conductive material, for example brass or copper, is housed. The figures illustrate the case of a four-way terminal board, in other words a terminal board equipped with four electrical connectors capable of interconnecting four different pairs of electrical conductors.

[0016] The electrical connectors 3 are housed inside the body 2 in such a way as to be electrically insulated from one another.

[0017] Each electrical connector 3 is arranged to interface and make a firm and stable connection with the ends of the pair of electrical conductor to be connected. In accordance with the preferred embodiment illustrated in the figures, this is obtained thanks to the fact that each connector:

- defines a rectilinear tubular element of predetermined axis Y-Y comprising at least two openings each of which is suitable for allowing the insertion of a top end of an electrical conductor
- comprises clamping means 4 suitable for engaging the top end of an electrical conductor inserted in the electrical connector to hold it in engagement.

[0018] In order to allow the insertion into the openings of the electrical connectors 3 of the electrical conductors from outside the body 2, the latter is equipped with corresponding passages 5 suitable for placing each opening of the electrical connectors 3 in communication with the outside of the body 2.

[0019] With regard to the clamping means 4, it should be noted that they can be of various types, for example screw, clip or jointed.

[0020] In accordance with the embodiment illustrated in the figures, the clamping means 4 are in the form of screw clamping means comprising, for each of the aforementioned openings, a respective screw of conductive material, for example brass, extending transversally to the tubular element defined by the electrical connector. More specifically, the tubular element has a through hole with mother screw thread with which the aforementioned screw is in threaded engagement to insert transversally inside the tubular element to clamp onto the portion of the electrical conductor inserted in the tubular element itself.

[0021] Figure 2 shows a piece K of electrical conductor projecting from a tubular element of a connector 3, whereas the screw of the fastening means 4 of such an electrical connector is engaged by the tip of a screwdriver S to be set in rotation.

[0022] The electrical connectors 3 are housed in the body 2 so as to all be parallel to one another with the opposite open top ends of the tubular elements facing

towards a front side and a rear side of the terminal board 1. At the aforementioned front and rear sides the body 2 there are the aforementioned passages 5.

[0023] With regard to the insulating body 2, it should be noted how it can consist of a casing in which to house the electrical connectors 3 or it can consist of a layer of insulating material moulded over the electrical connectors 3.

[0024] Advantageously, the insulating body 2 of the terminal board 1 is divided into at least two distinct portions that are connected together through hinged connection means 6 so as to be able to articulate one with respect to the other around a predetermined rotation axis X-X.

[0025] In the figure example, the body 2 is divided into two portions 9 and 10 that, thanks to the presence of the hinged connection means 6, allow one to be rotated with respect to the other around the rotation axis X-X, so that the body 2 is able to be closed in a book-like fashion to go from an extended configuration (cf. figures 2 and from 4 to 7) to an overlapped configuration (cf. figure 1) in which the aforementioned articulated portions 9 and 10 are substantially side-by-side extending on from one another and, respectively, they are brought together overlapped one another.

[0026] Figure 3 illustrates the body 2 in an intermediate step of the rotary book-like closing movement (indicated in the figures indicated by the arrows).

[0027] In each of the two articulated portions 9 and 10 it is possible to identify an inner side, 9a and 10a respectively, and an opposite outer side, 9b and 10b respectively, being specified that the inner sides of the two articulated portions 9 and 10 face one another when such articulated portions 9 and 10 are brought together overlapped one another in the aforementioned overlapped configuration of the body 2 (cf. figure 1).

[0028] Advantageously, the electrical connectors 3 are present both in the articulated portion 9 and in the articulated portion 10. In the illustrated embodiment the four-way terminal board 1 has two electrical connectors 3 housed in the articulated portion 9 and two further electrical connectors 10 housed in the articulated portion 10.

[0029] In the illustrated example, the two articulated portions 9 and 10 are identical to one another. Each articulated portion 9, 10 defines a container, in which to house the respective electrical connectors 3, equipped with a bottom (defined by the inner wall, 9a and 10a respectively) and with an opposite open end onto which a respective cover (defined by the inner wall, 9b and 10b respectively) is applied when closing, for example by pressure or by snap-fastening.

[0030] Advantageously, the hinged connection means 6 are connected to the articulated portions 9 and 10 so that the rotation axis X-X is parallel to the axis Y-Y of the tubular element of each electrical connector 3.

[0031] Preferably, the hinged connection means 6 are made in a single piece with the articulated portions 9 and 10, being defined by appendages 7 projecting from the

side of the articulated portions and having the end portion configured so as to define the hinge pin or the pivot of a hinge. More specifically, the articulated portions 9 and 10 comprise opposite matching appendages suitable for engaging with one another since they are configured so as to define the hinge pin and the pivot of a hinge, respectively.

[0032] The two articulated portions 9 and 10 of the body 2 comprise matching engagement means 8 suitable for engaging with one another to keep said two articulated portions joined together in the aforementioned overlapped configuration of the insulating body 2.

[0033] Preferably, the aforementioned matching engagement means 8 are in the form of projections projecting from the side of the articulated portions 9 and 10 opposite the side at which the hinged connection means 6 are positioned.

[0034] Preferably, the aforementioned matching engagement means 8 of the two articulated portions 9 and 10 make a reversible snap engagement with each other suitable for keeping the two articulated portions 9 and 10 of the body 2 joined brought together in the aforementioned closed configuration (cf. figure 1)

[0035] Advantageously, the aforementioned clamping means 4 are positioned so as to be able to be actuated from the same side of said body when said body is in said extended configuration. With particular reference to figure 2, it can be seen how in the illustrated embodiment, the screw of the clamping means 4 associated with the electrical connectors 3 can be actuated with the tip S of the screwdriver by acting from the outer side 9b and 10b of the two articulated portions 9 and 10.

[0036] Advantageously, this makes it possible to act to clamp on the aforementioned clamping means 4 by acting from outside always from the same side of the body 2, without therefore needing to turn the terminal board by 180° to be able to actuate all of the clamping means 4.

[0037] When wiring is complete, in other words after having finished clamping the clamping means 4 of all the electrical connectors 3 into which the free end of an electrical conductor has been introduced, it is sufficient to close the two articulated portions 9 and 10 in a book-like fashion, making them with respect to one another about the axis X-X of the hinged connection means 4 to take the body 2 of the terminal board 1 into the overlapped configuration (cf. figure 1) in which the two articulated portions 9 and 10, instead of being positioned side-by-side, are overlapped one another having the aforementioned inner sides 9a and 10a brought together side-by-side.

[0038] Moreover, when coming into the overlapped configuration of the insulating body 2, the matching engagement means 8 which are brought by the two articulated portions 9 and 10 interact with one another, determining reversible snap-locking of the two articulated portions such as to prevent the insulating body 2 from going back into the aforementioned extended configuration (cf.

figure 2 and from 4 to 7).

[0039] If necessary, by acting with a flat-headed screw-driver or another suitable tool it is in any case possible to release the snap engagement of the aforementioned matching engagement means 8, thus being able to take the body 2 of the terminal board 1 back into the extended configuration.

[0040] As can be appreciated from what has been described, the terminal board for the electrical interconnection of electrical conductors according to the present invention makes it possible to satisfy the aforementioned requirement and at the same time to overcome the drawbacks referred to in the introductory part of the present description with reference to the prior art. Indeed, with the terminal board according to the invention it is possible to carry out the wiring operation of the electrical conductors while it is in the extended configuration, so as to be able to easily act on the clamping means always from the same side of the body of the terminal boards and, once the wiring operation has ended, it is possible to articulate the parts of the body of the terminal board so as to take the body thereof in the overlapped configuration that is less problematic than the extended configuration in terms of the bulk of the terminal board.

[0041] Another advantage of the terminal board according to the invention is the unusual possibility to have structural simplicity thereof.

[0042] Of course, a man skilled in the art, in order to satisfy contingent and specific requirements, can bring numerous modifications and variants to the described above, all of which are in any case covered by the scope of protection of the invention as defined by the following claims.

[0043] Thus, for example, the clamping means or the matching engagement means can also take up a different configuration or can be positioned differently with respect to what has been described above.

Claims

1. Terminal board for the electrical interconnection of electrical conductors, comprising a body (2) of electrically insulating material and a plurality of electrical connectors (3) housed in said body (2) so as to be electrically insulated from one another, wherein:

- each electrical connector (3) of said plurality of electrical connectors (3) comprises at least two openings each suitable for allowing the insertion of a top end of an electrical conductor (K);
- each electrical connector (3) comprises clamping means (4) suitable for engaging the top end of an electrical conductor (K) to hold it engaged in said electrical connector (3) and
- said body (2) comprises passages (5) positioned at the respective openings of each electrical connector (3) of said plurality of electrical

connectors (3), so that the openings of each electrical connector (3) are accessible from outside of said body (2),

characterised in that:

- said body (2) is divided into at least two distinct articulated portions (9,10) connected together through hinged connection means (6) to articulate together around a rotation axis (X-X) and allow said body (2) to pass from an extended configuration to an overlapped configuration in which said articulated portions (9,10) are substantially side-by-side extending on from one another and, respectively, are brought together overlapped one another;

- said articulated portions (9,10) of said body (2) comprise matching engagement means (8) to keep said articulated portions (9,10) joined together in said overlapped configuration and

- each of said articulated portions (9,10) comprises electrical connectors (3) of said plurality of electrical connectors (3).

2. Terminal board according to claim 1, wherein said matching engagement means (8) are matching snap engagement means.

3. Terminal board according to claim 1 or 2, wherein said electrical connectors (3) are housed in said body (2) parallel to one another.

4. Terminal board according to any one of claims 1 to 3, wherein said electrical connectors (3) extend along a predetermined axial direction (Y-Y) and said openings are positioned at the opposite top ends of said electrical connectors (3).

5. Terminal board according to any one of claims 1 to 4, wherein said electrical connectors (3) are tubular elements equipped with open top ends to allow the insertion in the tubular element of the top end of an electrical conductor (K).

6. Terminal board according to any one of claims 1 to 5, wherein said clamping means (4) comprise screw fastening means associated with the respective electrical connectors (3) to clamp on the top end of an electrical conductor inserted in the respective electrical connector (3).

7. Terminal board according to claim 4, wherein said electrical connectors (3) extend along an axial direction (Y-Y) parallel to the hinging axis (X-X) of said hinged connection means (6).

8. Terminal board according to any one of claims 1 to 7, wherein said hinged connection means (6) and said matching engagement means (8) are positioned at respective opposite sides of said body (2) when

said body (2) is in said overlapped configuration.

9. Terminal board according to any one of claims 1 to 7, wherein said clamping means (4) are positioned so as to be able to be actuated from the same side (9b,10b) of said body (2) when said body (2) is in said extended configuration.

10. Terminal board according to claims 5 and 6, wherein:

- said articulated portions (9,10) of said body (2) each comprise an inner side (9a,10a) and an opposite outer side (10a,10b), said inner sides facing one another when said articulated portions (9, 10) are drawn close one another in the overlapped configuration of said body (2) and
- said screwed clamping means (4) extend transversally to the respective tubular element so as to be able to be actuated and accessed from said outer side (10a,10b) of the respective articulated portion (9,10) of said body (2).

11. Terminal board according to any one of claims 1 to 10, wherein said at least two distinct articulated portions (9,10) are the same as each other and are oriented rotated by 180° with respect to one another.

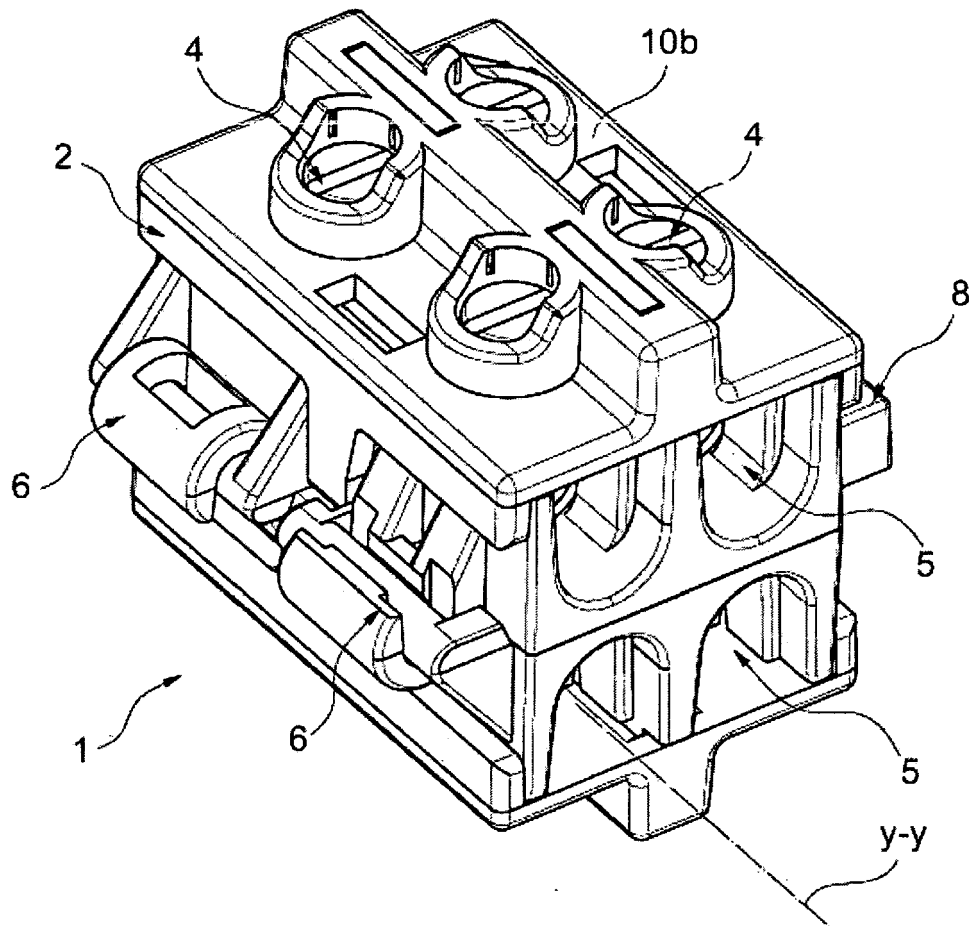
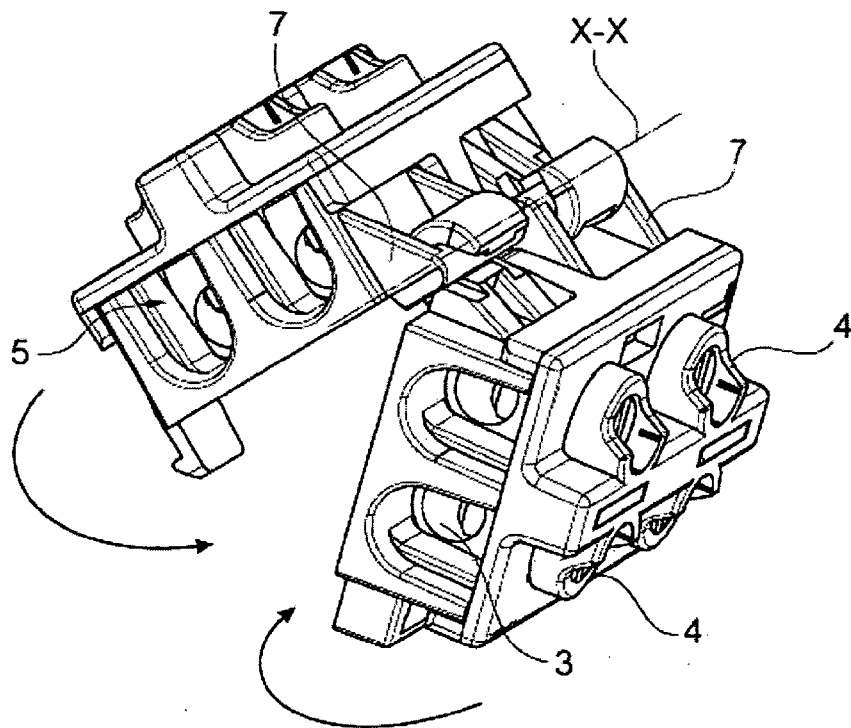
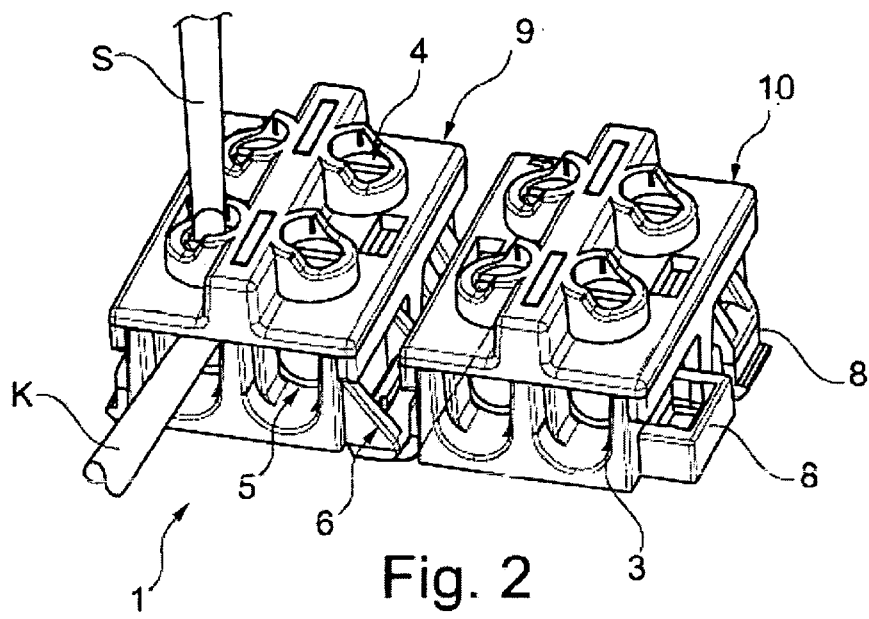
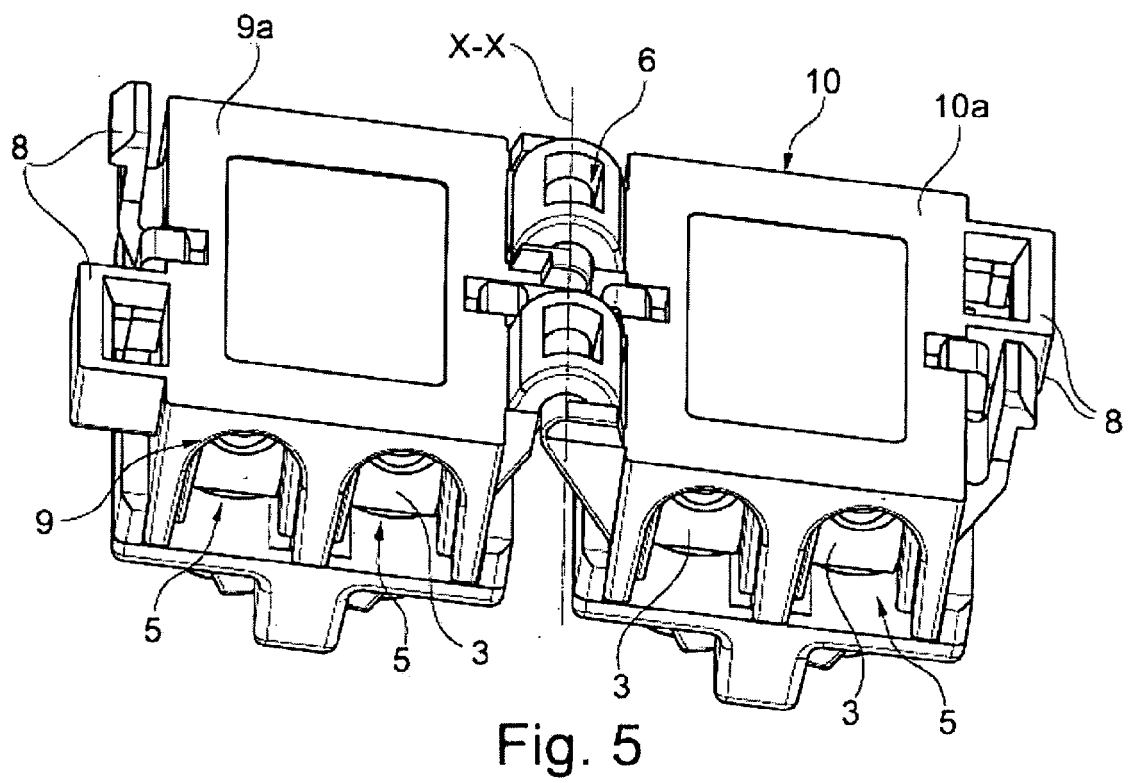
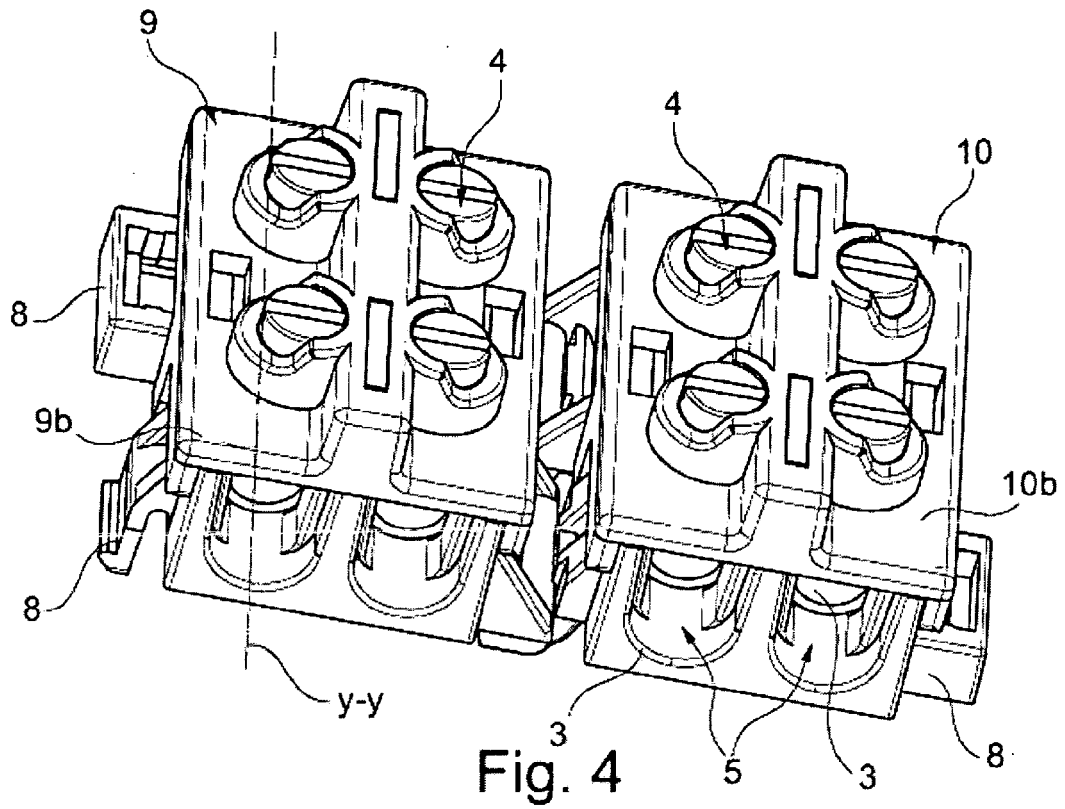


Fig. 1





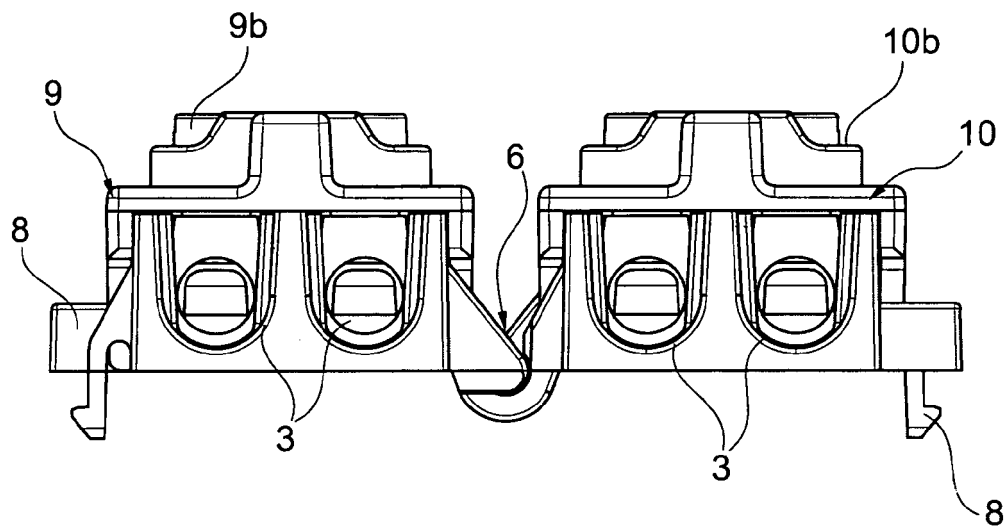


Fig. 6

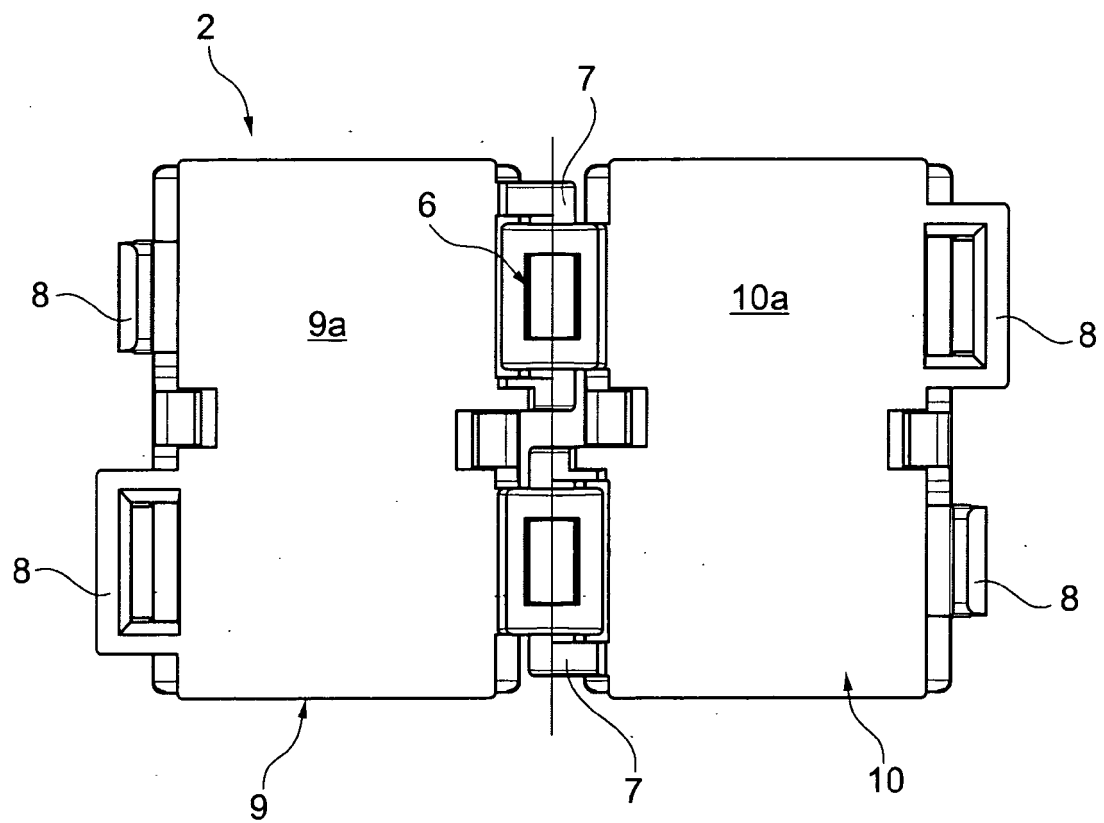


Fig. 7



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Application Number
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Place of search The Hague		Date of completion of the search 14 November 2011	Examiner Hugueny, Bertrand
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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