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(54) **A connector for a suspended power distribution track**

Steckverbinder für eine aufgehängte Stromverteilungsbahn

Connecteur pour une piste de distribution électrique suspendue

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Description

[0001] The present invention relates to a connector for a suspended power distribution track and more specifically to a modular connector which can be assembled according to different requirements, with a reversible connection to the power distribution track, with protected contact blades and with an incorporated fuse.

[0002] There are known power distribution tracks, and, more specifically, suspended tracks, which are composed of modular sections, each formed by a metal casing of predetermined length, for example 4 metres, which is downwardly open and which houses within itself, on its two sides, a pair of supports or at least one support made from insulating material, provided with recesses in each of which a bus bar is housed.

[0003] Examples of these tracks are described in EP 0 015 356 and in the more recent European patent application No. 06425836.1, filed on 14 December 2006.

[0004] End joints, butt joints, and L, X and T joints are used to interconnect a plurality of these modules and to produce continuous tracks having a wide range of different lengths and configurations.

[0005] Examples of these end joints are provided in US 4,053,194 and in the more recent European patent application No. 07425068.2, filed on 6 February 2007.

[0006] There are also known connectors for tracks of this type which can be connected along the track and which are essentially composed of a head which is inserted into the track and which supports contact blades or contact devices.

[0007] By a convenient rotation of the head, the contact blades are brought into contact with the bus bars.

[0008] In some of these connectors, such as those described in US 3,848,715 and WO 0 191 249 and BE 895352 at least one contact blade can be placed selectively in one of a number of different positions in order to make contact with one of a plurality of bus bars, particularly those of a three-phase system.

[0009] One limitation of these connectors is that they are intended to be inserted into the track in a one-way orientation, in other words a non-reversible orientation, whereas a reversible orientation is desirable in the case of tracks in which the bus bars can be placed internally on one side or the other, if not on both sides, of the track casing.

[0010] The length of the connector generally extends (even when not combined with light fittings and the like) beyond the contact head, with a base plate in which an aperture is made for the passage of electrical cables (as shown for example in DE 10241941), and it is advantageous for the connector to be reversible because it enables the connector to be placed close to either end of a track section in which the presence of connectors for joining the various track sections prevents the insertion of the contact head into the track and its electrical connection.

[0011] The reversibility of the connector thus increases

the scope for application along the extension of a track section.

[0012] A further limitation of known connectors with rotating heads is that the contact blades projecting from the contact head are not protected, and, during the manipulation of the connector, including its insertion into the track, the blades may undergo deformation which adversely affects or prevents the correct insertion of the blades into the recesses of the bus bars and makes the effectiveness of the electrical contact a matter of chance.

[0013] A further limitation is that this type of rotating head connector is not provided with any fuse for protection against overloads or short circuits, and if a protective device is provided it is not associated with the rotating head, leading to an increase in the overall dimensions of the connector.

[0014] The object of the present invention is to provide a connector for power distribution tracks which overcomes these limitations while having small overall dimensions, being of modular construction to meet different requirements in a simple and reliable way, and being installable, after configuration, without the use of tools, or with the aid of a simple screwdriver only (for rotating the contact head).

[0015] These requirements are met by a connector according to claim 1.

[0016] The features and advantages of the invention will be made clear by the following description of a preferred embodiment, provided with reference to the appended drawings, in which:

- Figure 1 is an overall perspective view of a preferred embodiment of a connector according to the present invention, and of an end portion of a power distribution track section to which the connector is connected;
- Figure 2 is a partially exploded perspective view from the front of the connector of Figure 1, with the contact head rotated into a position in which it can be inserted into the track;
- Figure 3 is a partially exploded perspective view from the rear of the connector of Figure 2;
- Figure 4 is a further perspective view of the connector of the preceding figures, with the contact head rotated into the electrical contact position.

[0017] Elements which are functionally and structurally equivalent are identified by the same reference numerals in the different drawings.

[0018] With reference to Figure 1, before examining the specific details of the connector, it will be appropriate to consider a preferred embodiment of the power distribution track section to which the connector is to be connected.

[0019] The track section 1 is essentially composed of a straight metal casing 2, made from bent sheet metal or extruded light alloy, forming a downwardly open channel, whose sides can house two identical straight supports 3,

extruded from insulating plastics material.

[0020] Depending on the requirements for use, the casing can also house one support only, as shown in the drawing.

[0021] A plurality of parallel straight recesses, opening on one side of the support, is formed in the support 3, which has a rectangular cross section, one conducting element being housed in each recess.

[0022] In the preferred embodiment shown in Figure 1, there are six recesses, housing four T-section bus bars 4, 5, 6 and 7, which are coextruded with the support (the material of which incorporates the head of each bar), for distributing a three-phase current and voltage system and its neutral, together with two bus bars 8 and 9 of circular cross section, for distributing an auxiliary voltage or possibly electrical signals.

[0023] As shown schematically in Figure 1, the butt joining of two track sections is generally carried out by using connectors composed of a sleeve of insulating material 10, housing electrical contact pliers and blades, collectively identified by the reference numeral 11, the number and configuration of which are appropriate for connection to the bus bars 4-9 of the support 3.

[0024] For further details of the structure of a preferred embodiment of these butt connectors (which are not essential for the purposes of the present invention), reference may be made to European patent application No. 07425067.1, filed on 6 February 2007.

[0025] Half of the length of the sleeve 10 is fitted on to the end of the support 3, as indicated by the arrow 12.

[0026] The other half of the sleeve can be fitted on to the end of another support, such as the support 3, belonging to an adjacent track section.

[0027] Alternatively, it can be inserted into an L, T, X or flexible electrical connection joint such as that detailed in the aforesaid patent application EP 07425068.2.

[0028] Clearly, it is not possible to form other electrical connections to the bus bars in the area in which the sleeve 10 is present, even if ample space is available in the channel formed by the casing 1 for housing accessory devices or cables.

[0029] This imposes some limits on the flexibility of use of the track, which is designed to enable electrical branch connections to be formed at any point along its extension, as may be required by the layout of premises.

[0030] This disadvantage can be overcome by providing rotating contact head connectors in which the output for the cables is offset with respect to the axis of rotation of the head, so that branches can also be formed at the position of practically any joints between track sections.

[0031] An example is provided by the cited document DE 10241941.

[0032] However, this requires the production of two different connectors, depending on whether the installation is to be carried out at one or other end of the track section.

[0033] The connector described below with reference to the drawings resolves this problem because of the symmetrical structure of its contact head (which has axial

symmetry with respect to the axis of rotation) and the interchangeability of the positions of the contacts, and it can be inserted at one or other end of the track section (or in any other position) simply by rotating its position through 180°

[0034] In other words, the connector is reversible.

[0035] The connector, which is collectively identified by the reference numeral 13, is composed, in a known way, of an elongate base plate 14 on which is mounted a contact head which can be rotated through a certain angle, with its axis of rotation A-A perpendicular to the base plate.

[0036] The angle of rotation, which is in the range from 45° to 90° (and is preferably equal to 60°), is limited, in a known way, by stops (not shown) which define an insertion position, in which the contact head can be inserted into the track, and an electrical contact position, shown in Figure 1, in which the contact blades penetrate into the recesses of the support 3 and make an electrical contact with the bus bars housed there.

[0037] The head can be rotated, in a known way, by moving the head with a screwdriver which is inserted into a housing which is formed in the lower part of the head and is accessible from the lower face of the base plate.

[0038] Alternatively, the head can be provided with a graspable projection, accessible from the underside of the base plate, for the manual operation of the head without the need for tools.

[0039] The head is composed of a central body or core 15 extending towards the axis of rotation A-A, from which core there radially extend two wings 16 and 17 which are positioned symmetrically about the axis of rotation and which, according to an innovative feature, are identical to each other and are axially symmetrical about the axis A-A.

[0040] An identical plurality of housings is formed in the two wings 16 and 17, the number of housings being equal to the number of the bus bars in the support 3 and having the same spacing in order to house a corresponding plurality of electrical connection devices. In Figure 1, one of these housings is identified by the reference numeral 18.

[0041] Figure 1 shows, by way of example, how four connection devices with contact blades, collectively identified by the reference numeral 19 and positioned to make the electrical contact with the bus bars 4, 5, 6 and 7 of the support, are housed removably in the wing 16.

[0042] In order to make the connection to the bus bars when the connector 13 has to be positioned in the track with its orientation rotated through 180° relative to the orientation shown in Figure 1, it is simply necessary to place the connection devices 19 in the corresponding housings formed in the wing 17, as shown for two of these devices 33 and 34 in Figure 3.

[0043] With reference to Figure 1, it should be noted that a pair of shields 20, 21 is mounted on the base plate 14, these shields housing the contact blades of the connection devices 19 when the head is rotated into the in-

sertion position (which is the normal resting position of the connector).

[0044] Thus the blades are protected from accidental impact and stresses which could deform or break them.

[0045] The shields 20 and 21 are fixed to the base plate by means of short plugs which extend from their lower faces and are not shown in the drawings. These plugs engage in a pair of hollow risers 22 formed on the base plate.

[0046] The fixing is completed with a locking screw 23 passing through an eyelet 24 formed on one side of the shield.

[0047] The screw 23 engages in a third riser 25 formed on the base plate.

[0048] Alternatively, the shields can be secured with screws passing from below into the base plate and engaging in hollow risers which in this case are formed on the lower faces of the shields.

[0049] As shown more clearly in Figure 2, the central body 15 of the rotating contact head extends upwards into a support 25, on which is fitted a metal clip 26, conveniently shaped to form a earth contact surface in the form of a broken cylinder, and, positioned inside this surface, contact pliers 27 into which is inserted the blade 28 of an electrical connection device 30 (Fig. 1).

[0050] When the connector is inserted into the track, the metal clip 26 comes into contact with the metal casing 2 of the track, which acts as an earth conductor.

[0051] It should be noted that the electrical earth contact is ensured in any position of the contact head.

[0052] As shown more clearly in the exploded view of Figure 2, the electrical connection device or earth contact device is essentially composed of a box of insulating material 38, with a front face closed by a lever 39 pivoted on the box and provided with an aperture 31 for the introduction of an electrical cable end.

[0053] A contact spring is housed in the box and is released by the lever 39. The contact spring securely clamps the cable end, which has been inserted into the aperture 31, against an inner portion of the contact blade 28, the outer portion of which emerges from a lateral face of the box.

[0054] The electrical connection can easily be made without the use of tools, by exerting pressure manually on the end portion of the lever.

[0055] The operation can also be carried out with the box already snap-fitted removably into a housing 32 formed in the central body 15 of the rotating head, the housing being provided with a groove 40 for the passage of the contact blade 28 and its insertion into the receptacle 27.

[0056] The box 38 is fixed in its housing 32 by a resilient tab, terminating in a fastening tooth 41, formed on the side of the box opposite that from which the contact blade 28 emerges.

[0057] The structure of the electrical connection devices for making the electrical contact with the auxiliary bus bars 8 and 9 is identical (Fig. 1).

[0058] The devices for electrical connection to the bus bars, such as those identified by the reference numerals 19 (Fig. 1), 33, 34 (Fig. 3) and 35 (Fig. 2), are very similar to those described above, the only difference being that a pair of juxtaposed parallel blades 36 and 37 emerges from the box to form resilient contact pliers in which one of the bars 4, 5, 6 and 7 of Figure 1 is clamped.

[0059] For further details of the structure of these contact devices, which are not relevant for the purposes of the present invention, reference may be made to European patent application No. 08425054.7, filed on 31 January 2008.

[0060] It is useful to provide a fuse device in the track connectors for protection against overloads and short circuits.

[0061] Advantageously, the central body 15 of the rotating head acts as a support for this device, providing a considerable reduction in the overall dimensions.

[0062] As shown in Figure 3, two pairs of projecting risers, numbered 42 and 43 respectively, are formed on one face of the central body 15, metal contact and retaining pliers for a fuse being fixed to each of these during the production process, by welding and/or by means of a screw.

[0063] The two pliers are identified by the reference numerals 44 and 45.

[0064] The pliers 44 are fixed to the pair of studs 42 (as indicated by the arrow 46) and are provided with a short length of conducting wire 47, soldered in the factory to the pliers 44.

[0065] The pliers 45 are provided with a short length of conducting wire 48, with one end soldered in the factory to the pliers 45 and the other end soldered in the factory to the contact element of a contact device 49 which is similar to the preceding devices and which differs from them solely in the absence of the outer portion of the contact blade or blades.

[0066] In this case also, the soldering operation is carried out during the production process.

[0067] Also in the course of the production process, the group formed by the contact device 49, the length of wire 48 and the pliers 45 is inserted, in the direction indicated by the arrow 50, into an aperture 51 formed in the central body 15, in such a way that the contact device 49 is housed in the aperture 51 and the pliers 45 can be fixed to the pair of studs 43.

[0068] Figure 4 shows the protection device assembled on the rotating head, with the contact device 49 inserted into the housing 51 and with the end of the length of electrical cable 47 inserted into a contact device 52 mounted in a housing of the wing 17 for connection to a phase bar of the track.

[0069] A second contact device 53, mounted in a housing of the same wing 17, is used for the electrical connection to a second phase bar, which is different from the first, or to the neutral of the three-phase system.

[0070] Clearly, if the contact devices have to be placed in the housings formed in the wing 16, in order to conform

to the configuration of the track 1 (Fig. 1) and the orientation in which the connector is inserted into it, it is simply necessary to move the contact devices 52 and 53 into these housings and to pass the cable length 47 through one of the base apertures 54 and 55 of the housings formed in the flange 16, or through one of the bottom apertures 56 and 57 (Fig. 2) of the housings formed in the wing 17, depending on which is the most convenient method.

[0071] These apertures serve not only for the passage of the fastening teeth 41 of the contact devices, but also for the passage of cables.

[0072] When all the housings are occupied by contact devices, to make contact with bus bars positioned on both sides of the track 1, the protection device is not installed and some electrical cables are passed through the aperture 51, formed in the central body 15, which is free.

[0073] When the protection device is present, a fuse 58 can be inserted in the pliers 44 and 45 and then enclosed in a protective case 59, provided with an eyelet 60 into which is fitted a plug 61 formed on the central body 15 of the rotating head.

[0074] To complete the description of the connector, it should be noted, with reference to Figure 4, that the base plate 14 is provided, on its longer sides, with a set of three resilient tabs 62, 63 and 64, each terminating in a fastening tooth which engages by a snap-fit with one of the two lower wings 65 and 66 (Fig. 1), which are bent towards each other, of the casing 2 of the track 1.

[0075] Although the teeth of the tabs 62, 63 and 64 are sufficient to fasten the connector to the track, a further locking system is provided to prevent the removal of the connector when the rotating head is rotated into the electrical contact position.

[0076] For this purpose, the rotating head is provided, in a very simple way, with a platform 67 having a pair of teeth 68 and 69 projecting from the substantially circular profile of the platform.

[0077] When the rotating head is placed in the electrical contact position, the two teeth 68 and 69 engage with the lower flanges 65 and 66 of the track casing and prevent the removal of the connector.

[0078] The structure of the connector is completed by a pair of lead-ins 70 and 71 placed at one end of the base plate and a pair of cable clamps 72 and 73, of known types.

[0079] The two lead-ins 70 and 71 are orientated, respectively, for the passage of cables perpendicularly to the base plate 14 or parallel to it, in the direction of its greatest extension which is equal to the longitudinal extension of the track section to which the connector is connected.

Claims

1. An electrical connector for a power distribution track

comprising a base plate (14) for engaging the track and a contact head, pivoted on said base plate with respect to an axis of rotation (A-A) perpendicular to the base plate (4), wherein the contact head can be placed in a contact position and in an insertion position, said contact head comprising a central body (15) and two wings (16, 17) extending radially and symmetrically from said central body (15) to support a plurality of electrical connection devices (19) provided with at least one contact blade (36, 37), said base plate being provided with at least one aperture (70) for the passage of electrical cables, the aperture being offset with respect to the axis of rotation of said contact head, **characterized in that** said wings (16, 17) are identical to each other with axial symmetry with respect to the axis of rotation (A-A) of said contact head and each has an identical plurality of housings (18) for the removable insertion of said electrical connection devices (19).

2. A connector according to Claim 1, comprising a pair of shields (20, 21) mounted on said base plate (14), these shields housing the contact blades (36, 37) of said electrical connection devices (19) when said contact head is in the insertion position.
3. A connector according to Claim 1 or 2, in which said central body (15) provides a housing (32) for the removable insertion of an electrical connection device (38), said device being provided with a contact blade which is inserted into pliers formed by an earth contact (26) supported by said central body (15).
4. A connector according to any one of the preceding claims, comprising a pair of fuse contact and retention pliers (44, 45) mounted on said central body (15), one (45) of said pliers being connected to an electrical connection device (49) inserted into a housing (51) formed in said central body (15).

Patentansprüche

1. Elektrischer Verbinder für eine Stromverteilungsbahn, umfassend eine Grundplatte (14) zum Einrasten der Bahn und einen Kontaktkopf, der auf der Grundplatte in bezug zu einer Rotationsachse (A-A), die senkrecht zur Grundplatte (14) ist, drehbar gelagert ist, wobei der Kontaktkopf in eine Kontaktposition und in eine Einführposition gebracht werden kann, wobei der Kontaktkopf einen mittleren Körper (15) und zwei Flügel (16, 17) umfaßt, die sich radial und symmetrisch von dem mittleren Körper (15) erstrecken, um mehrere elektrische Anschlußvorrichtungen (19) zu tragen, die mit wenigstens einer Kontaktzunge (36, 37) versehen sind, wobei die Grundplatte mit wenigstens einer Öffnung (70) für den Durchgang von elektrischen Kabeln versehen ist,

wobei die Öffnung in bezug zur Rotationsachse des Kontaktkopfes versetzt ist, **dadurch gekennzeichnet, daß**

die Flügel (16, 17) zueinander identisch und axial-symmetrisch in bezug zur Rotationsachse (A-A) des Kontaktkopfes sind und jeweils mehrere identische Gehäuse (18) zum lösbaren Einsetzen der elektrischen Anschlußvorrichtungen (19) aufweisen.

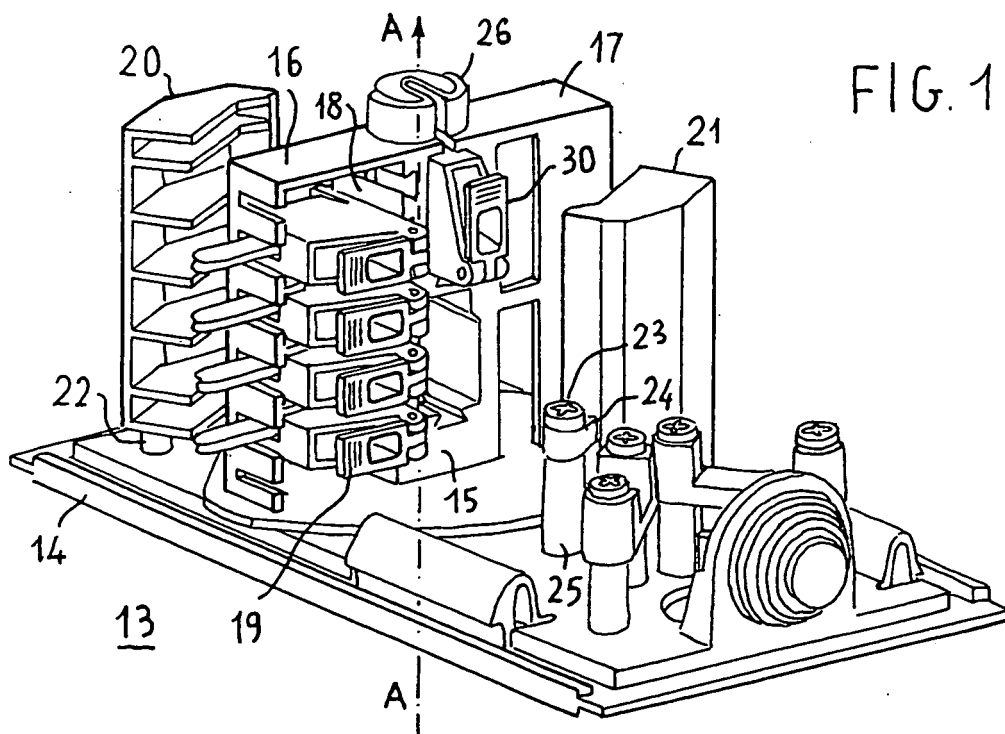
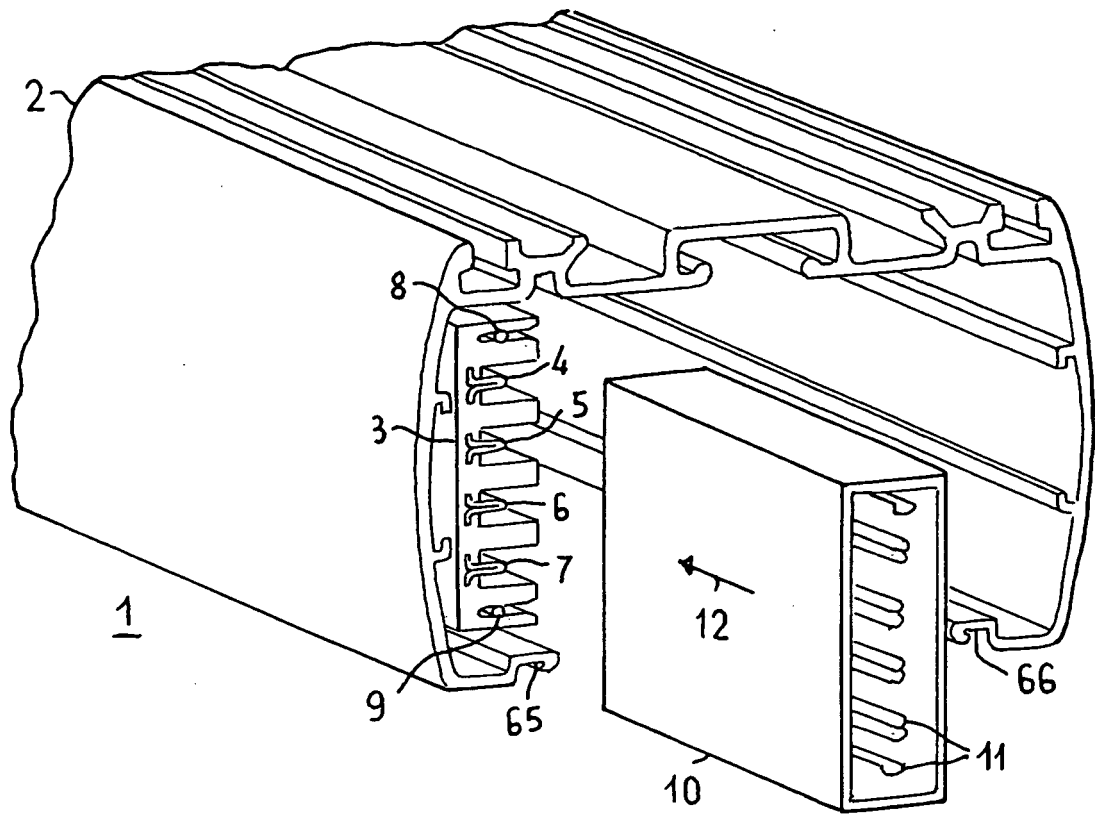
2. Verbinder nach Anspruch 1, umfassend ein Paar Abschirmungen (20, 21), die auf der Grundplatte (14) befestigt sind, wobei diese Abschirmungen die Kontaktzungen (36, 37) der elektrischen Anschlußvorrichtungen (19) aufnehmen, wenn sich der Kontaktkopf in der Einführposition befindet.
3. Verbinder nach Anspruch 1 oder 2, wobei der mittlere Körper (15) ein Gehäuse (32) zum lösbaren Einsetzen einer elektrischen Anschlußvorrichtung (38) bereitstellt, wobei die Vorrichtung mit einer Kontaktzunge versehen ist, die in Klemmen, die durch einen von dem mittleren Körper (15) getragenen Erdungskontakt (26) gebildet sind, eingeführt wird.
4. Verbinder nach einem der vorhergehenden Ansprüche, umfassend ein Paar Sicherungskontakt- und Halteklemmen (44, 45), die auf dem mittleren Körper (15) befestigt sind, wobei eine (45) der Klemmen mit einer elektrischen Anschlußvorrichtung (49) verbunden ist, die in ein in dem mittleren Körper (15) ausgebildetes Gehäuse (51) eingesetzt ist.

Revendications

1. Connecteur électrique pour une piste de distribution de courant, comprenant une plaque de base (14) pour encliqueter ladite piste ainsi qu'une tête de contact montée à pivotement sur ladite plaque de base par rapport à un axe de rotation (A-A) perpendiculaire à la plaque de base (4), dans lequel la tête de contact peut être placée dans une position de contact et dans une position d'insertion, ladite tête de contact comprenant un corps central (15) et deux ailes (16, 17) qui s'étendent radialement et symétriquement à partir dudit corps central (15) pour supporter une pluralité de dispositifs de connexion électriques (19) pourvus d'au moins une lame de contact (36, 37), ladite plaque de base étant pourvue d'au moins une ouverture (70) pour le passage de câbles électriques, ladite ouverture étant décalée par rapport à l'axe de rotation de ladite tête de contact, **caractérisé par le fait que** lesdites ailes (16, 17) sont identiques l'une à l'autre, à symétrie axiale par rapport à l'axe de rotation (A-A) de ladite tête de contact et présentent chacune une pluralité identique de logements (18) pour l'insertion amovible desdits dispositifs de connexion

électriques (19).

2. Connecteur selon la revendication 1, comprenant une paire d'écrans (20, 21) montés sur ladite plaque de base (14), ces écrans logeant les lames de contact (36, 37) des dispositifs de connexion électriques (19) lorsque ladite tête de contact se trouve dans la position d'insertion.
3. Connecteur selon la revendication 1 ou 2, dans lequel le corps central (15) fournit un logement (32) pour l'insertion amovible d'un dispositif de connexion électrique (38), ledit dispositif étant pourvu d'une lame de contact qui est insérée dans des pinces formées par un contact de terre (26) supporté par ledit corps central (15).
4. Connecteur selon l'une quelconque des revendications précédentes, comprenant une paire de pinces de contact fusible et de retenue (44, 45) montées sur ledit corps central (15), l'une (45) desdites pinces étant connectée à un dispositif de connexion électrique (49) inséré dans un logement (51) formé dans ledit corps central (15).



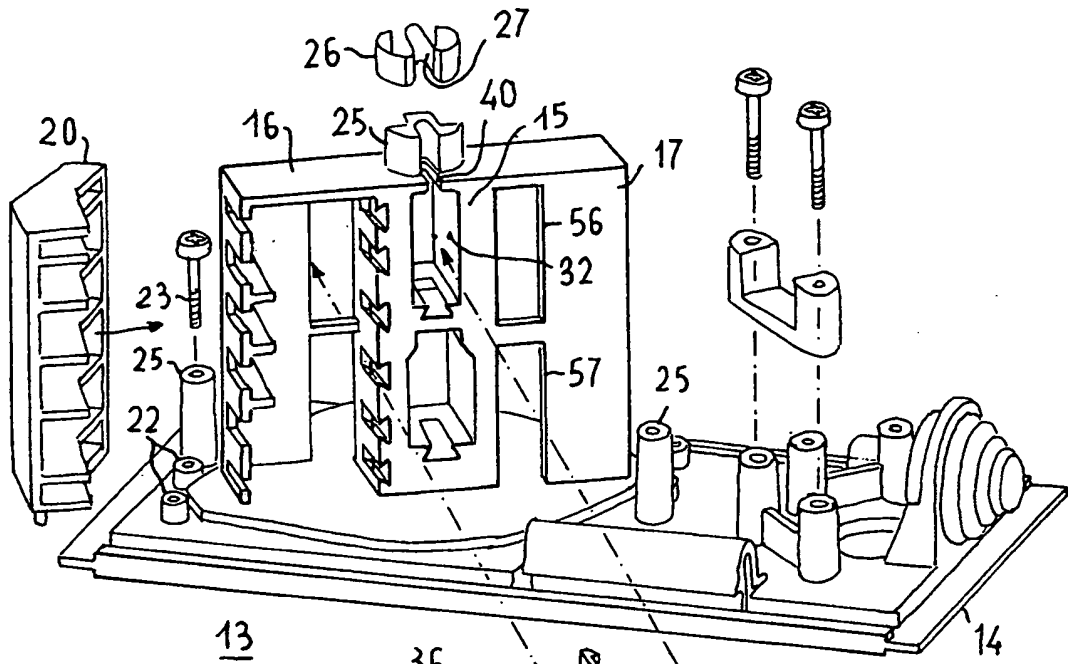


FIG. 2

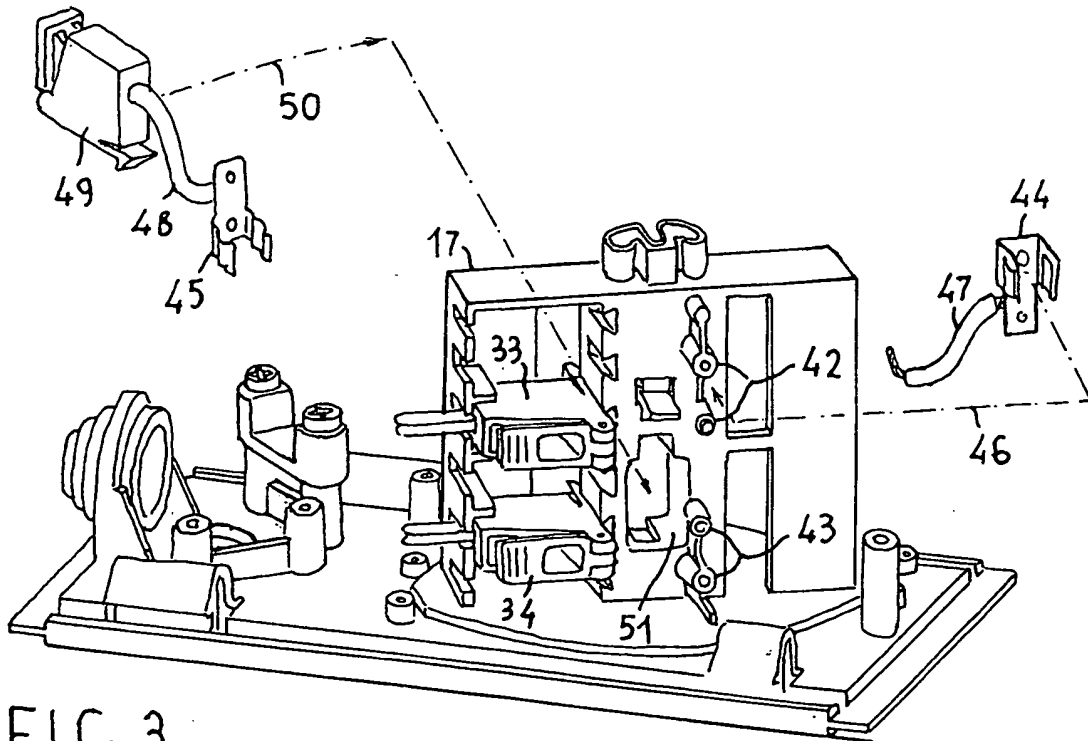


FIG. 3

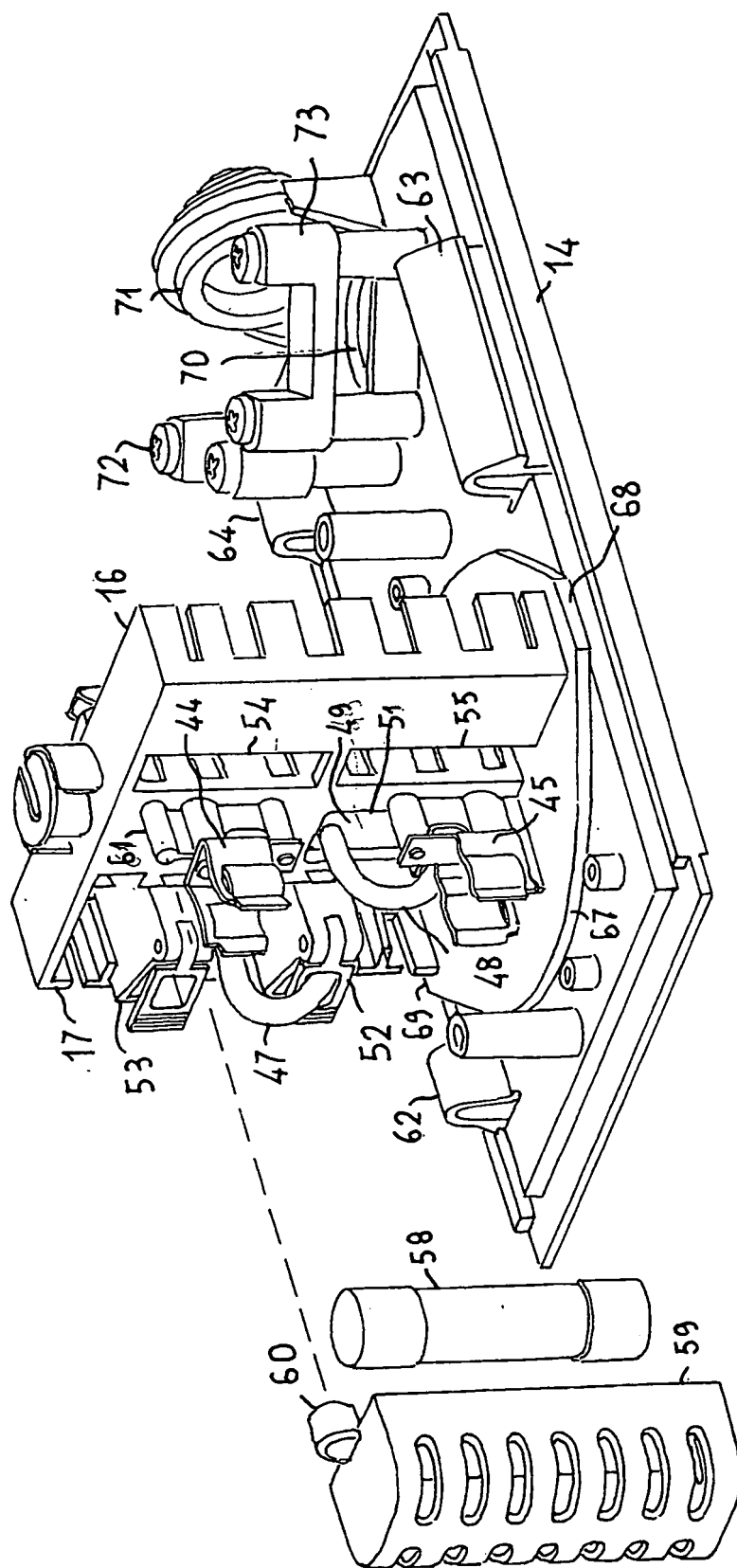


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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