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(54) **A screwless terminal assembly**

(57) The screwless terminal assembly in accordance with this invention is capable of receiving conductors on substantially opposite directions in a same plane and releasing said conductors with a single release mechanism. In a preferred embodiment, the screwless terminal comprises a single release lever mechanism (4) capable

of being actuated on mutually opposite directions to facilitate independent release of two different conductors. The release lever is pivoted about an axis of rotation (5) and is used for releasing the conductor on both sides on the same plane. The release lever mechanism is capable of automatically returning to its rest position once the force applied on it is withdrawn.

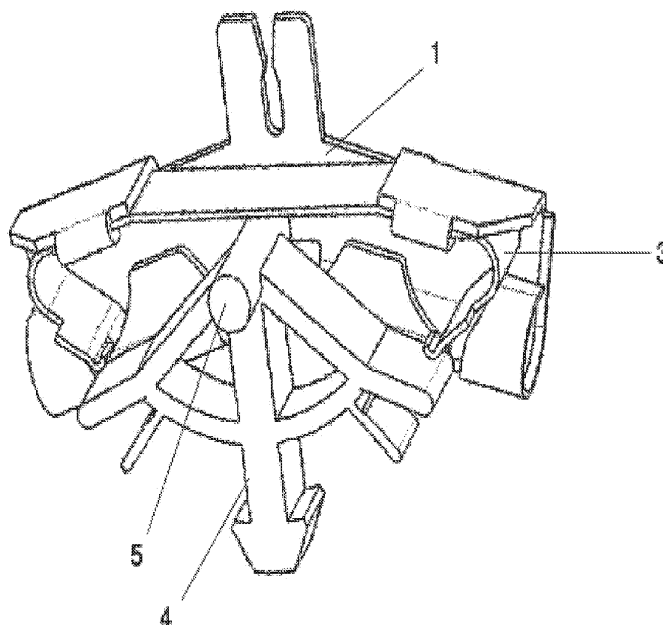


Fig. 1

Description

Field of Invention

[0001] The present invention relates to a screwless terminal assembly capable of receiving conductors on substantially opposite directions in a same plane and releasing said conductors with a single release mechanism.

Background of the Invention

[0002] A screwless terminal is a connecting device for the connection and subsequent disconnection of rigid (solid or stranded) or flexible connector or the interconnection of two or more conductors capable of being dismantled. The connection is made directly or indirectly by means of springs, parts of angled, eccentric or conical form, etc., without special preparation of the conductor concerned, other than removal of insulation. A release lever is used to deform the screwless terminal spring by applying force to release the conductor. The release lever can be actuated manually or with the use of a tool. Normally two release levers are necessary when the conductors are on opposite sides of a screwless terminal.

[0003] Some socket outlets contain screwless terminals on both sides of the socket outlets to facilitate ease of looping. For example, input to socket is given from one side of the terminal and output is taken from the other side for other wiring devices. This saves some wire length. However, this solution is costly, as it requires two separate screwless terminals for each pole. Further, it is not intuitive for the user to make sure that the looping is foolproof. There is a possibility that the user might connect the neutral wire to the live part of the screwless terminal on the output side.

[0004] Also, conventional screwless terminals usually have conductors having a 90° orientation with the socket outlet base, i.e. the conductors are inserted from the same direction. In this case the conductor has to take a 90° turn in the terminal and requires more space in the socket outlet. The conductor has higher stress due to sharp bending and due to the sharp bending there will be undue forces on the screwless terminal spring. In a further conventional assembly, the conductors are arranged at 180° with respect to the socket outlet base. In this case, the conductor does not have any bends. However, the screwless terminal has to project below the socket base to allow conductor entry, which increases the depth of socket outlet. Also, this increases the length of the screwless terminal, as it has to accommodate the minimum length of both conductors from opposite side. In a further conventional assembly, the conductors are arranged 45° to the socket outlet base on the same direction. The conductor for looping is taken from the same side as the input conductor. More space is required below socket outlet and more stresses occur on the conductor for looping.

Objects of the Invention

[0005] It is therefore the object of the invention to provide a screwless terminal that eliminates the need of more than one release lever to release conductors positioned on opposite sides of the screwless terminal.

[0006] It is a further object of the invention to provide a screwless terminal capable of receiving two conductors on the same plane but in substantially opposite direction to be proximal for two drop insertion of wire in the terminal to make it intuitive for loop through connections.

[0007] It is a further object of the invention to provide a screwless terminal that enables proper positioning/seating of flexible and stranded conductors inside the terminal housing.

[0008] It is a further object of the invention to provide a screwless terminal that enables ease of insertion of wire and drastically minimizes stresses on conductor caused due to bending of conductor.

Brief Description of the Invention

[0009] The present invention relates to a screwless terminal capable of receiving conductors on substantially opposite directions in a same plane and releasing said conductors with a single release mechanism.

[0010] In a preferred embodiment, the screwless terminal comprises a single release lever to actuate on opposite sides of the terminal to facilitate independent release of two different conductors. The release lever is pivoted about an axis of rotation and is used for releasing the conductor on both sides on the same plane. The release lever comprises at least two release arms and at least two return arms, wherein, when the lever is pushed from one side, the release arm on the other side actuates a resilient member, such as a release spring, to release the conductor. Thus, the conductor on one side of the terminal is released without affecting the position of the conductor on the other side. When the release lever is pushed from one side, the return arm on the side being pushed is forced against a plastic housing of the terminal and thus creating stress on the pivot member.

[0011] In a related preferred embodiment, upon removing the force on the release lever, the lever automatically reverts to its rest position.

[0012] In a further preferred embodiment, the screwless terminal is configured to insert and secure two conductors on the same plane but on substantially opposite direction, thereby reducing the size and material consumption. Accordingly, the bidirectional conductor entry screwless terminal according to this invention eliminates the need for two separate screwless terminals on the two ends of a socket outlet. The proximity of two drops for wire insertion in the terminal makes it intuitive for the installer to make accurate loop through connections.

[0013] In a further embodiment, the angle between the two conductors inserted into said single screwless terminal on the same plane is between the range of 140° to

170°, preferably 160°. This preferred angle enables ease of insertion of wire and drastically minimizes the stresses on the conductor since bends in the conductor are eliminated.

[0014] The release lever of the instant invention is preferably mounted on the plastic housing of the terminal. Alternatively, the pivoting member of the release lever can be depressed into a recess in the screwless terminal housing. The recess is configured to expand and hold the pivoting member of said release lever.

[0015] In a further embodiment, the terminal housing has a slot provided to make a knife-edge contact with a rail. This integrated provision in the terminal housing to have contact with the rail eliminates the need for secondary operations such as welding, crimping, riveting etc. The assembly between the rail and the terminal housing can happen in the assembly line, where, the screwless terminal is assembled first on the socket outlet and the rail is then pushed inside the slot formed on the terminal.

[0016] In a further embodiment, a stopping means is provided in the Plastic housing of the terminal assembly to prevent the conductor from entering beyond a predetermined limit. This ensures that an extra length of the wire does not interfere with other unintended components and their functions.

[0017] The screwless terminal preferably has a tubular housing to enable proper positioning and seating of the flexible and stranded conductors inside the terminal housing.

[0018] Accordingly, a screwless terminal assembly according to the present invention comprises: a terminal housing configured to receive two conductors on substantially opposite sides of said terminal in substantially the same plane; a resilient member contained within said terminal housing to hold said conductors in position when inserted; and a pivoted release lever mechanism configured to actuate in two mutually opposite directions in the same plane such as to release one of said two conductors without releasing the other conductor.

[0019] In a preferred embodiment, the release lever mechanism in accordance with the present invention comprises: a mounting means configured to be a pivot point for said mechanism; a first release arm extending from said mounting means towards a first conductor housing and positioned to actuate said resilient member close to said first conductor housing; a second release arm extending from said mounting means towards a second conductor housing and positioned to actuate said resilient member close to said second conductor housing; a main arm extending perpendicularly downward from said mounting means and capable of being laterally actuated to facilitate said first or second release arms to actuate said resilient member; a first arcuate support portion extending from said main arm to said first release arm; a second arcuate support portion extending from said main arm to said second release arm; and a first and second return arms extending downwardly from said first and second arcuate support portion respectively, and

being capable of automatically bringing said mechanism to its rest position when said main arm is de-actuated.

Brief Description of the Drawings

[0020] Referring now to the drawings wherein the showings are for the purpose of illustrating a preferred embodiment of the invention only, and not for the purpose of limiting the same: -

Figure 1 shows the screwless terminal comprising the release lever mechanism according to the present invention;

Figure 1a shows the de-actuated position of the release lever;

Figure 1b shows the actuated position of the release lever to release the conductor;

Figure 2a shows the construction of the release lever according to the present invention;

Figure 2b shows the assembly of the release lever with the terminal housing;

Figure 3 shows the mounting of the release lever in the plastic housing of the terminal assembly according to a preferred embodiment of the present invention;

Figure 4a and 4b show the assembly of the release lever on the terminal housing according to a preferred embodiment of the present invention;

Figure 5a shows the angular construction of the terminal assembly in accordance with a preferred embodiment of the present invention;

Figure 5b shows the construction of the terminal housing according to the present invention;

Figure 5c shows the tubular housing configuration of the terminal assembly according a preferred embodiment of the present invention;

Figure 6 shows the construction of a resilient member, which can be fitted into the terminal housing;

Figure 7 shows the rear view of the screwless terminal housing;

Figure 8 shows a sectional view of the screwless terminal assembly with the release lever according to the present invention;

Figure 9 shows the bidirectional conductor entry into the screwless terminal according to the present in-

vention;

Figure 10a-10c shows the assembly of the screwless terminal and the rail according to a preferred embodiment of the present invention; and

Figure 11 shows another cross sectional view of the screwless terminal assembly according to the present invention.

Detailed Description of the Invention

[0021] The screwless terminal assembly according to the present invention as illustrated in figure 1 comprises a housing (1) which is preferably attached to the plastic housing (2) of socket unit or the like. The housing (1) houses a resilient member (3), such as a spring or the like, and the release lever assembly (4). As illustrated in figure 1b the release lever mechanism (4) in accordance with the invention can be pushed from one direction to release the conductor from the opposite side of the terminal. Upon releasing the pressure, the release lever mechanism automatically returns to its rest position as shown in figure 1 a. The release lever assembly and the construction of the terminal housing in order to achieve the above-mentioned function will now be explained.

[0022] The release lever mechanism (4) and the functioning of the release lever assembly in the terminal housing are illustrated in figures 2a and 2b. The release lever mechanism (4) comprises a cylindrical pivot member (5) used to mount the release lever mechanism (4) with the screwless terminal housing or with the plastic housing of a socket unit or the like depending on the design and space constraints. The cylindrical pivot member (5) serves as a pivot point for the release lever mechanism (4). Release arms (6a, 6b) are provided to extend from the pivot member (5) on opposite sides in a manner such that they are positioned to actuate the screwless terminal spring (3) when a main arm (8) of the release lever mechanism (4) is laterally pushed. The main arm (8) is pivoted since it extends perpendicularly downwardly from said pivot member (5), and it provides the necessary motion to the release arms (6a, 6b) when actuated. The terminal spring (3) in connection with the first release arm (6a) is actuated by the first release arm (6a) to release the conductor housed in its conductor housing (11a) when the main arm (8) is pushed in the positive 'x' direction. Similarly, the terminal spring (3) in connection with the second release arm (6b) is actuated by the second release arm (6b) to release the conductor housed in the conductor housing (11 b) when the main arm (8) is pushed in the opposite direction. A first arcuate support (14a) extends from the main arm (8) to provide structural rigidity to the first release arm (6a). A second arcuate support (14b) extends from the main arm (8) to provide structural rigidity to the second release arm (6b). A second return arm (9b) extending from the second arcuate support (14b) is depressed against the plastic housing when the

main arm (8) is pushed in the positive 'x' direction to facilitate the release of the conductor from the housing (11a). Similarly, a first return arm (9a) extending from the first arcuate support (14a) is depressed against the plastic housing when the main arm (8) is pushed in the opposite direction to facilitate the release of the conductor from the housing (11 b). Thus, upon releasing the force on the main arm (8) the pressure on the first or second return arm (9b, 9a), depending upon the direction of force applied on the main arm, facilitates in bringing back the release lever mechanism (4) to its rest position. Figures 1 a and 1 b shows the de-actuated and actuated positions of the release lever assembly. The first and second return arms (9b, 9a) are formed with respective hinge-like portions (7b, 7a) to give flexibility to return to the rest position about this point. A main arm grip (10) is provided partially on the main arm (8) to offer a gripping surface when the main arm is being pushed. The main arm (8) may be pushed manually or by using a tool, such as a screwdriver, or any other appropriate tool.

[0023] The above construction of the terminal housing and release lever assembly facilitates release of conductors on substantially opposite sides of the terminal independently of each other using a single release lever assembly.

[0024] Where there is a space constraint, the release lever assembly (4) described above is mounted on the plastic housing (2) of the socket assembly as illustrated in figure 3. Alternatively, the release lever assembly can also be mounted to the screwless terminal as shown in figure 4b. The cylindrical pivot member is snapped into recesses (13) formed in the terminal housing (1) as clearly shown in figure 4a. These recesses (13) expand and hold the cylindrical pivot member (5).

[0025] The screwless terminal assembly in accordance with the invention is illustrated separately in figures 5a and 5b. The construction of the screwless terminal assembly is such that the terminal housings are on substantially opposite sides on the same plane separated by an angle of about 140° to 170°, preferably about 160° as shown in figure 5a. This angular orientation of the terminal housings enables ease of insertion of conductors and drastically reduces the stresses, which is usually caused due to bending of the conductor. Thus, a single terminal is sufficient to receive two conductors on the same plane. The terminal assembly comprises at least two tubular conductor housings (11a, 11 b) spaced apart from each other at an angle of preferably 160° as mentioned above. The tubular housing construction of the terminal assembly is illustrated in figure 5c. The tubular housing configuration enables efficient insertion, positioning and seating of the conductors, both flexible and stranded, inside the terminal housing.

[0026] With reference to figure 5b, the terminal housing (1) comprises a sub assembly feature (15) adjacent to each of the tubular conductor housings (11a, 11b). The feature (15) is assembled after positioning the Terminal Spring (3) inside the terminal housing. The sub assembly

feature (15) secures the Terminal spring with Terminal housing. The tubular conductor housings (11a, 11 b) have a chamfer shaped entry portion (16) to facilitate ease of entry of the conductor. A recess (17) is provided for aiding the assembly of Screwless terminal spring (3) into terminal housing (1). While assembling the Screwless terminal spring into terminal housing, the arms (20) are flexed outwards & pushed inside the recess (17) on both sides. A slot (18) for knife-edge contact with a rail is provided on a protrusion (19) in the terminal housing (1). This slot (18) serves as an integrated feature in the terminal housing for a mechanical connection with the rail.

[0027] The terminal resilient member, preferably a spring (3) is illustrated in figure 6. The spring (3) is generally of a single piece construction made of suitable material with a flexible bend on both sides to provide the spring action. Locators (19) are provided in the spring (3) to be positioned and locked, preferably fitted in the bent assembly feature (15 of fig 5b) of the terminal housing. An arm (20) is provided in each of the flexible bend of the spring (3) to press the conductor against the terminal housing, thus maintaining contact pressure. A bent arm (21) is provided in each of the flexible bend of the spring (3), which will become depressed by the release lever during a releasing operation of the conductor. A spring locating slot (22) is provided on the terminal housing as shown in figure 7. The spring locating slot (22) is configured to securely latch the spring onto the terminal housing (1).

[0028] A fully assembled sectional view of the terminal housing assembly (1) is shown in figure 8, where the release lever (4) is in the actuated position. In its actuated position, the release arm (6a) is configured to displace the bent arm (21) portion of the terminal spring (3) from its normal position to facilitate the release of the conductor from the tubular conductor housing (11a). The Resilient property of terminal spring (3) will bring it back to its original position once the force on the release lever (4) is removed. Also the resilient arm (21) of terminal spring (3) forces the release arm (6a) of the release lever (4) to bring it back to its original position. The Release lever (4) is free to play inside the Pocket (23) when both conductors are inserted in to tubular terminal housing (11 a & 11 b). This is an unfavourable situation as it gives a feeling of loose parts on the Socket outlet. To address this issue, two return arms (9a & 9b) are provided. The actuation of the release lever (4) in the direction shown in figure 8 causes the second return arm (9b) to press against the plastic housing (2) and by releasing the force on the release lever (4) the energy stored in the second return arm (9b) causes the release lever assembly to automatically return to its rest position. Due to Return arms (9a & 9b) the release lever assembly (4) will always remain in its original position unless a sideward force is applied on main arm (8) of release lever (4). The pocket (23) is provided as a limiting means in the plastic housing (2) to limit the main arm (8) from causing over pressing the

screwless terminal spring (3).

[0029] As was described before, the screwless terminal assembly of the instant invention is designed such that it eliminates the need for two separate terminals on the two ends for each pole of the socket outlet. Figure 9 shows the bi directional conductor entry screwless terminal of the invention as provided for a socket. The provision for an input conductor and a conductor for looping are provided on the same terminal assembly (1). Thus, there is provided a single screwless terminal assembly for each of the live, earth and neutral poles of the socket outlet. By this design, since the input and output are in the single screwless terminal and are close to each other, the connections are more intuitive to the installer, whereby the installer does not by accident loop the neutral wire to the live wire.

[0030] Figure 10a shows the isometric view of the terminal assembly integrated with a rail (24). The rail (24) is pushed into the slot (18) in the terminal housing as illustrated in figure 10b. Upon pushing, the material shears due to interference and shape of the slot (18) to form a knife-edge contact with the rail. Figure 10c shows the different views of the terminal housing (1) integrated with the rail (24). The live and neutral contacts (L, N) are positioned on the rail as shown, each terminal having a plug pin recess (25) therein.

[0031] In a further embodiment, a stopping means preferably in the form of a projection (26) is provided on the terminal as shown in figure 11 to prevent the conductor from entering beyond a certain limit to ensure that an extra length of the conductor does not interfere with other unintended parts and functions. While the above paragraphs explain the various embodiments of the invention, it is apparent that numerous modifications and variations can be made without departing from the scope and spirit of this invention. It is therefore intended that this invention be limited only as indicated in the appended claims.

Claims

1. A screwless terminal assembly comprising:

a terminal housing configured to receive two conductors on substantially opposite sides of said terminal in substantially the same plane;
a resilient member contained within said terminal housing to hold said conductors in position when inserted; and
a pivoted release lever mechanism configured to actuate in two mutually opposite directions in the same plane such as to release one of said two conductors without releasing the other conductor.

2. The screwless terminal assembly as claimed in claim 1, wherein said two conductors are inserted at an angle of about 140° to 170° from each other in sep-

- arate conductor housings.
3. The screwless terminal assembly as claimed in claim 2, wherein said angle is preferably about 160°.
 4. The screwless terminal assembly as claimed in claim 2, wherein said conductor housings are tubular housings.
 5. The screwless terminal assembly as claimed in claim 2, wherein said resilient member is secured with sub assembly feature in said housing and extends across said terminal housing towards said conductor housings.
 6. The screwless terminal assembly as claimed in claim 1, wherein said release lever mechanism comprises:
 - a mounting means configured to be a pivot point for said mechanism;
 - a first release arm extending from said mounting means towards a first conductor housing and positioned to actuate said resilient member proximal to said first conductor housing;
 - a second release arm extending from said mounting means towards a second conductor housing and positioned to actuate said resilient member proximal to said second conductor housing;
 - a main arm extending perpendicularly downward from said mounting means and capable of being laterally actuated to facilitate said first or second release arms to actuate said resilient member;
 - a first arcuate support portion extending from said main arm to said first release arm;
 - a second arcuate support portion extending from said main arm to said second release arm;
 - and
 - a first and second return arms extending downwardly from said first and second arcuate support portion respectively, and being capable of automatically bringing said mechanism to its rest position when said main arm is de-actuated.
 7. The screwless terminal as claimed in claim 6, wherein a grip is provided partially on said main arm.
 8. The screwless terminal assembly as claimed in claim 6, wherein said first and second return arm comprises a first and second return arm hinge respectively providing flexibility to the mechanism to automatically return to its rest position.
 9. The screwless terminal assembly as claimed in claim 6, wherein said release lever mechanism is pivotably arranged on said terminal housing.
 10. The screwless terminal assembly as claimed in claim 6, wherein said release lever mechanism is pivotably arranged on a plastic housing of an electrical unit.
 11. The screwless terminal assembly as claimed in claim 1, wherein said terminal housing has a provision to make a knife-edge contact with a rail.
 12. The screwless terminal assembly as claimed in claim 11, wherein said provision is an integrated slot in said terminal housing into which said rail is pushed.
 13. The screwless terminal assembly as claimed in claim 9 & 10, wherein a limiting means is provided to prevent excess lateral movement of said main arm.
 14. The screwless terminal assembly as claimed in claim 1, comprising a stopping means to prevent the conductor from entering beyond a predetermined limit.

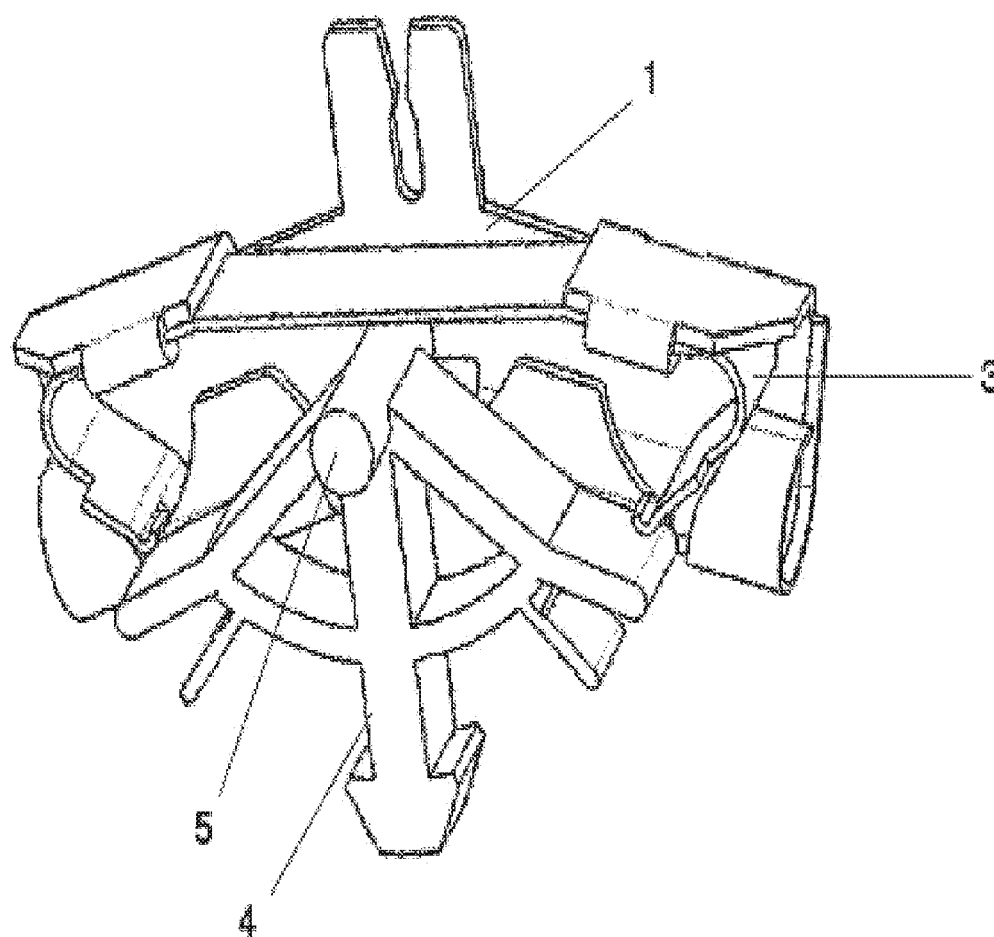


Fig. 1

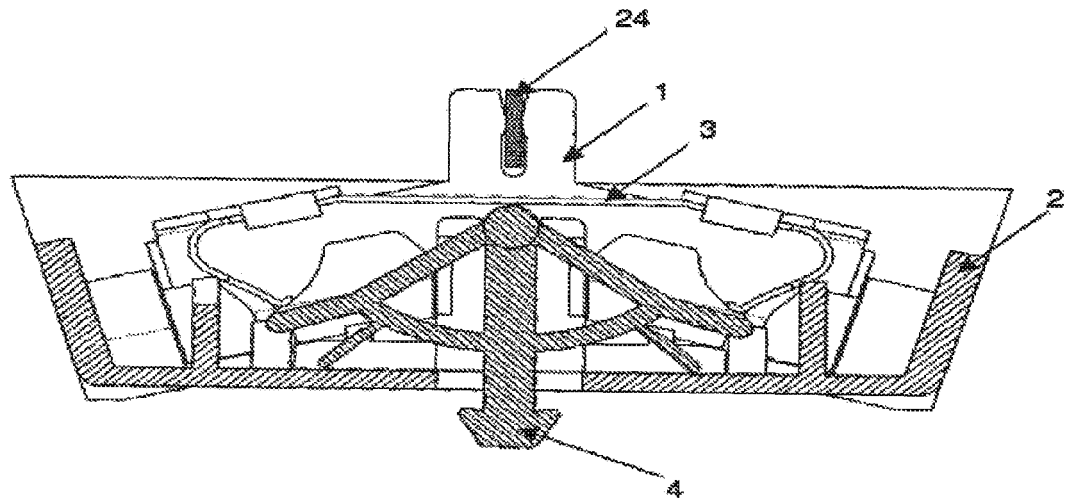


Fig. 1a

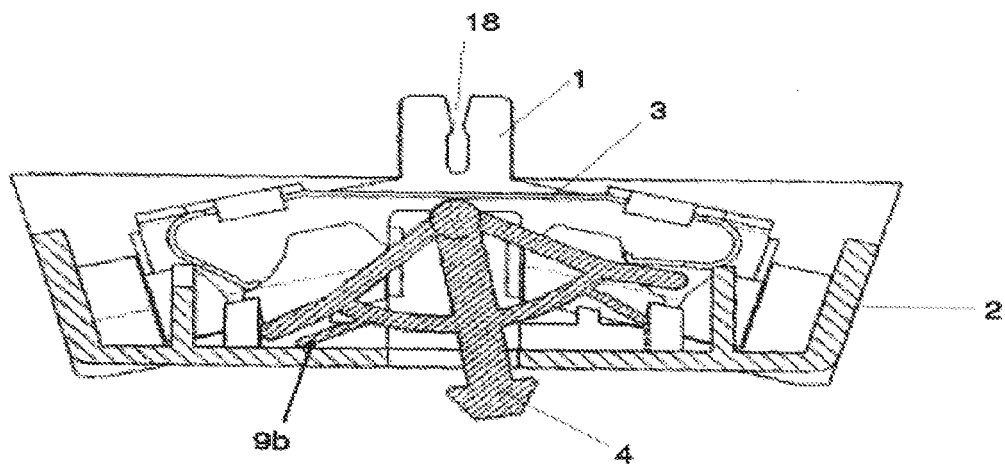


Fig. 1b

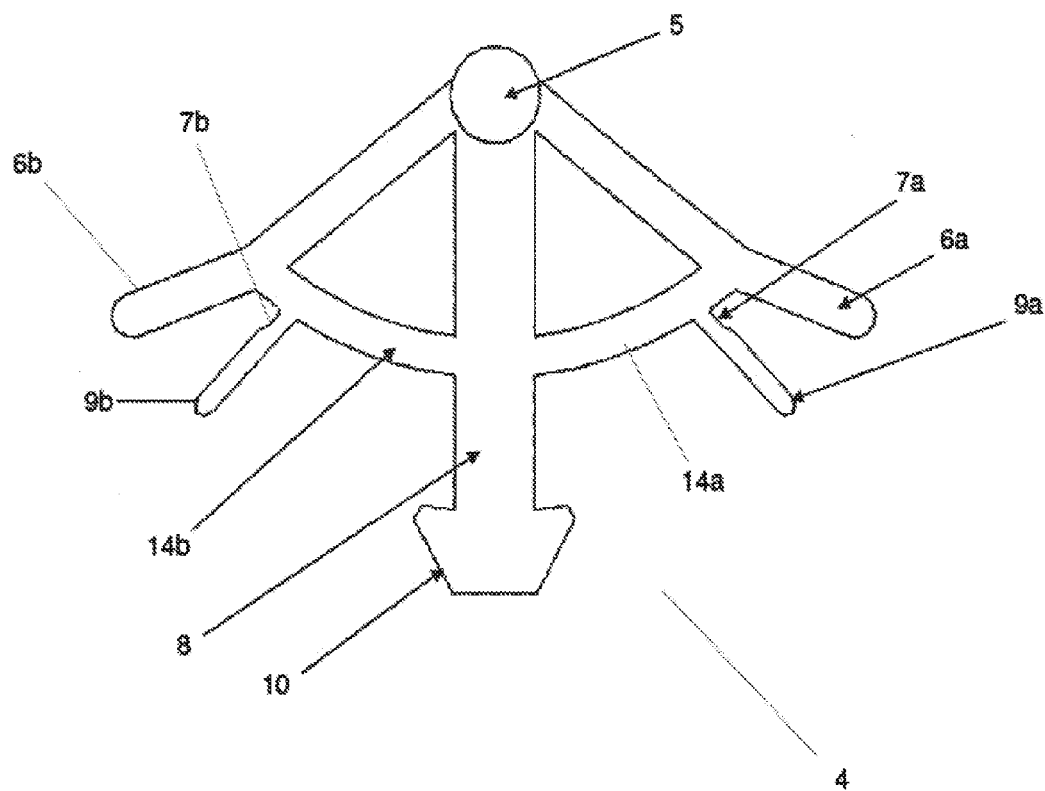


Fig. 2a

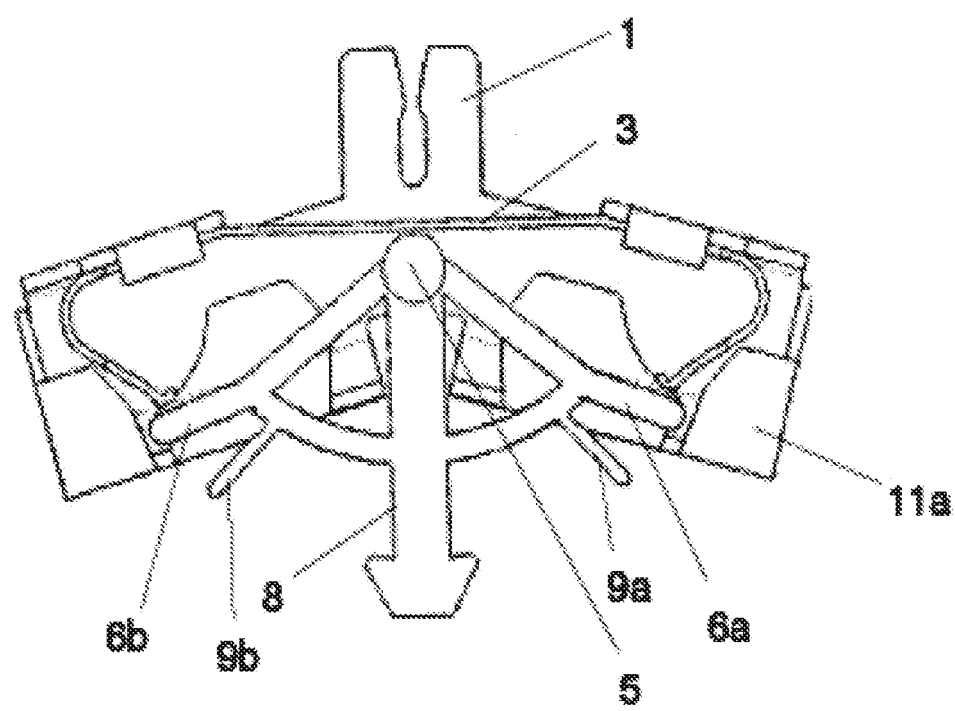


Fig. 2b

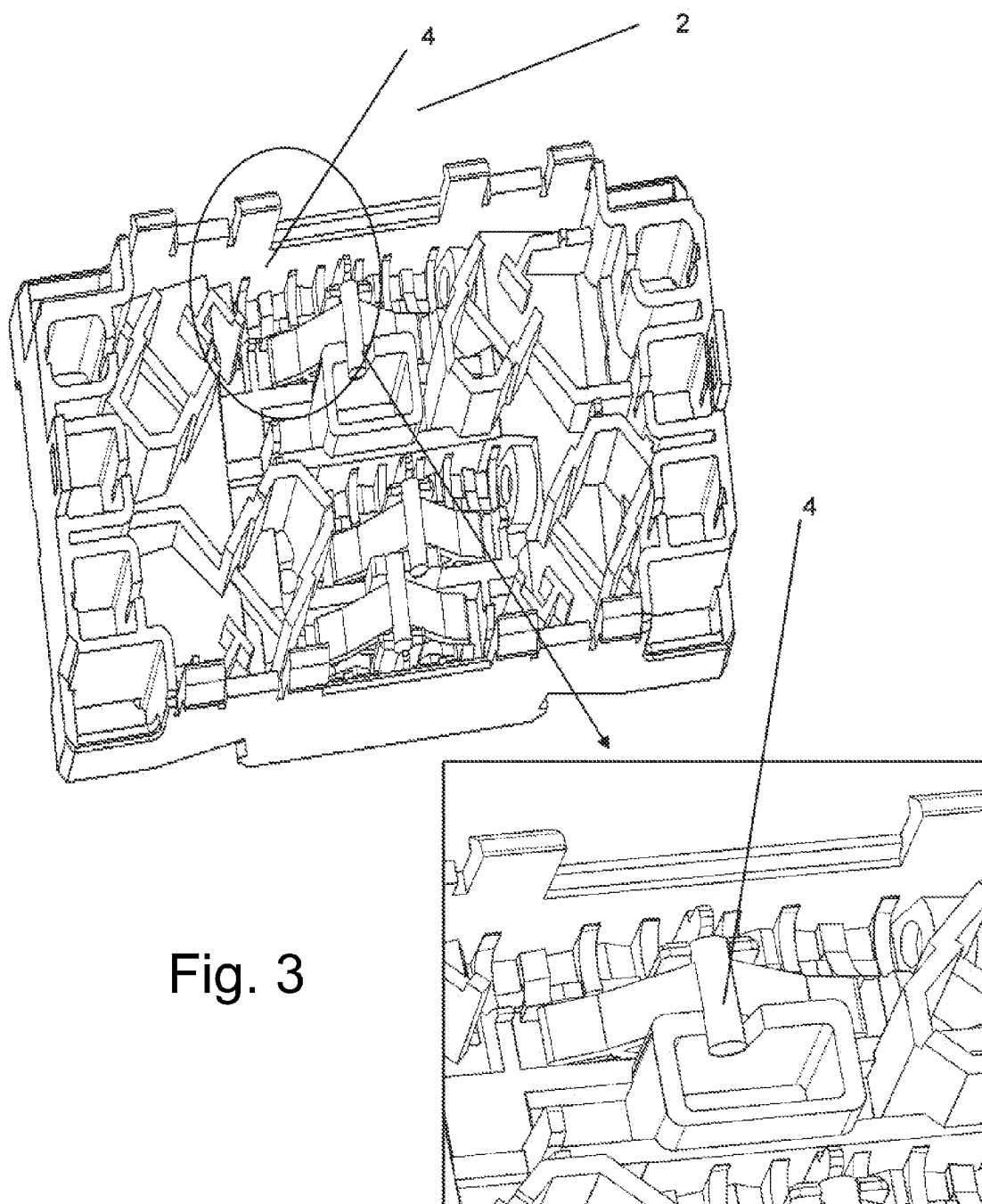


Fig. 3

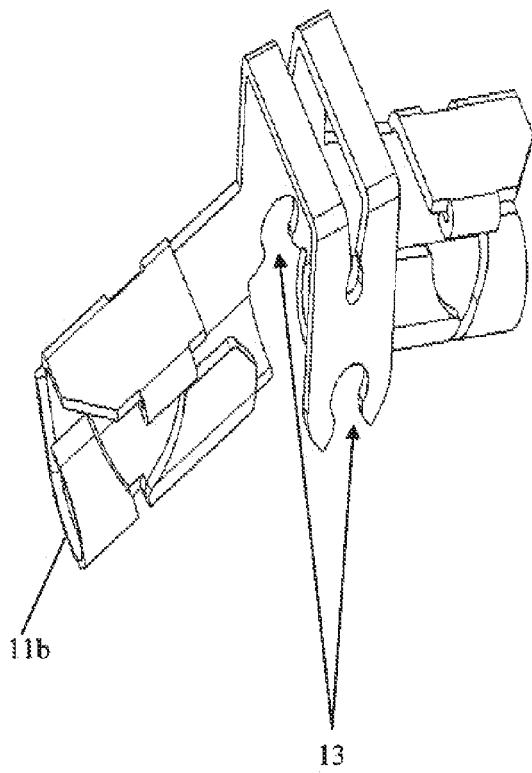


Fig. 4a

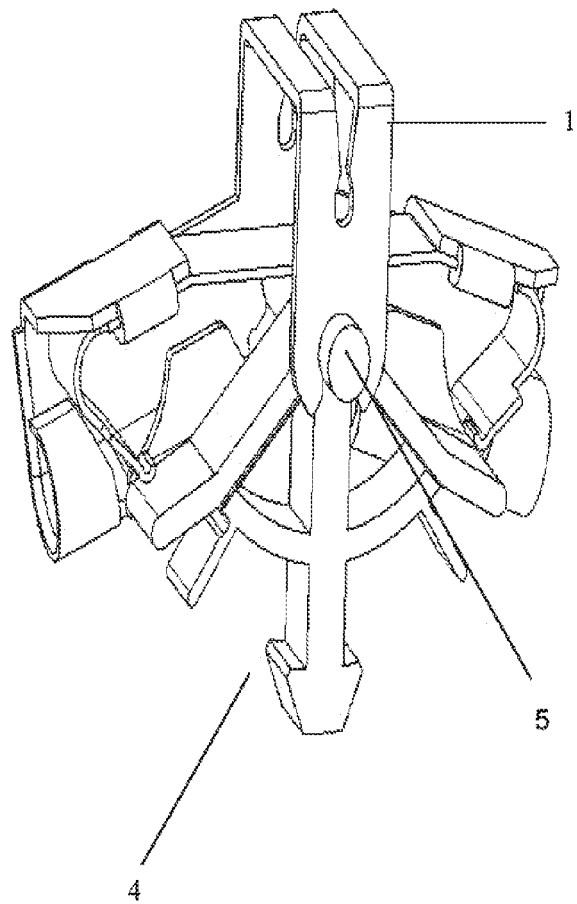


Fig. 4b

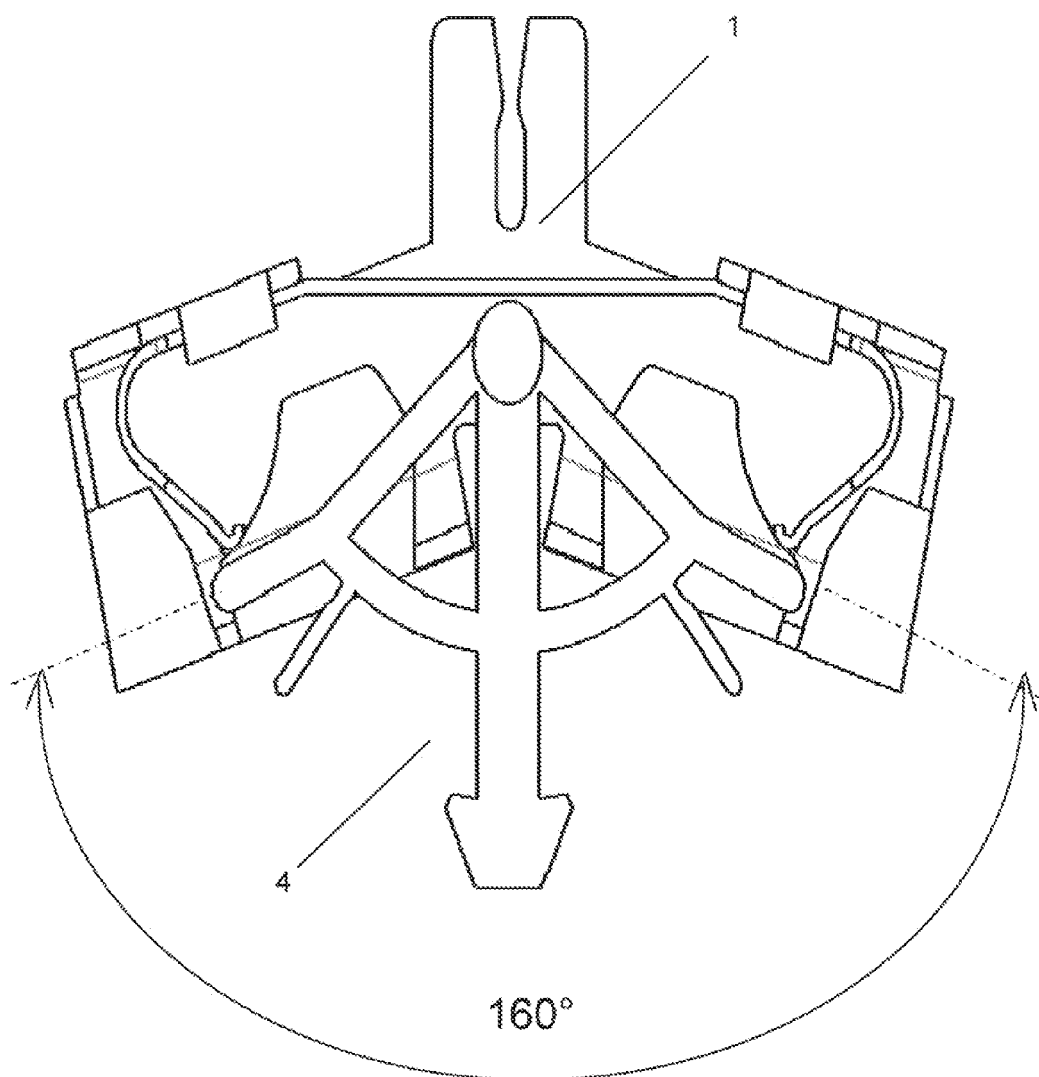


Fig. 5a

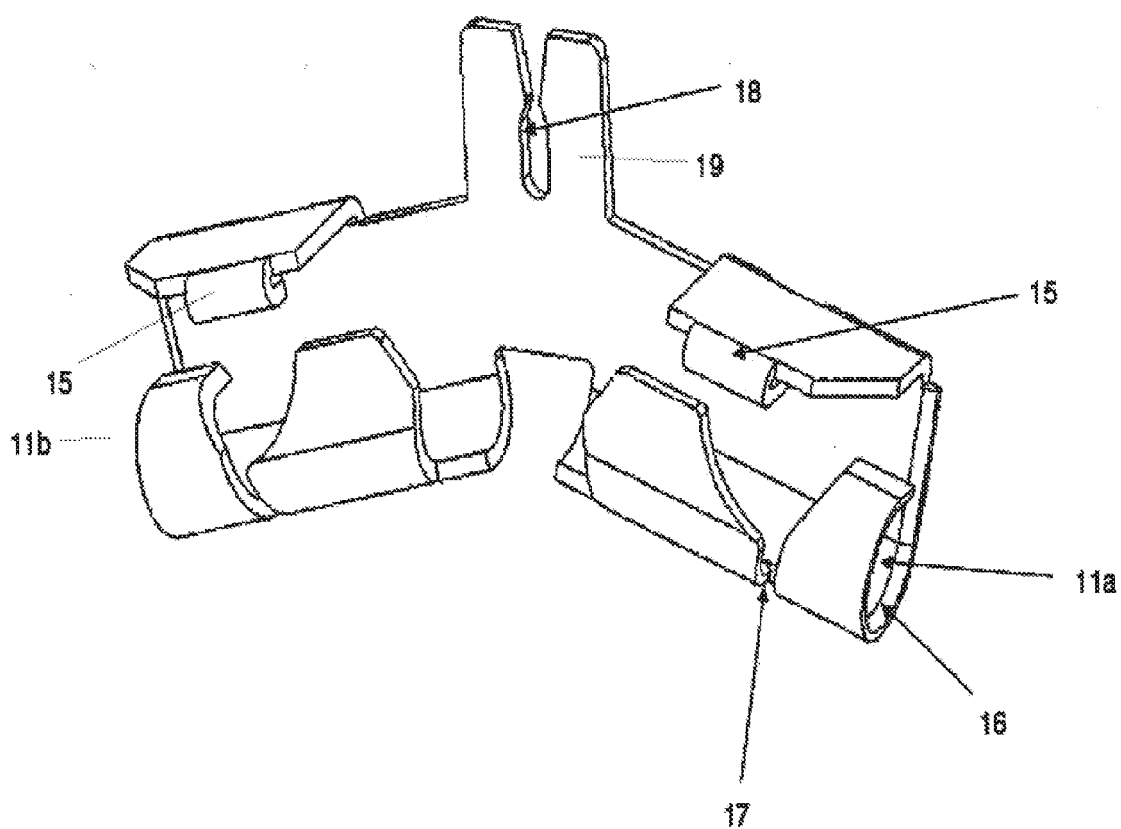


Fig. 5b

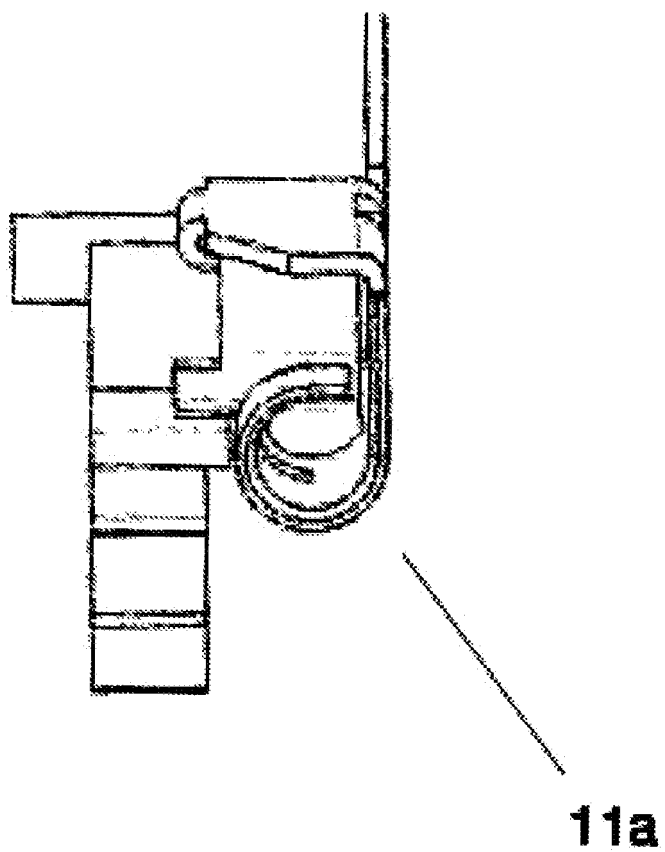


Fig. 5c

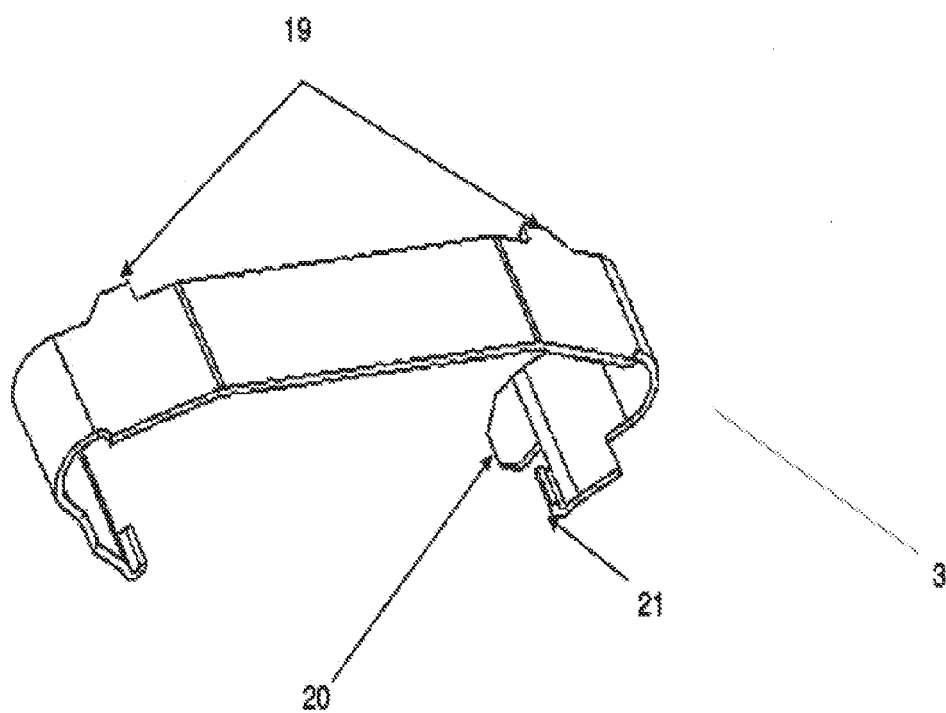


Fig. 6

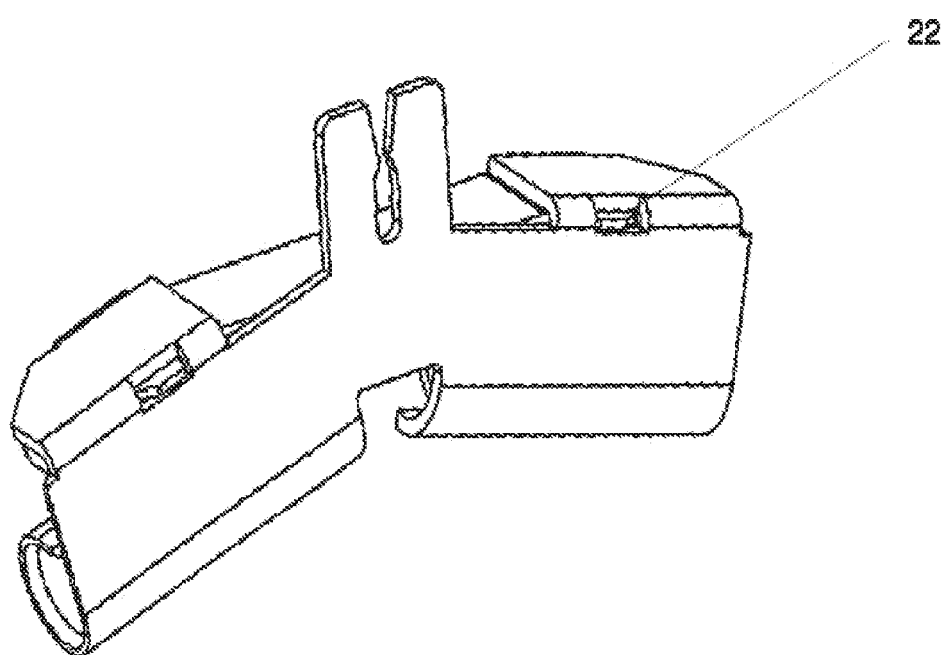


Fig. 7

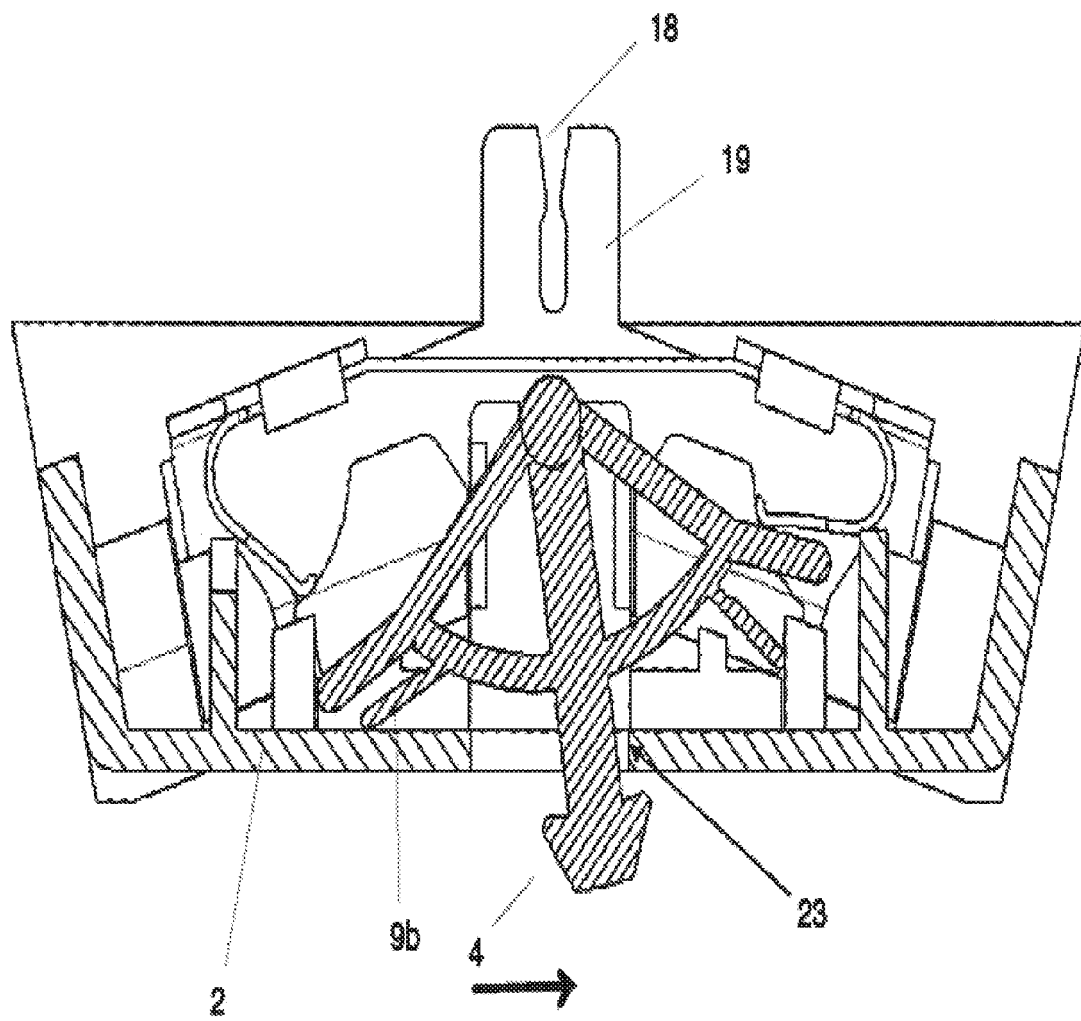


Fig. 8

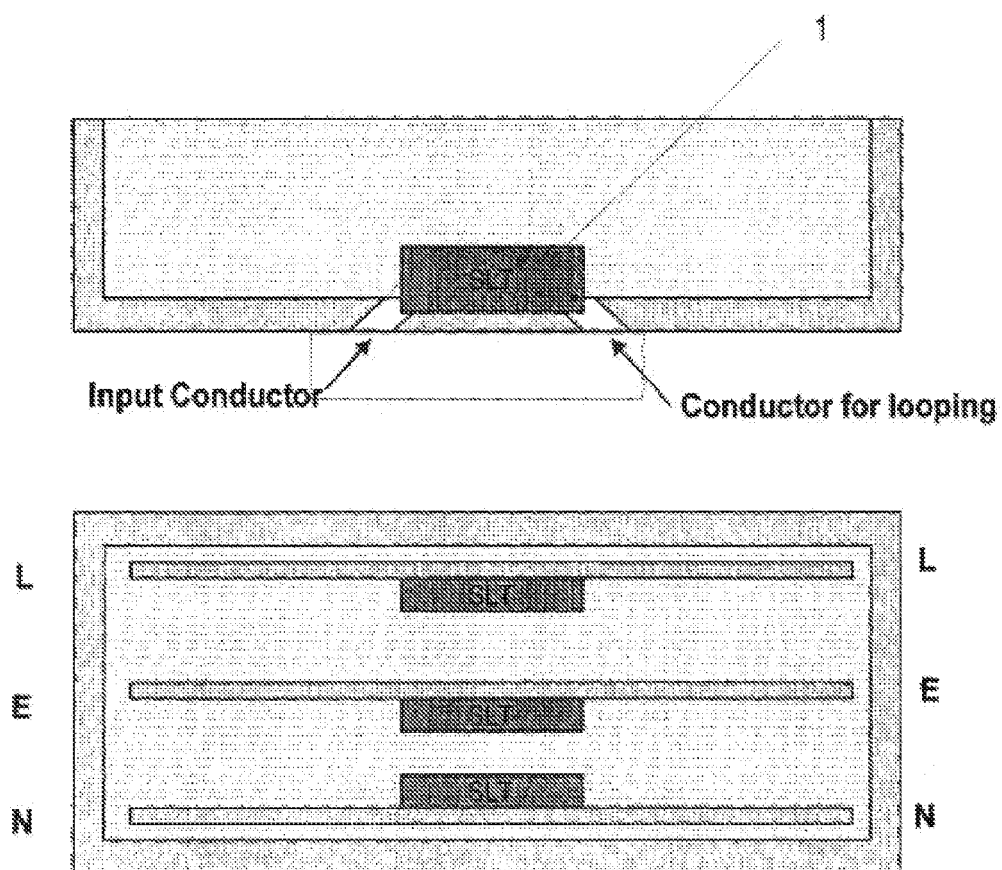


Fig. 9

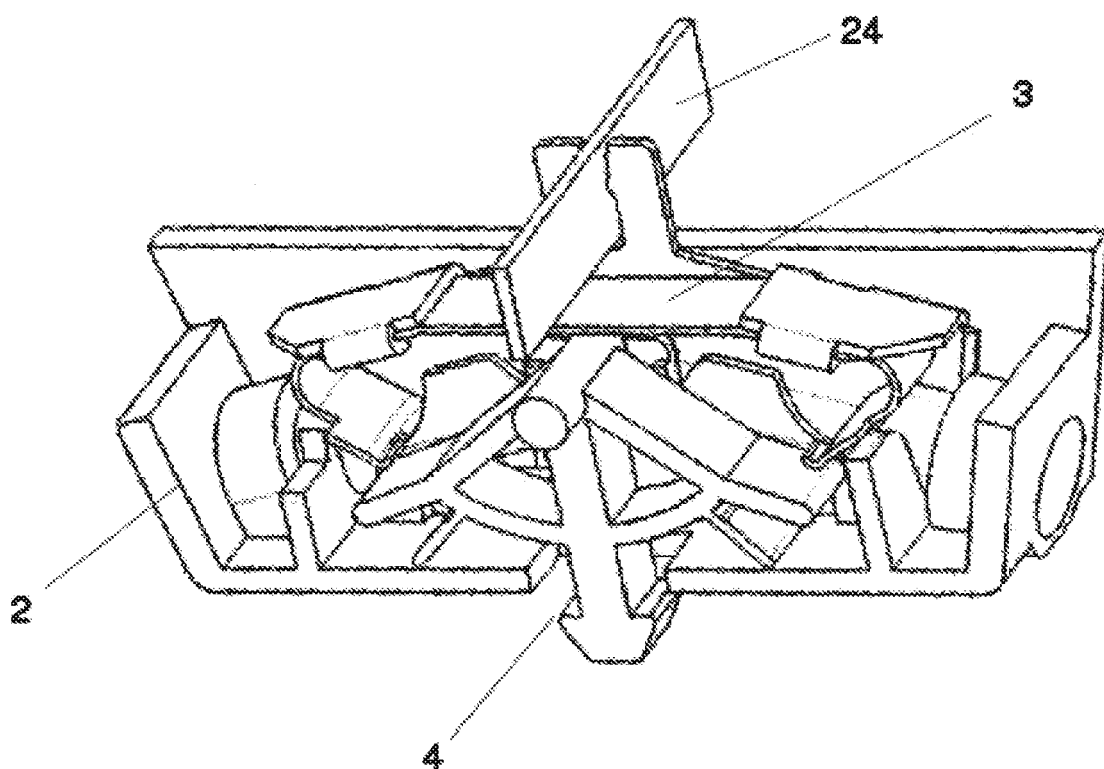


Fig. 10a

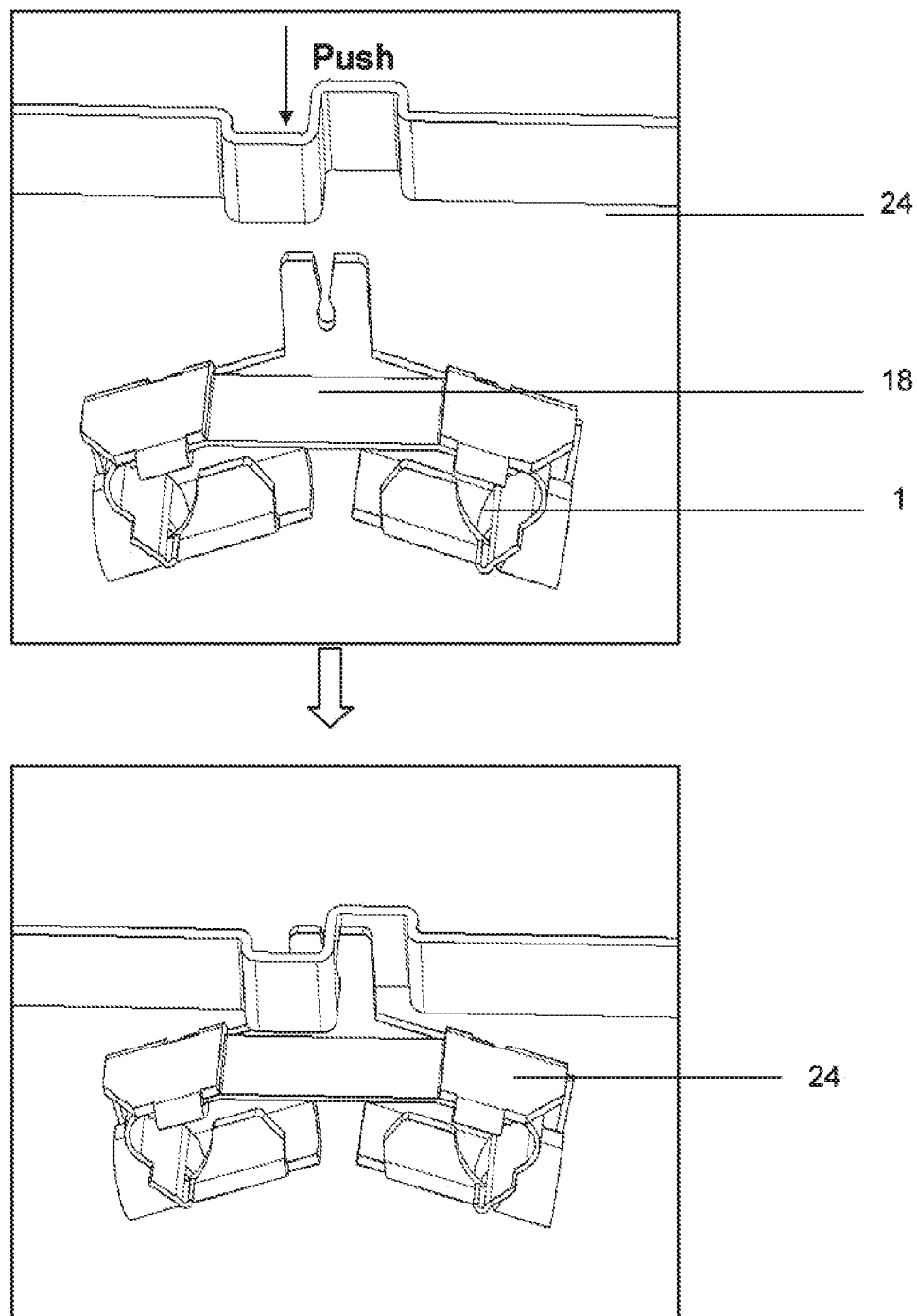


Fig. 10b

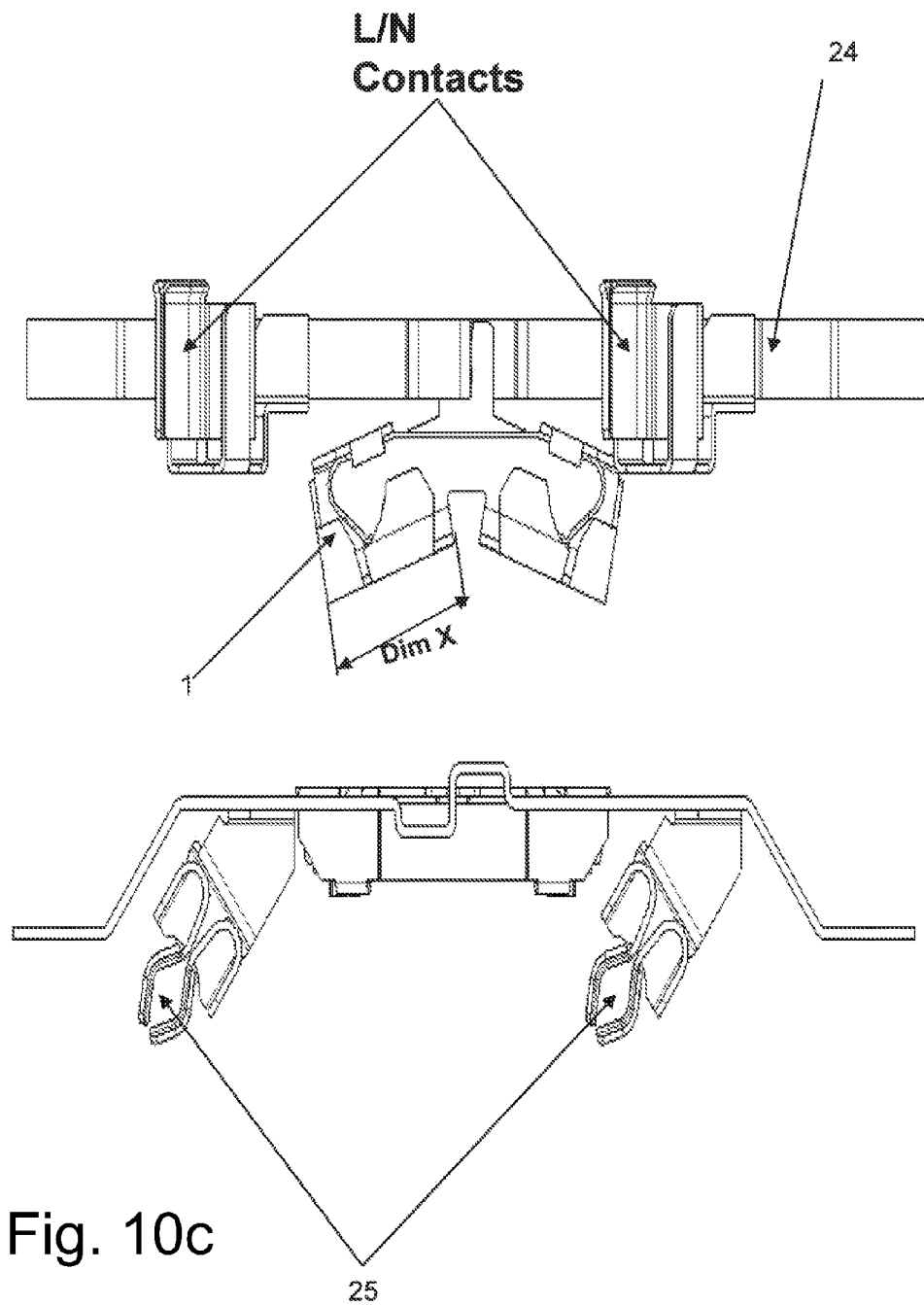


Fig. 10c

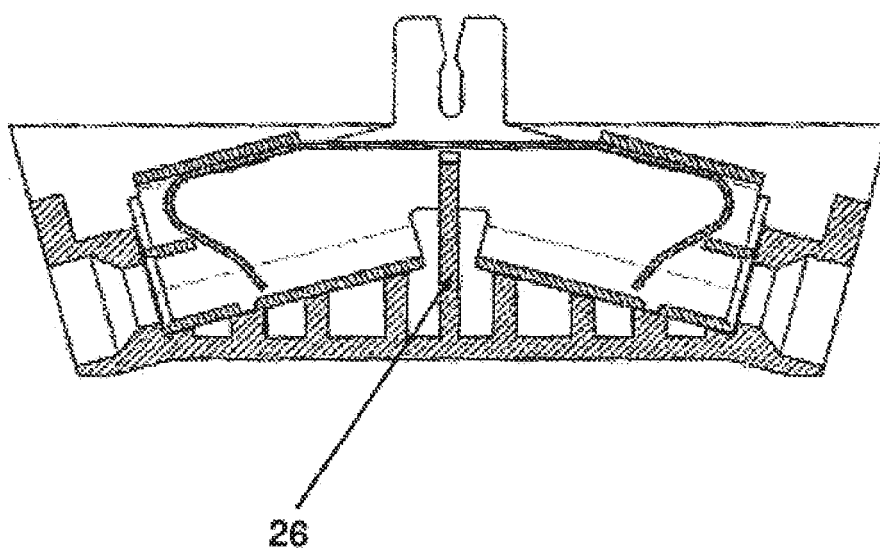


Fig. 11



EUROPEAN SEARCH REPORT

Application Number
EP 11 17 4182

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 76 13 091 U1 (KLEINHUIS FA H) 26 August 1976 (1976-08-26)	1-5,14	INV. H01R4/48
Y	* figure 1 *	11,12	
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Y	* figure 5 *	11,12	
Y	EP 0 833 408 A2 (WEIDMUELLER INTERFACE [DE]) 1 April 1998 (1998-04-01) * figure 4 *	11,12	
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A	DE 199 49 387 A1 (ELECTRO TERMINAL GMBH [AT]; ADELS CONTACT GMBH [DE]) 31 May 2001 (2001-05-31) * figure 1 *	1-5	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 October 2011	Examiner Esmiol, Marc-Olivier
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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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 17 4182

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11-10-2011

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