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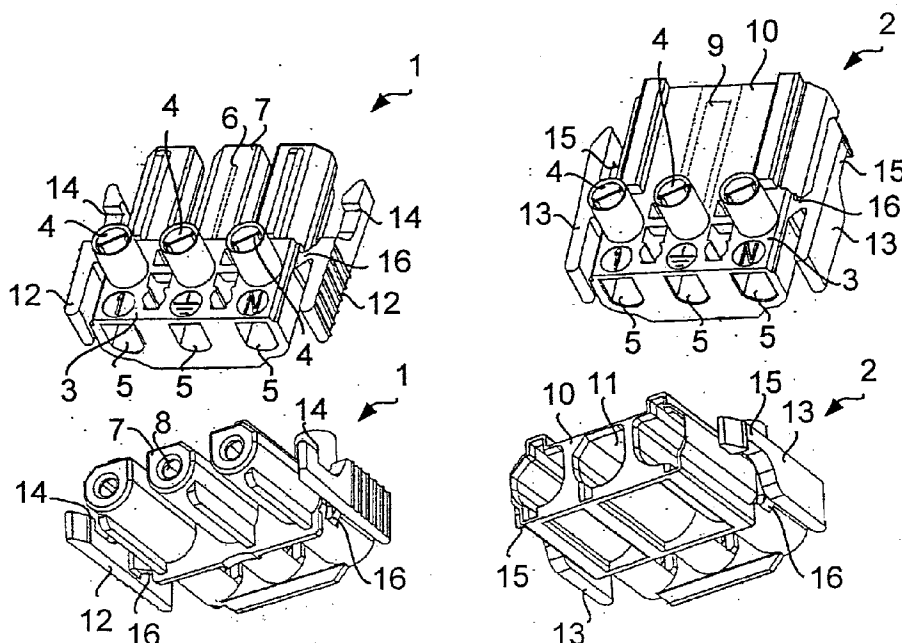
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(54) **Plug-in contact pair, plug-in contact and electric network component**

(57) This invention relates to a plug-in contact pair consists of a male contact (1) and a female contact (2), wherein a first coupling element (6) of the male contact (1) and a second coupling element (9) of the female contact (2) are formed to be each other's counterparts in such a manner that they can be coupled to each other to provide an electric contact between a first and a second electric wires, and wherein the male and the female

contacts are provided with locking means (12 to 16) which lock them together. In order that the interlocking of the plug-in contacts could be unlocked more easily than before, the locking means (12 to 16) of both the male contact and the female contact are formed for unlocking in such a way that a force exerted on the locking means of either one of the plug-in contacts (1, 2) unlocks the interlocking of the male contact and the female contact.

**FIG. 1****EP 0 898 341 A2**

Description

[0001] This invention relates to a plug-in contact pair which consists of a male contact and a female contact, of which the male contact comprises a body with connecting means for receiving at least a first electric wire, and with a first coupling element that is coupled to the connecting means of the male contact, the female contact comprises a body with connecting means for receiving at least a second electric wire, and with a second coupling element that is coupled to the connecting means of the female contact, whereby the first coupling element of the male contact and the second coupling element of the female contact are formed to be each other's counterparts such that they can be coupled to each other to provide an electric contact between the first and the second electric wire, and the male and the female contacts are provided with locking means which lock the male and the female contacts together when the first and the second coupling elements are coupled to each other.

[0002] The invention further relates to a plug-in contact comprising a body with an upper side and a lower side, connecting means arranged in the body to receive at least two electric wires, at least two parallel, elongated coupling elements arranged in the body, the coupling elements being coupled to the connecting means and formed to provide a contact with corresponding coupling elements of a counterpart of the plug-in contact, and which are adjacently positioned with a spacing when the upper side of the plug-in contact is seen from above, and locking means which include at least one elongated element formed with a hooked part in order to lock the plug-in contact with its counterpart when the coupling elements establish a contact with the corresponding coupling elements of the counterpart of the plug-in contact.

[0003] Furthermore, the invention relates to an electric network component with plug-in contacts comprising at least a first male contact and a first female contact, and in which the first male contact comprises connecting means for receiving at least one electric wire, and a first coupling element that is coupled to the connecting means of the first male contact, the first female contact comprises connecting means for receiving at least one electric wire, and a second coupling element that is coupled to the connecting means of the first female contact, the connecting means of the first male contact are connected with a electric wire to the connecting means of the first female contact, the first coupling element of the first male contact and the second coupling element of the first female contact are formed to be each other's counterparts such that a second female contact, corresponding in structure to the first female contact, can be connected to the first male contact, and correspondingly, a second male contact, corresponding in structure to the first male contact, can be connected to the first female contact, the male contacts and the female contacts

are provided with locking means which lock the first male contact with the second female contact, and correspondingly, the first female contact to the second male contact when their first and second coupling elements are coupled to one another.

[0004] This invention relates to the construction of an electric network and to the connection of apparatuses and devices to the electric network. Particularly, the invention relates to interlocking plug-in contacts by means of which various components of the electric network can be connected to each other.

[0005] In such targets of application that are likely to need alterations in electric wiring later on, it is desirable that from the very beginning the electric network is implemented in such a way that the alterations are simple to carry out afterwards. This kind of need is typically found, for instance, in exhibition stand structures and in transformable office and commercial buildings where, in all likelihood, the placing of partition walls, for instance, has to be changed at some stage. If the couplings of electric devices, such as lighting fixtures and sockets, are originally carried out in these targets in a conventional manner, i.e. by connecting the electric devices to the electric network by using fixed cable installation, it is very time-consuming and cumbersome to shift the electric devices afterwards. Also at the first installation stage, i.e. when the electric wiring is laid for the first time in a construction, the installation work carried out as conventional fixed installation is relatively time-consuming.

[0006] Thus, instead of the above-described conventional solution based on screw connections, a solution is introduced, in which the electric devices, branching pieces and even cables to be used in wiring are provided from the very beginning, in connection with their manufacture, with specific plug-in contacts. Consequently, in practice the electric installation work to be carried out in situ consists of connecting the plug-in contacts of cables and other devices to each other in the desired manner. It is obvious that said installation manner is considerably quicker as compared with the manner in which the electric devices would have to be coupled with fixed cables.

[0007] In order to be able to ensure that the plug-in contacts keep in place and hence to prevent eventual loose electrical contacts from being established, the known plug-in contacts are provided with locking means by the action of which the female contacts and the male contacts to be coupled interlock in connection with installation. In practice, the locking is achieved in such a way that one of the plug-in contacts to be coupled has at least one locking element that can be unlocked, and in turn, the other has a fixed counterpart of the locking element that can be unlocked, to which counterpart the locking element is attached. Thus the locking of the plug-in contacts can be unlocked and the contacts can be detached from one another, when a force is exerted on the locking element that can be used for unlocking, for instance, by pressing with hand.

[0008] The most serious drawback of the above-described known plug-in contacts is that the interlocking of two plug-in contacts can only be unlocked through one plug-in contact. In practice, this creates problems, as the plug-in contact with a locking element that can be used for unlocking has to be positioned in the device in such a way that its locking element is not accessible (at least not very easily). These situations arise, for instance, with branching pieces or with such electric devices that form a part of the electric network, such as a lighting fixture with an output contact for supplying electricity from an input contact both to a lamp in the lighting fixture and from the output contact further to other electric devices. In these applications, unnecessarily many parts of electric devices have to be detached, often with special tools, before there is access to the plug-in contact's unlockable locking elements, and the interlocking of two plug-in contacts can be unlocked.

[0009] The object of this invention is to solve the above-described problem and to provide a solution by means of which the interlocking of the plug-in contacts can be undone more easily than before, whereby the construction and removal of the electric network, the connection of apparatuses and device to the electric network and their disconnection therefrom, and the extension of the electric network become quicker and more flexible than before, and by means of which the above operations cause as little inconvenience as possible to the environment. This is achieved with the plug-in contact pair in accordance with the invention, which is characterized in that the locking means of both the male contact and the female contact are formed for unlocking, whereby a force exerted on the locking means of either one of the plug-in contacts unlocks the interlocking of the male contact and the female contact.

[0010] The invention is based on the idea that, when both the male contact and the female contact are provided with locking elements that can be used for unlocking, the interlocking of these two contacts can be undone by either one of the contacts, so that under no circumstances a situation arises when that contact of the plug-in contact pair, which has the locking element that can be unlocked, is located in an inaccessible place. Hence the plug-in contact pair in accordance with the invention makes it easier than before to unlock the interlocking of two plug-in contacts, and consequently the installation and removal of electric networks, as well as the implementation of alterations in couplings, become considerably more flexible and easier.

[0011] The invention also relates to a plug-in contact that can be utilized as a contact in the plug-in contact pair in accordance with the invention. The plug-in contact in accordance with the invention is characterized in that the hooked part of the elongated element included in the locking means is formed to be free upwards or downwards, when the upper side of the plug-in contact body is seen from above.

[0012] The design of the plug-in contact in accord-

ance with the invention makes it possible that the locking means which can be used for unlocking of said plug-in contact can grip another corresponding plug-in contact with the locking means which can be used for unlocking, the hooked part of the elongated element in said other plug-in contact being free to the opposite direction. Then the hooked parts, free upwards and downwards, of said plug-in contacts grip each other to the effect that the plug-in contacts interlock. The design of the plug-in contact in accordance with the invention also makes it possible that said plug-in contact can be connected, apart from another plug-in contact with a locking means which can be used for unlocking, to another such plug-in contact that has no locking means which can be used for unlocking, but instead of it, for instance, a fixed hook or pin which the hooked part of the plug-in contact can grip.

[0013] Furthermore, the invention relates to an electric network component having male and female contacts, in which component the plug-in contact pair and the plug-in contact in accordance with the invention can be utilized. The electric network component in accordance with the invention is characterized in that the locking means of both the first male contact and the first female contact are formed for unlocking whereby a force exerted on the locking means of the first male contact unlocks the interlocking of the first male contact and the second female contact, and a force exerted on the locking means of the first female contact unlocks the interlocking of the first female contact and a second male contact. The electric network component in accordance with the invention may consist of e.g. a cable, a branching piece or a lighting fixture, both the male contact and the female contact thereof having locking means which can be used for unlocking. When another component also having locking means which can be used for unlocking is connected to a component of this kind, it is assured that the locking means of each plug-in contact pair are easily accessible and the interlocking of the components can be undone.

[0014] The preferred embodiments of the plug-in contact pair and the electric network component in accordance with the invention appear from the attached dependent claims 2 to 4 and 7 to 9.

[0015] In the following, the invention will be described in greater detail by way of example with reference to the attached drawings, wherein

Figure 1 illustrates a first preferred embodiment of a plug-in contact pair of the invention,

Figure 2 illustrates a second preferred embodiment of a plug-in contact pair of the invention,

Figure 3 illustrates a first preferred embodiment of an electric network component of the invention,

Figure 4 illustrates a second preferred embodiment of an electric network component of the invention, and

Figure 5 illustrates a third preferred embodiment of an electric network component of the invention.

[0016] Figure 1 illustrates the first preferred embodiment of the plug-in contact pair of the invention. In Figure 1, a male contact 1 is shown on the left from two different angles of view, and a female contact 2 is shown on the right from two different angles of view. Connecting means 4 and 5 to receive three separate electric wires are arranged in the bodies 3 of the male contact 1 and the female contact 2. Thus the ends of the separate electric wires are inserted into openings 5, whereafter their connection to the plug-in contacts is secured with fixing screws 4.

[0017] The connecting means 4 and 5 of the male contact are coupled to pin-shaped coupling elements 6, of which one is illustrated by broken lines in Figure 1. The coupling element 6 is located inside a barrel-shaped plastic plug 7 protruding from the body 3 of the contact 1. An opening 8 of the barrel-shaped plastic plug 7 is shown in the lower figure illustrating the male contact.

[0018] Correspondingly, the connecting means 4 and 5 of the female contact 2 are coupled to barrel-shaped coupling elements 9, of which one is illustrated by broken lines in Figure 1. The barrel-shaped coupling element 9 is located in a cavity formed by a plastic part 10 protruding from the body 3 of the female contact 1, an opening 11 of the cavity being shown in the lower figure illustrating the female contact.

[0019] When the male and the female contacts of Figure 1 are connected to each other, the plastic plug 7 of the male contact 1 penetrates through the cavity opening 11 of the female contact in such a way that the pin-shaped coupling element 6 of the male contact penetrates into the barrel-shaped coupling element 9 of the female contact, whereby a contact is established between the coupling elements 6 and 9.

[0020] The male and the female contacts of Figure 1 both comprise locking means which interlock the plug-in contacts when their coupling elements 6 and 9 are connected to each other. In the case of Figure 1, the locking means comprise elongated elements 12 and 13 with hooked parts 14 and 15. In the case of Figure 1, the elongated elements 12 of the male contact 1 shown on the left comprise hooked parts 14 that are free upwards. Correspondingly, the elongated elements 13 of the female contact 2 shown on the right comprise hooked parts 15 that are free downwards. Thus the elongated elements 12 and 13 of the plug-in contacts grip each other by means of their hooked parts 14 and 15, when the plug-in contacts 1 and 2 are connected to each other.

[0021] The elongated elements 12 and 13 are attached to the body 3 of the plug-in contacts with an arm 16 protruding from the body. Since said arm 16 and the elongated elements 12 and 13 are made of flexible/resilient plastic, the interlocking of the elongated elements can be undone by exerting a force, directed towards the body 3 or away from the body 3, on the elongated elements 12, 13 of either one of the plug-in contacts 1 or

2. As a consequence, said elongated element and/or the arm 16 bends to the effect that the hooked parts 14 and 15 detach from each other.

[0022] Figure 2 illustrates a second preferred embodiment of the plug-in contact pair in accordance with the invention. In Figure 2, the plug-in contacts are shown connected to each other. Thus Figure 2 does not show the coupling means of the plug-in contacts, but only the locking means and the fixing screws 4' by means of which the electric wires are connected to the plug-in contacts are shown in the figure.

[0023] Unlike in Figure 1, the male contact 1' of Figure 2 comprises an elongated element 12' whose hooked part 14' is free towards the contact body. Correspondingly, an elongated element 13' of the female contact 2' comprises a hooked part 15' that is free away from the contact body. In addition, the positioning of an arm 16" that connects the elongated element 13' of the female contact 2' to the body deviates from the embodiment of Figure 1. Thus the interlocking of the male contact 1' and the female contact 2' can be undone by pressing the end, indicated by the reference numeral 17', of the elongated element 12' of the male contact towards the body of the contact 1'. Alternatively, said interlocking can be undone by pressing the elongated element 13' of the female contact 2' towards the body of the female contact.

[0024] Figure 3 illustrates a first preferred embodiment of an electric network component in accordance with the invention. The electric network component shown in Figure 3 consists of an electric cable 17, at the ends of which plug-in contacts are arranged i.e. a male contact 1' and a female contact 2'. The male contact and the female contact 2' are designed to form each other's counterparts, i.e. they could be connected to each other, if desired.

[0025] Since both the locking means of the male contact 1' and the locking means of the female contact 2' are unlockable, said electric network component can be easily detached at both ends.

[0026] Figure 4 illustrates a second preferred embodiment of the electric network component in accordance with the invention. The electric network component of Figure 4 consists of a lighting fixture, in the body of which the plug-in contacts 1' and 2' are arranged. The lighting fixture includes a branching piece 19, by means of which a lamp of the lighting fixture 18 and the male contact 1' are coupled to the female contact with wires 20 to 22. Thus the lighting fixture can be used as a part of the electric network, for instance, to the effect that electricity is supplied by means of it also to other lighting fixtures.

[0027] Figure 5 illustrates a third preferred embodiment of the electric network component in accordance with the invention. The electric network component of Figure 5 consists of a branching piece 23 with one female contact 2' forming an input and two male contacts 1' forming outputs. Thus the electric network can be readily branched in the desired manner by means of

said branching piece.

[0028] It is to be understood that the above specification and figures related thereto, are only intended to illustrate the present invention. It is obvious to persons skilled in the art that the invention may be varied and modified in various ways without deviating from the scope and spirit of the invention disclosed in the appended claims.

Claims

1. A plug-in contact pair which consists of a male contact (1,1') and a female contact (2, 2'), of which

the male contact (1, 1') comprises a body (3) with connecting means (4, 5) for receiving at least a first electric wire, and with a first coupling element (6) that is coupled to the connecting means (4, 5) of the male contact, the female contact (2, 2') comprises a body (3) with connecting means (4, 5) for receiving at least a second electric wire, and with a second coupling element (9) that is coupled to the connecting means (4, 5) of the female contact, whereby the first coupling element (6) of the male contact (1, 1') and the second coupling element (6) of the female contact (2, 2') are formed to be each other's counterparts such that they can be coupled to each other to provide an electric contact between the first and the second electric wire, and the male and the female contacts are provided with locking means (12 to 16, 12' to 16') which lock the male and the female contacts together when the first and the second coupling elements (6, 9) are coupled to each other, **characterized** in that the locking means (12 to 16, 12' to 16') are formed for unlocking whereby a force exerted on the locking means of either one of the plug-in contacts (1,1'; 2, 2') unlocks the interlocking of the male and the female contacts.

2. A plug-in contact pair as claimed in claim 1, **characterized** in

that the coupling elements of the male and the female contacts consist of elongated parts (6, 9) arranged in the body of the male contact and in the body of the female contact respectively, that the locking means comprise elongated elements (12, 13, 12', 13') with a hooked part (14, 15, 14', 15'), that the hooked part (14, 14') of each elongated element is arranged to grip the corresponding hooked part (15, 15') of the elongated element of the opposite plug-in contact, when the first

and the second coupling elements (6, 9) are coupled to each other, and that each elongated element (12, 13, 12', 13') is attached to the body with an arm (16, 16', 16'') which protrudes from the body, and which is attached to the elongated element, whereby the arm (16, 16', 16'') and/or the elongated element (12, 13, 12', 13') yields such that the position of the elongated element changes and its hooked part is detached from the hooked part of the opposite plug-in contact, when a transversal force is exerted on the elongated element (12, 13, 12', 13').

3. A plug-in contact pair as claimed in claim 2, **characterized** in

that the female contact and the male contact both comprise connecting means (4, 5) for receiving at least two electric wires, and at least two parallel, elongated coupling elements (6) which are adjacently positioned with a spacing when the upper side of the male contact, and correspondingly, of the female contact are seen from above, and that the elongated element (12) of the locking means of one plug-in contact (1) comprises a hooked part (14) that is free upwards and the elongated element (13) of the locking means of the other plug-in contact (2) comprises a hooked part (15) that is free downwards, when the upper side of the plug-in contacts is seen from above, whereby the hooked parts (14, 15) that are free upwards and downwards grip each other when said coupling means (6, 9) of the male and the female contacts are coupled to each other.

4. A plug-in contact pair as claimed in claim 2, **characterized** in that, of the male and the female contacts:

the elongated element (12') of one of the plug-in contacts (1') is attached to the body with an arm (16') which protrudes from the body, and which is attached to the elongated element (12') between a first and a second end of the elongated element (12'), said hooked part (14') which is free towards to the body being located in said first end, whereby the arm (16') yields such that the distance between the hooked part and the body (3') of the plug-in contact increases, when a force, directed towards the body, is exerted on the second end of the elongated element (12'), and the elongated element (13') of the other plug-in contact (2') is attached to the body with an arm (16'') which protrudes from the body, and which

is attached to a first end of the elongated element (13'), whereby the arm (16'') and/or the elongated element (13') yield such that the distance between the body and the hooked part (15'), which is free away from the body (3') and located between the first and a second end of the elongated element (13'), decreases, when a force directed towards the body (3') is exerted on the second end of the elongated element (3').

5. A plug-in contact comprising

a body (3, 3') with an upper side and a lower side,
 connecting means (4, 5) arranged in the body to receive at least two electric wires,
 at least two parallel, elongated coupling elements (6, 9) arranged in the body, the coupling elements being coupled to the connecting means (4, 5) and formed to provide a contact with corresponding coupling elements of a counterpart of the plug-in contact, and which are adjacently positioned with a spacing, when the upper side of the plug-in contact (1, 2) is seen from above, and
 locking means which include at least one elongated element which is formed with a hooked part in order to lock the plug-in contact with its counterpart, when the coupling elements (6, 9) establish a contact with the corresponding coupling elements of the counterpart of the plug-in contact, **characterized** in that the hooked part (14, 15) of the elongated element (12, 13) included in the locking means is formed to be free upwards or downwards, when the upper side of the body (3) of the plug-in contact is seen from above.

6. An electric network component with plug-in contacts comprising at least a first male contact (1') and a first female contact (2'), and in which

the first male contact (1') comprises connecting means for receiving at least one electric wire and a first coupling element that is coupled to the connecting means of the first male contact, the first female contact (2') comprises connecting means for receiving at least one electric wire and a second coupling element that is coupled to the connecting means of the first female contact (2'),
 the connecting means of the first male contact (1') are coupled with an electric wire to the connecting means of the first female contact (2'),
 the first coupling element of the first male contact (1') and the second coupling element of the first female contact (2') are formed to be each

other's counterparts such that a second female contact, corresponding in structure to the first female contact, can be connected to the first male contact (1'), and correspondingly, a second male contact, corresponding in structure to the first male contact (1'), can be connected to the first female contact (2'),

the male contacts and the female contacts are provided with locking means which lock the first male contact (1') with the second female contact (2'), and correspondingly, the first female contact (2') with the second male contact, when their first and second coupling elements are coupled to one another, **characterized** in that the locking means of both the first male contact and the first female contact are formed for unlocking whereby a force exerted on the locking means of the first male contact (1') unlocks the interlocking of the first male contact (1') and the second female contact, and a force exerted on the locking means of the first female contact (2') unlocks the interlocking of the first female contact (2') and the second male contact.

7. An electric network component as claimed in claim 6, **characterized** in that

said component consists of an electric cable (17), at the ends of which said first male and female contacts (1', 2') are arranged.

8. An electric network component as claimed in claim 6, **characterized** in that said electric network component consists of a branching piece (23) in which a plurality of plug-in contacts (1', 2') are arranged, the connecting means of the plug-in contacts being coupled to each other with parts conducting electricity.

9. An electric network component as claimed in claim 6, **characterized** in that said electric network component is a device consuming electricity, such as a lamp or the like.

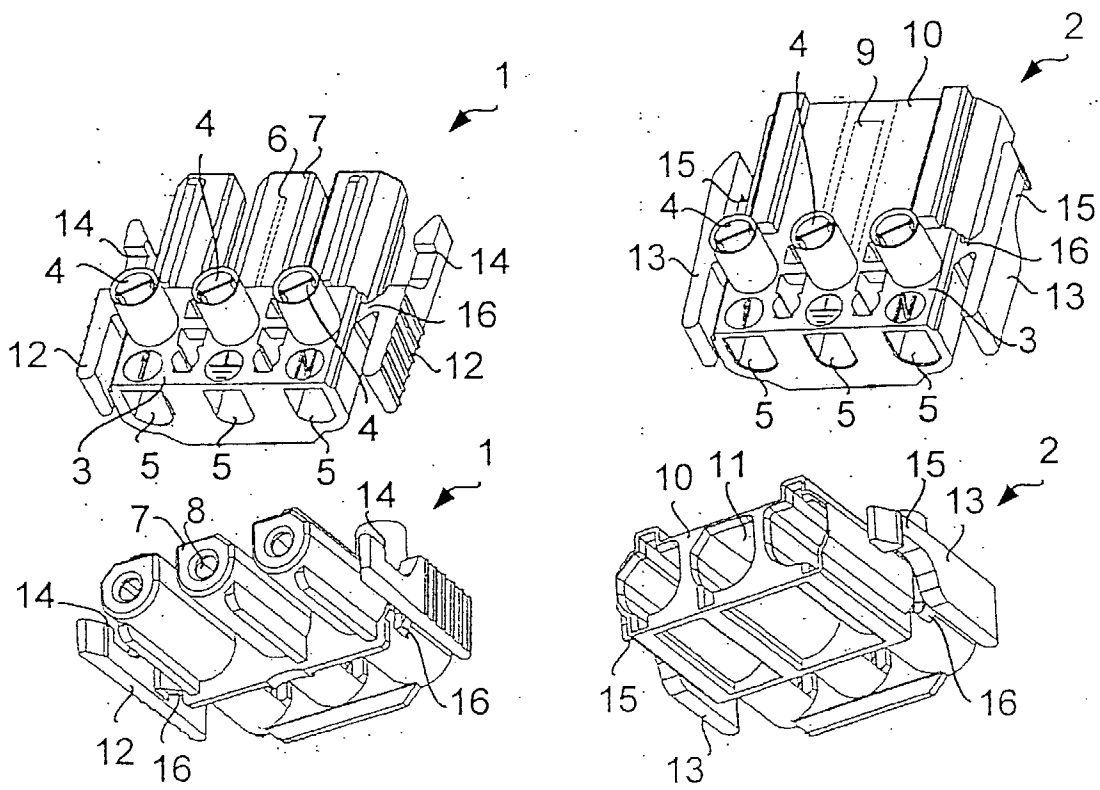


FIG. 1

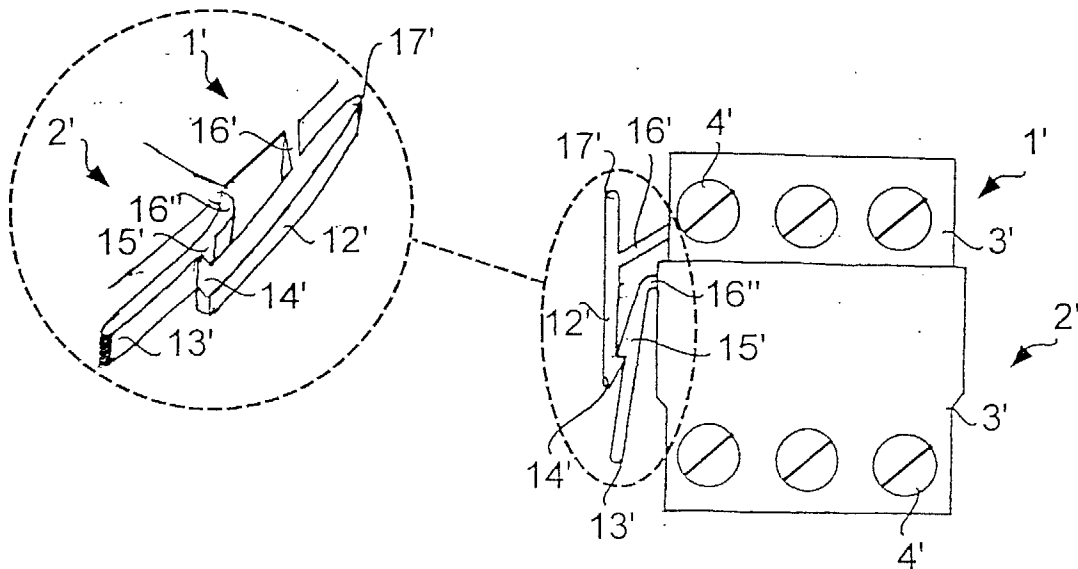


FIG. 2

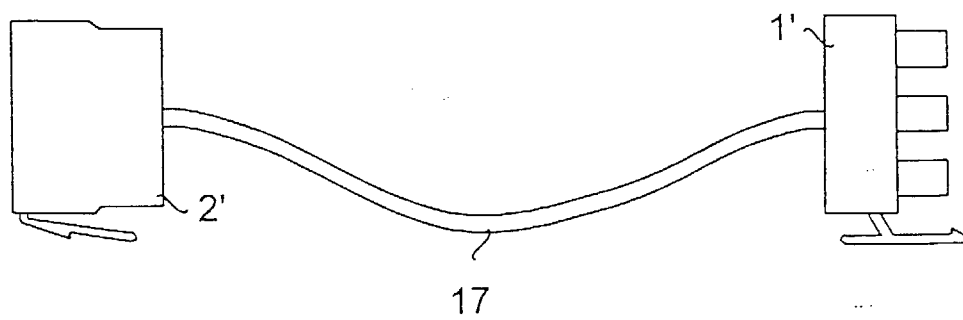


FIG. 3

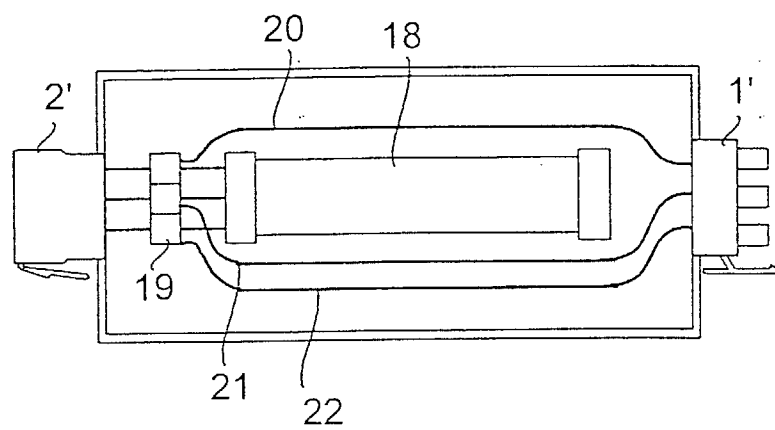


FIG. 4

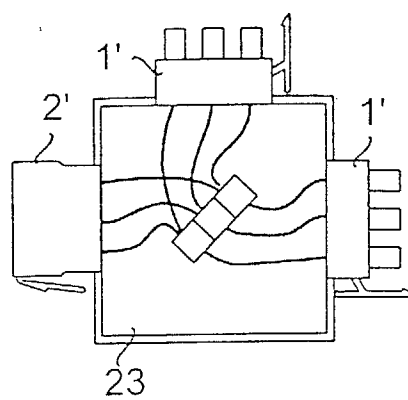


FIG. 5