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(54) **An industrial electric connector with push button for the fast unhooking of the complementary connector**

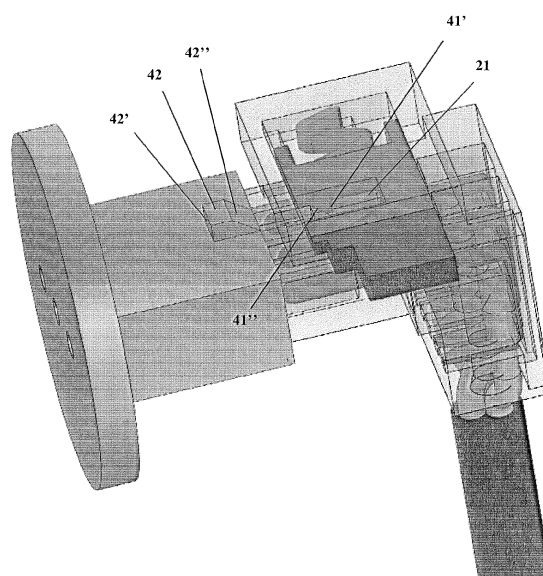
(57) The present invention concerns an electric connector (1) that couples, in a releasable manner, to a complementary electric connector (100).

The electric connector foresees an external casing (2), an electrical plug (4) arranged inside the external casing (2) in such a way so that it can connect with the complementary electric connector (100) with fast hooking means (10). The fast hooking means are suitable for engaging in a releasable manner with relative connection means (42) belonging to the complementary electric connector (100) when the complementary electric connector couples to the electric connector (1).

According to the invention, the fast hooking means (10) comprise:

- A slab (11) assembled slidingly with respect to the electrical plug (4);
- Elastic means (16,216) arranged in such a way as to push an end (11') of the slab (11) outside the casing (2) through an opening (50) found in the casing and;
- An engaging element (41) arranged in the slab so that it can engage in contrast against a complementary element (42) belonging to the complementary electric connector (100) when the complementary electric connector (100) is inserted in the electrical plug (4), and it can disengage from said complementary tooth (42) when the slab (11) is made to slide with respect to the electrical plug (4) through a crushing exerted on the end of the slab exiting from the casing (2).

FIG. 13



Description

Technical field

[0001] The present invention concerns the technical field relative to industrial electric connectors.

[0002] In particular, the invention refers to an industrial electric connector provided with an innovative retention/unhooking system that allows to connect it in a removable way to its complementary connector.

Background art

[0003] Industrial electric connectors have long been known and serve to feed electrically various devices, such as, in the case in question, outdoor and indoor pumps/circulators to various apparatus, like solar thermal systems, boilers, floor heating systems, etc.

[0004] These types of connectors, through an electric wire, are connected on one side to a current source, generally coming from an electric panel on the equipment, while on the opposite side they are connected in a removable way to a complementary connector installed on the device to feed.

[0005] The connectors, as per figure 1 of the prior art, foresees an electrical plug contained in a casing forming the body of the connector itself. The electrical plug is fed electrically through a wire that terminates in the body of the connector and, in turn, the plug transmits the current to the external device when it is connected to it through its complementary connector, which is inserted in the electrical plug.

[0006] Figure 1 shows an external casing 101 which is hollow internally in such a way as to form a lodging seat 102 inside which the electrical plug 103 is placed.

[0007] As it is well known, the electrical plug 103 serves to hold the male (complementary connector). To that aim, the electrical plug is provided with holes 103' in which the metallic terminals of the male are inserted. The electrical plug contains inside it the electrical contacts and is fed through a wire that penetrates in the body of the connector through its back part 104.

[0008] The connection with the male has to be fastened in such a way as to impede accidental unhookings and for this reason fast attachment systems are foreseen that connect the male to the female.

[0009] In the background art, always with reference to figure 1, these fast attachment systems have the shape of a shank 105 which is fixed by one of its ends 105' to the external casing 101 that forms the body of the connector. The opposite end, instead, terminates with a tooth 105" which, through an appropriate opening, has access in part to the seat 102, penetrating in the thickness of the casing. The male foresees an appropriate receiving seat or a complementary tooth that comes into contact with the end of the tooth 105", realizing the block at the moment of the insertion. In particular, the tooth that is present in the complementary connector, during its in-

sertion in the seat 102, climbs over the tooth 105", constraining themselves one against the other.

[0010] To operate the removal of the male electric connector (complementary) it is therefore necessary to manually operate the lifting of the shank 105 in such a way that the tooth disengages, allowing its removal. When the male connector has exited, the shank is released and goes back elastically to the initial position. To make an insertion it is therefore enough to insert again the male inside the seat until the tooth snaps, i.e. it engages in a pre-established point of the male connector, blocking it in position.

[0011] It is clear that this solution presents various technical inconveniences.

[0012] For example, the removal of the male connector is not easy because it is not easy to operate the lifting of the shank. It is required to act with the tip of the fingers and this operation can produce abrasions.

[0013] Moreover, if the shank is excessively forced, it can be broken, rendering the entire connector not usable. It is therefore clear that this solution lends itself well to accidental breakings.

Disclosure of invention

[0014] It is therefore the aim of the present invention to provide an innovative electric connector that solves at least in part said technical inconveniences.

[0015] In particular, it is the aim of the present invention to provide an industrial electric connector wherein the retain/unhooking device of the internal plug satisfy to regulation requirements that impose a traction resistance superior to the 100 N, in such a way as to result applicable in many different sectors.

[0016] It is also the aim of the present invention to provide an industrial connector wherein the retain/unhooking device is such as to allow an unhooking that is fast, simple and does not imply risks of abrasions for the user.

[0017] Last, it is the aim of the present invention to provide an industrial connector provided with a retain/unhooking device that results long-lasting.

[0018] These aims are reached with the present electric connector 1 according to the invention.

[0019] The electric connector (1) is suitable for coupling in a releasable way to a complementary electric connector (100).

[0020] The electric connector (1) comprises:

- An external casing (2);
- An electrical plug (4) arranged in the external casing (2) so that it can be connected with the complementary electric connector (100);
- Fast hooking means (10) that allow to fasten in a releasable way the electric connector (4) to its complementary connector (100), in turn provided with hooking means (42), when the two connectors are connected between them.

[0021] In accordance with the invention, the fast hooking means (10) comprise:

- A slab (11) arranged slidably and provided with an engaging element (41);
- Elastic means (16, 216) arranged in such a way as to push an end (11') of the slab (11) outside the casing (2) through an opening (50) found in the casing (2) and;
- and wherein said engaging element (41) is arranged in the slab in such a way that it can engage in contrast against a complementary engaging element (42) belonging to the complementary electric connector (100) when the complementary electric connector (100) is inserted in the electrical plug (4), and it can disengage from said complementary engaging element (42) when the slab (11) is made to slide through a crushing exerted on the end (11') exiting from the casing (2).

[0022] This solution easily solves said technical problems.

[0023] It is not necessary anymore to operate a difficult lifting of the shank to disengage the tooth from the complementary connector, with the risk of injuries or breakings. The solution proposed allows the unhooking by simply acting using pressure on a button, i.e. by pressing the button. Not only does this solution cause abrasions but, above all, is much more solid and long-lasting than the preceding one. The engaging element (41), in the shape of a tooth, for example, is integral to the slab, therefore a sliding of the slab causes a disengagement of this tooth with the complementary engaging element. The action of crushing between the engaging elements (41, 42) in the unhooking phase is certainly safer against breakings with respect to an operation of lifting of the shank.

[0024] The present solution, further, does not require modifications of the complementary electric connector, which continue productively to maintain their original configuration. This solution, therefore, adapts itself well to the block of complementary electric connectors already in commerce without requiring their adapting structural modification.

[0025] Further advantages can be deduced from the dependent claims.

Brief description of drawings

[0026] Further characteristics and advantages of the present industrial electric connector, according to the invention, will result clearer with the description that follows of some embodiments, made to illustrate but not to limit, with reference to the annexed drawings, wherein:

- Figure 1 represents an axonometric view of a connector in accordance with the background art;
- Figure 2 represents an axonometric view of the in-

dustrial electric connector in accordance with the invention;

- Figure 3 shows an exploded view of the connector of figure 2;
- Figure 4 and figure 5 show a technical detail, in axonometry, of the fast hooking/unhooking device in accordance with the invention;
- Figure 6 shows the same solution in a top view;
- Figures from 7 to 11 show possible forms of electric connector that couples to a complementary electric connector 100;
- Figure 12 and figure 13 show in an axonometric view the teeth (41, 42) to connect the complementary connector 100 to the plug 4;
- Figure 12A highlights the gap between the U-shaped guide, where the slab 11 is placed slidably, and the body of the plug 4 in such a way as to allow the insertion of the tooth 42 of the complementary connector that engages with the tooth 41;
- Figure 14 shows a variant wherein the spring is integrated directly in the body of the slab, in particular it is a bent appendix of the slab.

Description of some preferred embodiments

[0027] With reference to figure 2, an industrial connector is highlighted in accordance with the present invention.

[0028] The industrial connector 1 foresees an external casing 2, for example generally L-shaped. It forms an internal seat 3 suitable for holding, in a permanent way, an electrical plug 4.

[0029] The external casing 2 is, preferably but not necessarily, realized in PVC so as to be easily moulded with well-known mould processes as per the background art.

[0030] Figure 3 shows in an exploded view the essential components. The electrical plug 4 is therefore highlighted, removed from the seat 3 just for descriptive clarity purposes. Always in figure 3 the electric wire 20 is highlighted that feeds the current to the plug 4. Figure 2 highlights the wire 20 that enters in the casing 2 of the connector through its back part 5.

[0031] Always figure 3 highlights, according to the background art, the three or more electrical contacts 7 that are connected from one of their parts to the wire 20. To that aim, the wire 20 foresees three or more corresponding branches 20' that engage in the appropriate connections 7' found at the end of the contacts 7.

[0032] The electric contacts 7 result inserted in the body of the plug 4 and the branches 20' engage in the hooks 7', penetrating through the holes 8 of the plug 4 (see dotted lines that join the branches 20' to the holes 8).

[0033] Figure 2, like figure 3 as well, shows the hooking/unhooking device 10 that is the subject of the invention.

[0034] This device foresees a slab 11, for example made of plastic, of such a length that when applied, as described right below, one of its exceeding parts 11' exits

from the casing forming a button. The casing 2 foresees an opening 50 through which the end 11' of the slab 11 can exit. The slab is slidably assembled inside a guide 12 and brings integral to it a tooth 41. The guide is found integral to the body of the plug but it could also be separate and then connected in the production phase.

[0035] As shown in figure 5, for example, the guide is preferably constituted by a U-shaped element open from one side and that forms the two sides 13 and 14 into which the slab results slidably interposed.

[0036] As it is then highlighted in figure 12A, the U-shaped guide is connected or integral to the plug 4 in such a way as to result distanced from it of a pre-determined quantity. In this way, as better clarified below, the tooth 41 of figure 12 belonging to the slab exits from the guide, facing the plug 4.

[0037] The casing itself 2 forms a constraint against a shoulder 40 of the slab 11 to impede the exit of the slab from the opening 50 and, therefore, limiting the exit of the single end 11' that has the function of unhooking button. Alternatively, a stop could be foreseen, directly found on a side (13, 14) of the U-shaped seat.

[0038] The U-shaped element therefore terminates with a support base 15. Both figure 4 and figure 5 highlight an elastic spring 16 (for example, of compression) which is arranged inside the U-shaped element in such a way as to result comprised between the support base 15 and the slab 11 assembled slidably inside the U-shaped element itself.

[0039] In particular, as highlighted in figure 5, the spring is fixed on one side to the support base 15 and on the opposite side to a point of the slab.

[0040] In this particular solution of figure 5, the fixing of the spring 16 to the slab 11 is obtained by conforming in a particular way the slab itself, as described right below.

[0041] The slab foresees a cut 21 that generates a lower side 21' and a passage channel that goes from the side 21' to the side 22 and in which to insert the end of the spring. The passage channel of the spring therefore starts from the base 22 of the slab 11 and terminates on the lower side 21'. The path of the channel is inclined in such a way as to follow the profile of the terminal section of spring that is inserted in it. The exceeding part of spring that exits from the opening 21' is bent in such a way as to constrain the spring to the slab. This solution has the advantage of realizing a simple connection and guarantees an optimal coaxiality between spring and button and therefore a precise functioning.

[0042] Obviously, other connection systems could anyway be realized without for this moving apart from the present inventive concept.

[0043] For example, in a variant it would be possible to avoid the realization of the channel that joins the side 22 to the side 21' and glue or weld the end of the spring directly to the side 22.

[0044] As shown in figure 6, therefore, the slab exits from the casing 2 through an appropriate opening 50 found in said casing. The exceeding part 11' of slab that

exits from the cut therefore forms a fast unhooking button.

[0045] In a further variant, shown in figure 14, the spring is substituted by an appendix 216 elastically flexible and found directly in the slab 11. On the basis of the thickness of the appendix, it will result adjustable in flexibility, acting exactly as a spring integrated to the slab.

[0046] Going back to figure 5 or figure 3, these show the shoulder 40, for instance, found in the slab and that goes in contrast against the casing in such a way that the slab is not expelled by the push action of the spring.

[0047] In the realization phase, the entire plug 4 is assembled together with the contacts 7 and the electric wires 20', and the casing 2 is moulded around these elements.

[0048] Figures from 7 to 11 show many different types of electric connectors 1 connectable to a complementary connector 100. For example, figure 11 shows the seats 101 where the contacts 102 are placed, which hold the contacts 7 of the connector 1.

[0049] As shown in figure 12, the slab (obviously in all the embodiments described) also foresees integrated in it a block element 41, in the shape of a tooth 41, for example, which is configured to engage against an equivalent block element 42, such as a tooth 42, belonging to the male connector 100 and highlighted both in figure 7 and in figure 13.

[0050] Figure 13 shows the cut 21 to allow, as better clarified right below, an enhanced extraction of the male connector 100 with respect to the electrical plug 1.

[0051] In use, therefore, as shown in figure 12, the spring maintains the slab all extended in such a way that the exceeding part 11' of slab that exits from the casing 2 forms the release button for the user. The slab, thanks to its shoulder 40, stops against the casing and is not expelled.

[0052] In this position, the tooth 42 of the male 100, at the moment of the insertion, results in line (therefore in the insertion trajectory) with the tooth 41 of the slab. The tooth 41 exits from the guide and faces the plug through the gap described with reference to figure 12A. In this way, during the insertion of the complementary plug 100, the teeth intercept themselves and the climbing over of the tooth 42 on the tooth 41 takes place. Once the climbing over has taken place, the flat face 42' is found in contrast against the flat face 41', realizing the block. In this position, the male connector 100 is impeded from exiting also if a high traction force is applied, since the tooth 42 is in contrast against the tooth 41.

[0053] To operate the release, it is necessary to push the button 11, i.e. the exceeding part 11' of slab that exits from the casing. So during the crushing of the slab, the flat face 41' of the tooth 41 slides on the flat face 42' of the tooth 42, realizing a disengagement of the teeth and thus bringing the tooth 42 in line with the seat 21. In this position, not being the teeth in contrast one against the other anymore, the tooth 42 is free to slide into the seat 21, appropriately wide, allowing the unhooking that allows to extract the male 100 from the plug 4.

[0054] From what has been described about the functioning, it is now clear that, in a further variant of the invention, the U-shaped guide found integral to the plug could be instead found directly in the casing and, as usual, open from one side in such a way that the tooth 41 belonging to the slab faces the plug 4, appropriately distanced to allow the insertion of the tooth 42 belonging to the complementary connector 100.

[0055] In order to favour the climbing over of the tooth 42 it is clear that the teeth 41 and 42 can be appropriately configured. For instance, in figure 13 a tooth 42 is shown that presents an inclined face 42" complementary to the inclined face 41" of the tooth 41. The inclined faces realize inclined surfaces that facilitate the snap and therefore the reciprocal climbing over for the block.

[0056] It is clear that equivalent realization solutions are possible.

[0057] For instance, always with reference to figure 12 or 13, it can be foreseen that the sliding U-shaped seat of the slab is of such a height as to allow a minimal vertical play of the slab 11. In this way, the insertion would be enhanced by lifting a little the slab during the insertion of the complementary connector 100 that would favour the climbing over of the tooth 42 on the tooth 41.

[0058] Alternatively, a system of tighter tolerances can be realized, resorting to precise dimensions of the teeth (42, 41) and to the yielding of the materials, so as to obtain a safer block.

[0059] The seat 21, by the way, is not essential for the unblock since, once the pushing of the button 11' has taken place, the two teeth are not in contrast anymore. It is clear that a seat 21 eliminates completely the eventual rubbing friction that would be created between the crest of the tooth 42 and the surface of the slab itself during the removal phase, thus facilitating the extraction significantly.

[0060] Preferably, but not necessarily, the electrical plug 4 is made of Nylon plastic of the PA66 type with a three or six-pole connector.

Claims

1. An electric connector (1) suitable for coupling in a releasable manner to a complementary electric connector (100), the electric connector (1) comprising:

- An external casing (2);
- An electrical plug (4) arranged inside the external casing (2) in such a way that it can be connected with the complementary electric connector (100);
- Fast hooking means (10) suitable for engaging in a releasable manner with relative hooking means (42) belonging to the complementary electric connector (100) when the complementary electric connector couples to the electric connector (1) and;

characterized in that said fast hooking means (10) comprise:

- A slab (11) arranged slidably and provided with an engaging element (41);
- Elastic means (16, 216) arranged in such a way as to push an end (11') of the slab (11) outside the casing (2) through an opening (50) found in the casing (2) and;
- and wherein said engaging element (41) is arranged in the slab so that it can engage in contrast against a complementary engaging element (42) belonging to the complementary electric connector (100) when the complementary electric connector (100) is inserted in the electrical plug (4) and it can disengage from said complementary engaging element (42) when the slab (11) is made to slide through a crushing exerted on the end (11') exiting from the casing (2).

2. An electric connector (1), according to claim 1, wherein the slab is assembled slidably with respect to the electrical plug (4).
3. An electric connector (1), according to claim 1 or 2, wherein the slab (11) is arranged inside a sliding guide (12) integral to the electrical plug (4).
4. An electric connector (1), according to claim 1, wherein the slab is slidably assembled inside a seat found in the external casing (2).
5. An electric connector (1), according to one or more of the preceding claims, wherein the sliding guide (12) is such that the slab results distanced from the electrical plug (4) in such a way that the engaging element (41) faces the electrical plug (4).
6. An electric connector (1), according to one or more of the preceding claims, wherein said engaging element (41) has the shape of a tooth (41).
7. An electric connector (1), according to claim 6, wherein said tooth (41) is configured in such a way that a complementary tooth (42) belonging to the complementary electric connector (100), climbs over it, bringing in contrast one against the other when the complementary connector (100) is inserted in the electrical plug (4), realizing the block and, when the crushing on the end (11') is operated, the tooth (41) slides with respect to the other tooth (42), operating the unblock.
8. An electric connector (1), according to claim 6 or 7, wherein said tooth (41) presents a flat face (41') destined to go in contrast against the block tooth (42) of the complementary electric connector (100) and an inclined face (41") to enhance the climbing over.

9. An electric connector (1), according to one or more of the preceding claims, wherein the slab (11) presents a cut (21) of a pre-determined width and arranged in such a way as to intercept the tooth (42) of the complementary connector (100) when said end (11') of the slab (11) is crushed. 5
10. An electric connector (1), according to one or more of the preceding claims, wherein the slab (11) presents a shoulder (40). 10
11. An electric connector (1), according to one or more of the preceding claims, wherein said elastic means have the shape of a spring (16). 15
12. An electric connector (1), according to claim 11, wherein said spring (16) is interposed between the slab (11) and the base (15) of the sliding guide (12).
13. An electric connector (1), according to claim 11 or 12, wherein said spring (16) is inserted by one of its ends in a channel found along at least a part of the length of the slab (11). 20
14. An electric connector (1), according to claim 13, wherein said channel runs from the surface (22) of the slab to the surface (21') generated by the cut (21) in the slab (11). 25
15. An electric connector (1), according to one or more of the preceding claims, wherein said elastic means have the shape of a flexible appendix (216) found in the slab, so as to go in contrast against the base (15) of the U-shaped seat. 30

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FIG. 1
(Prior Art)

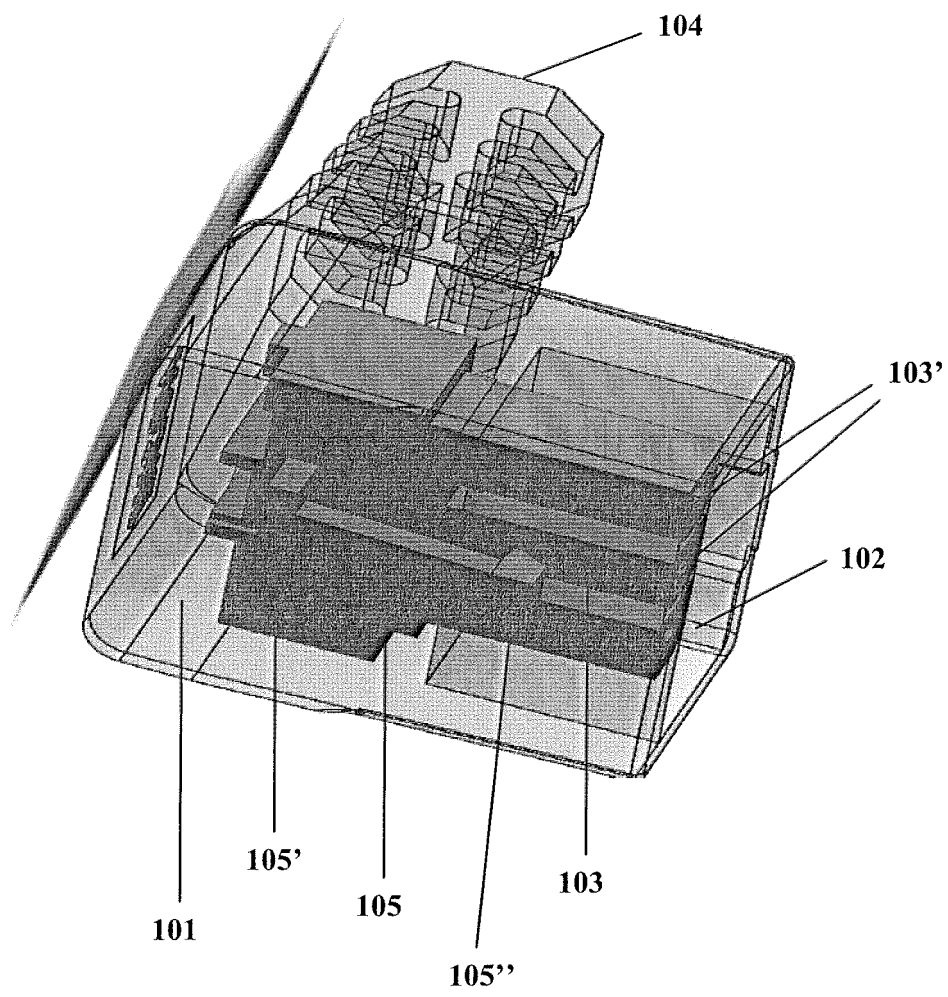


FIG. 2

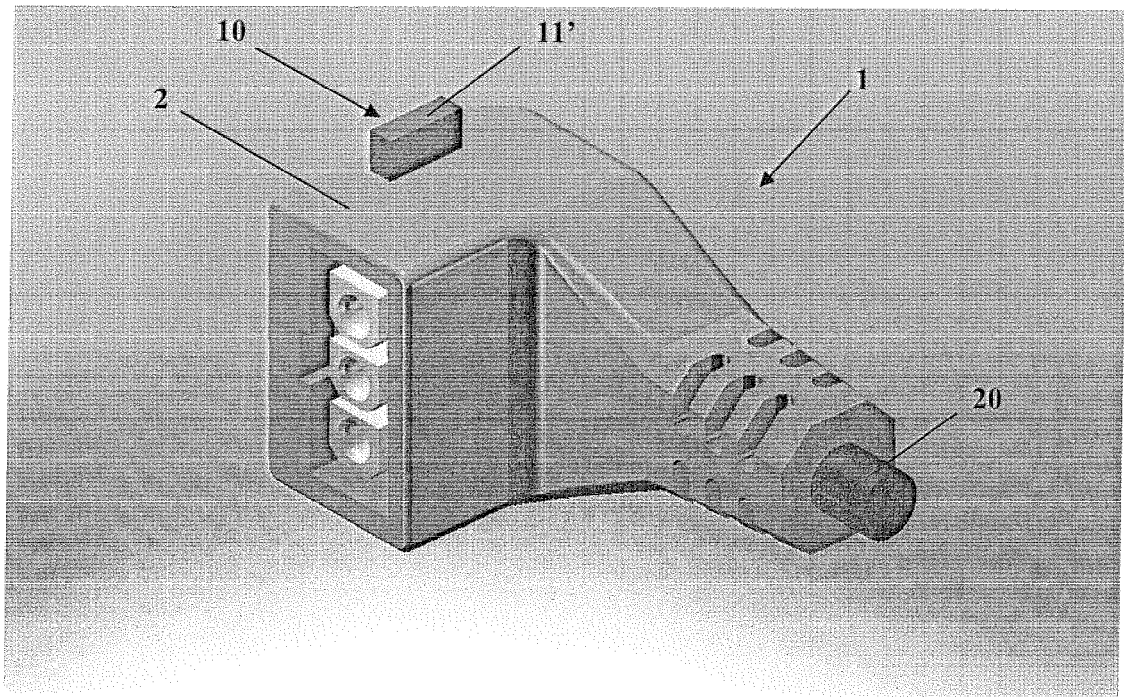


FIG. 3

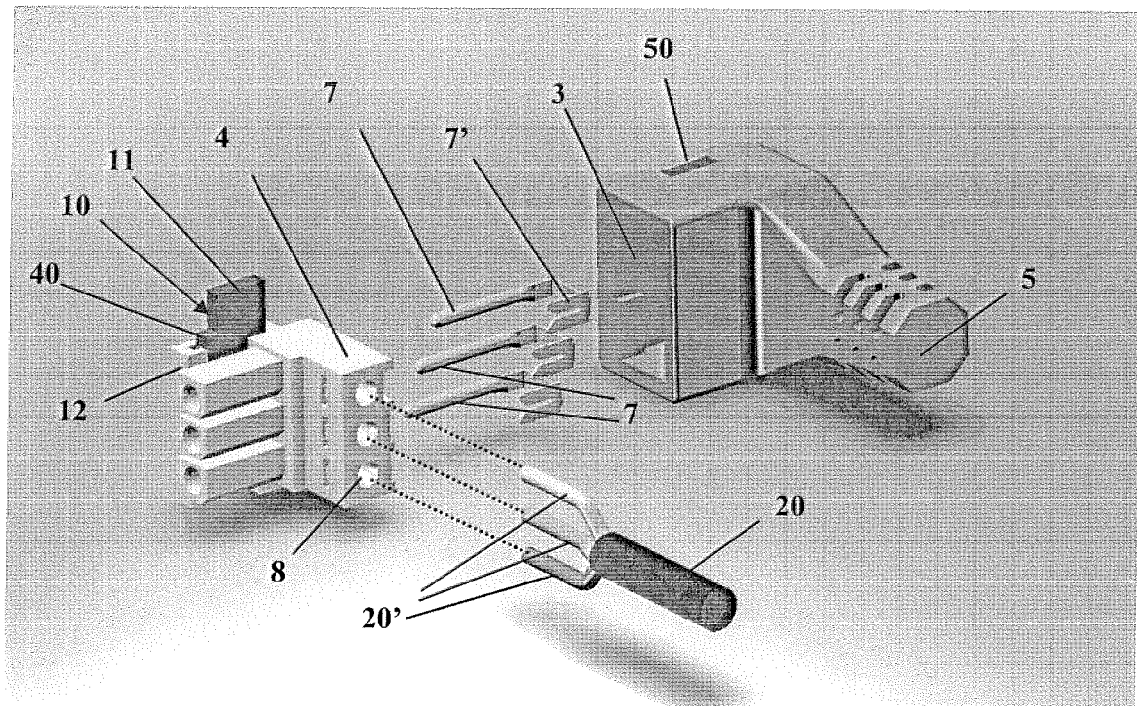


FIG. 4

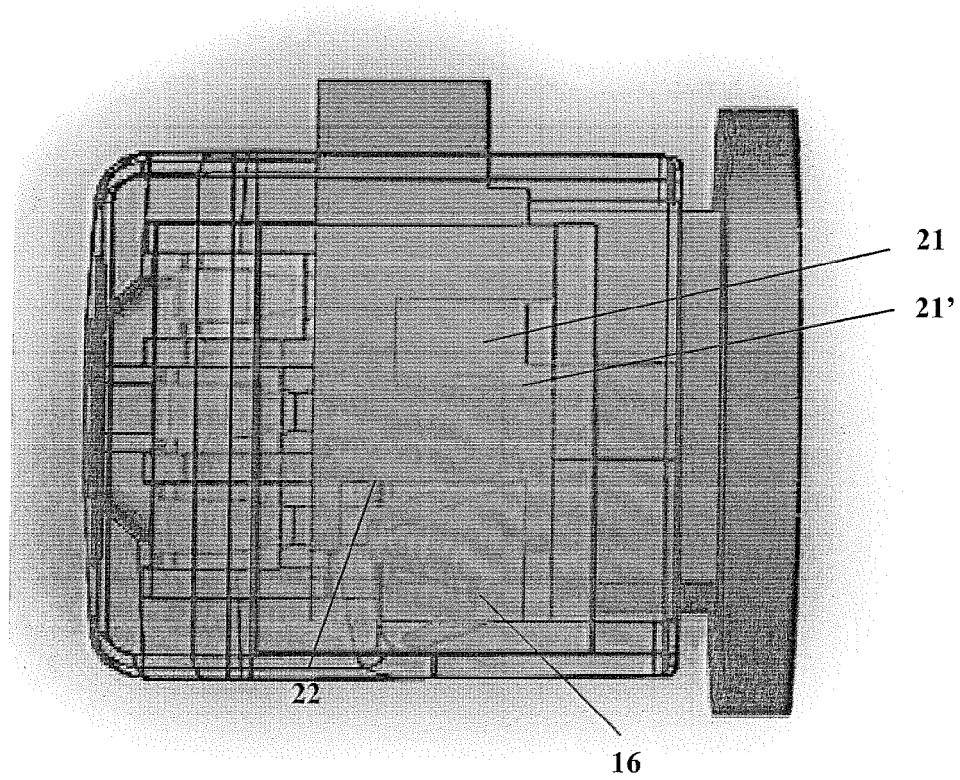


FIG. 5

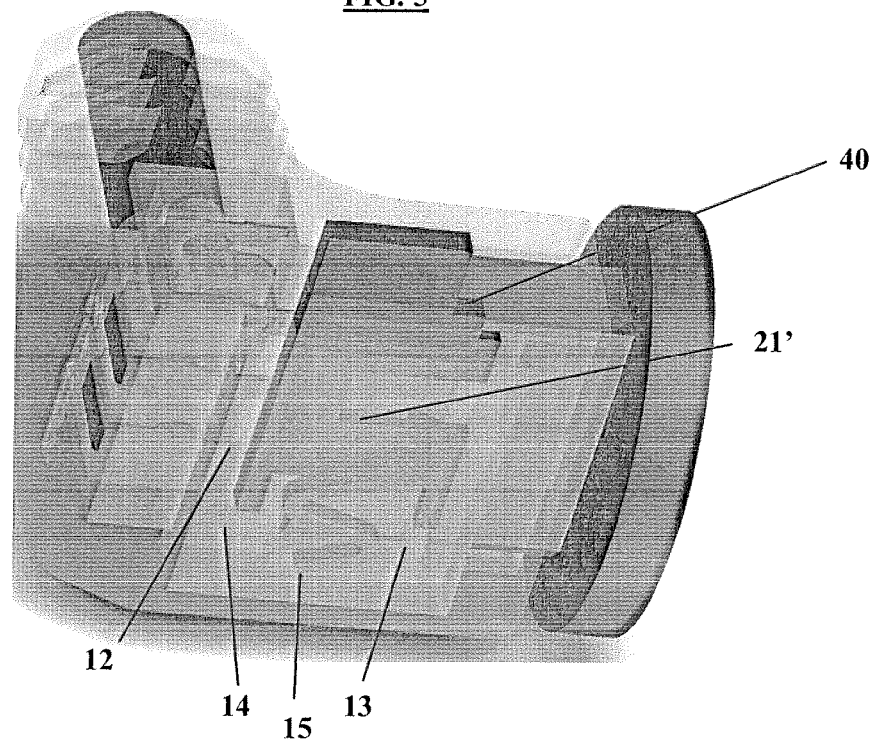


FIG. 6

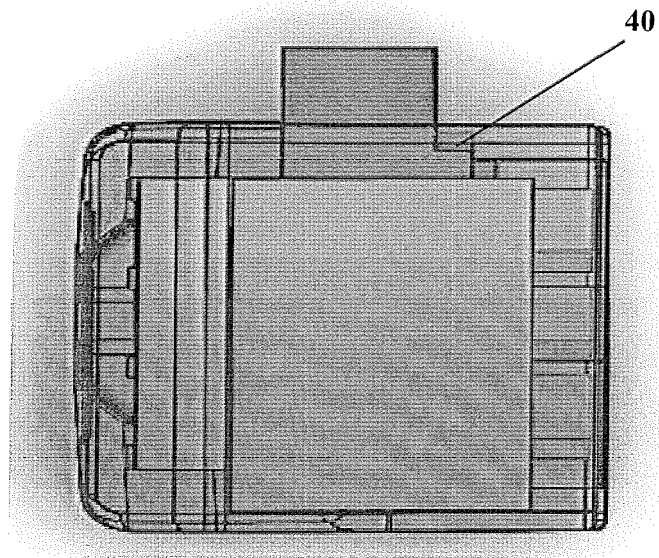


FIG. 7

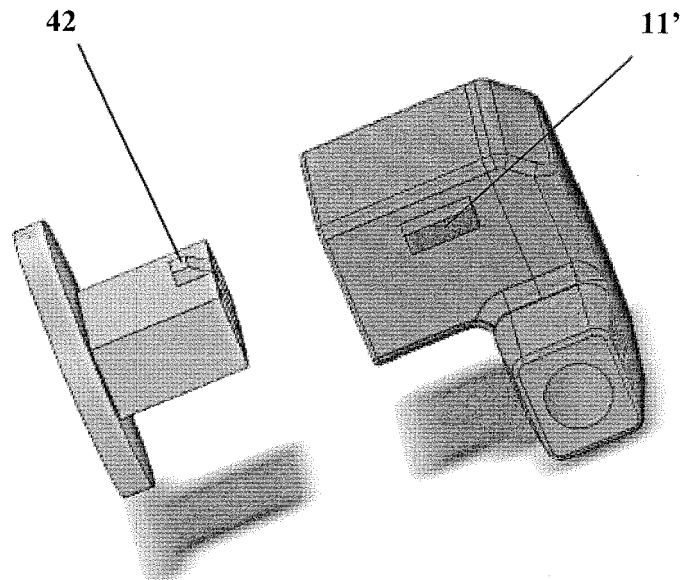


FIG. 8

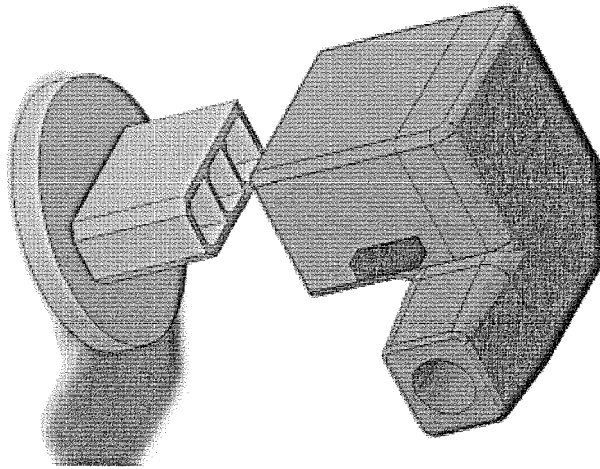


FIG. 9

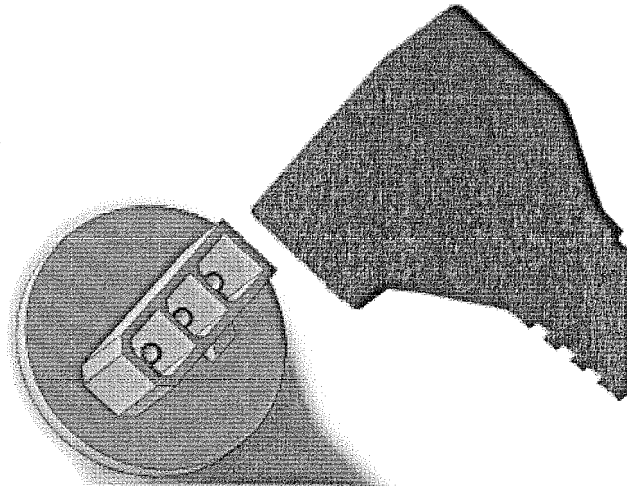


FIG. 10

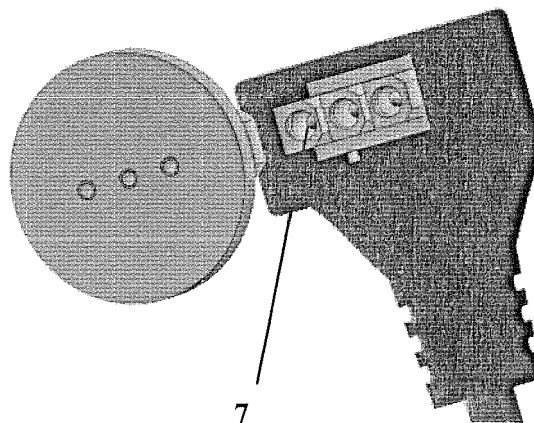


FIG. 11

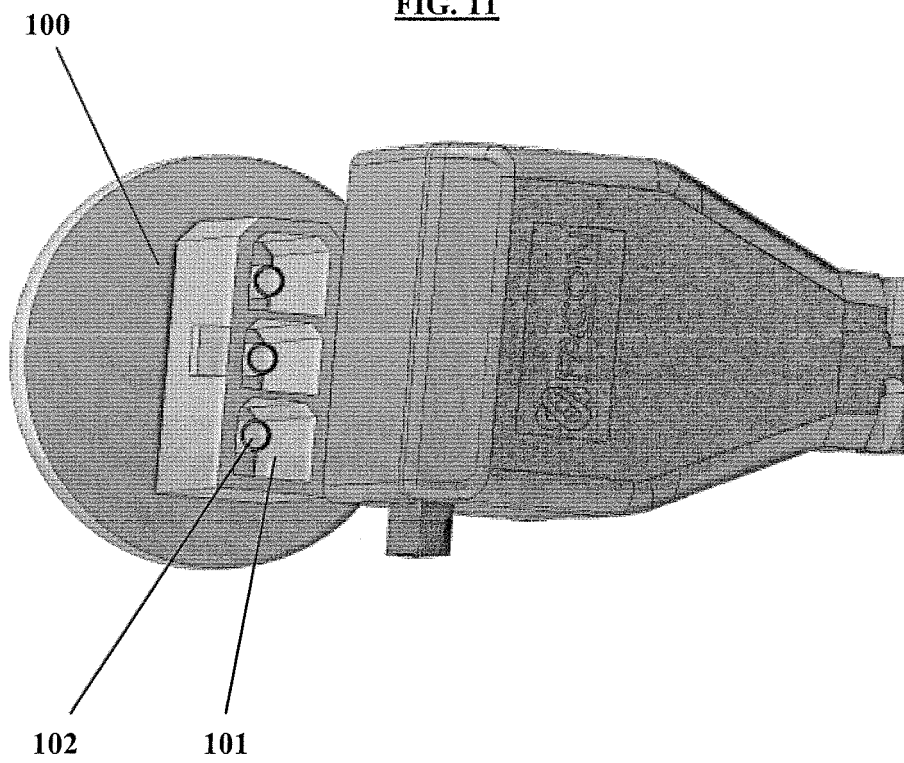


FIG. 12

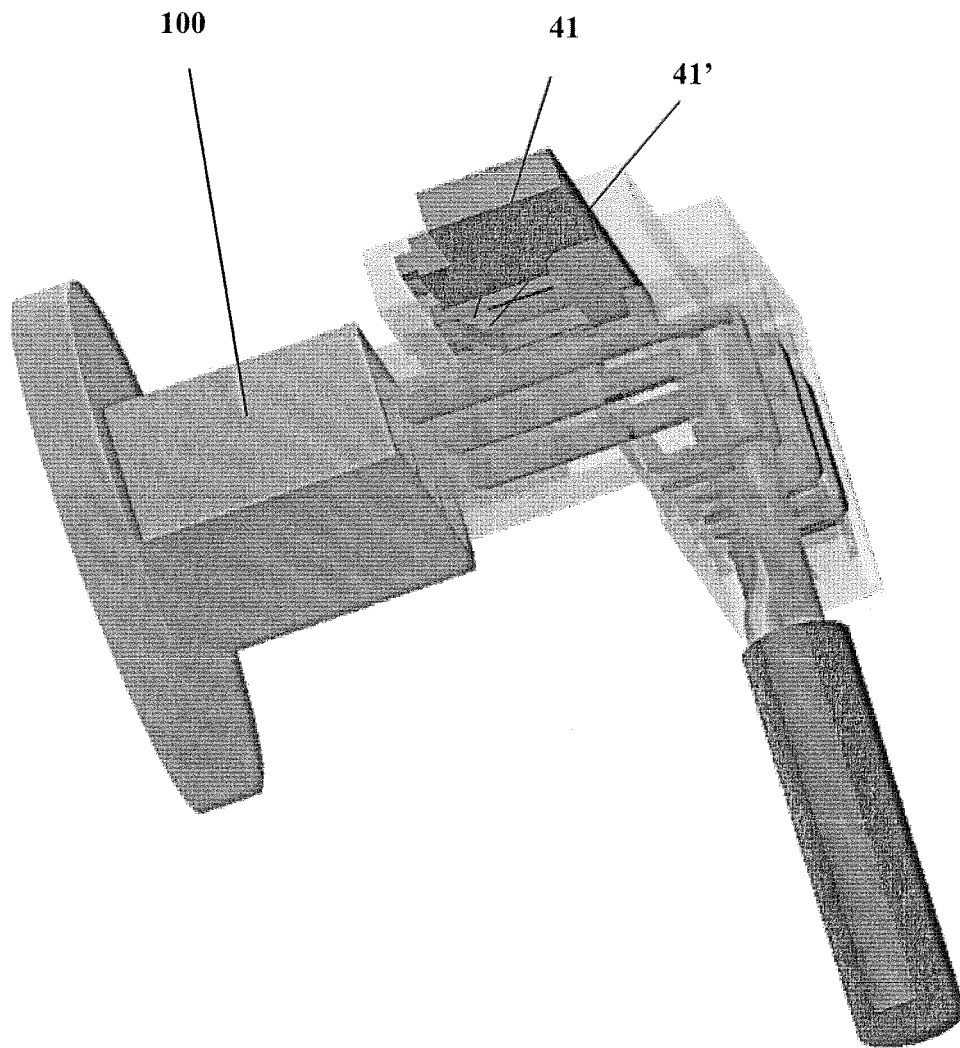


FIG. 12A

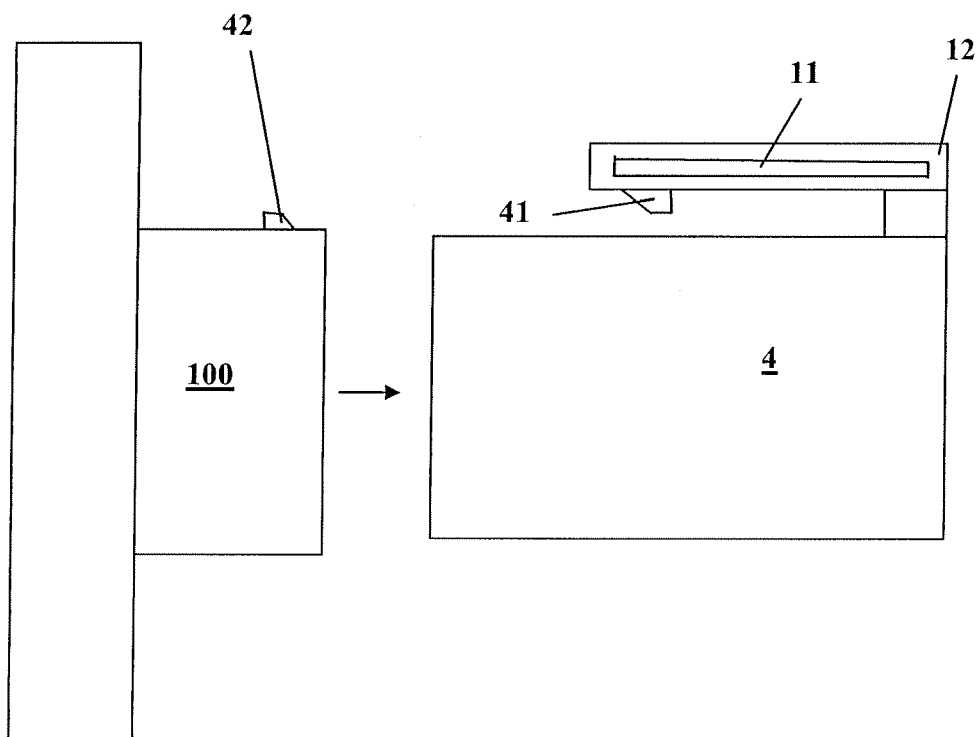


FIG. 13

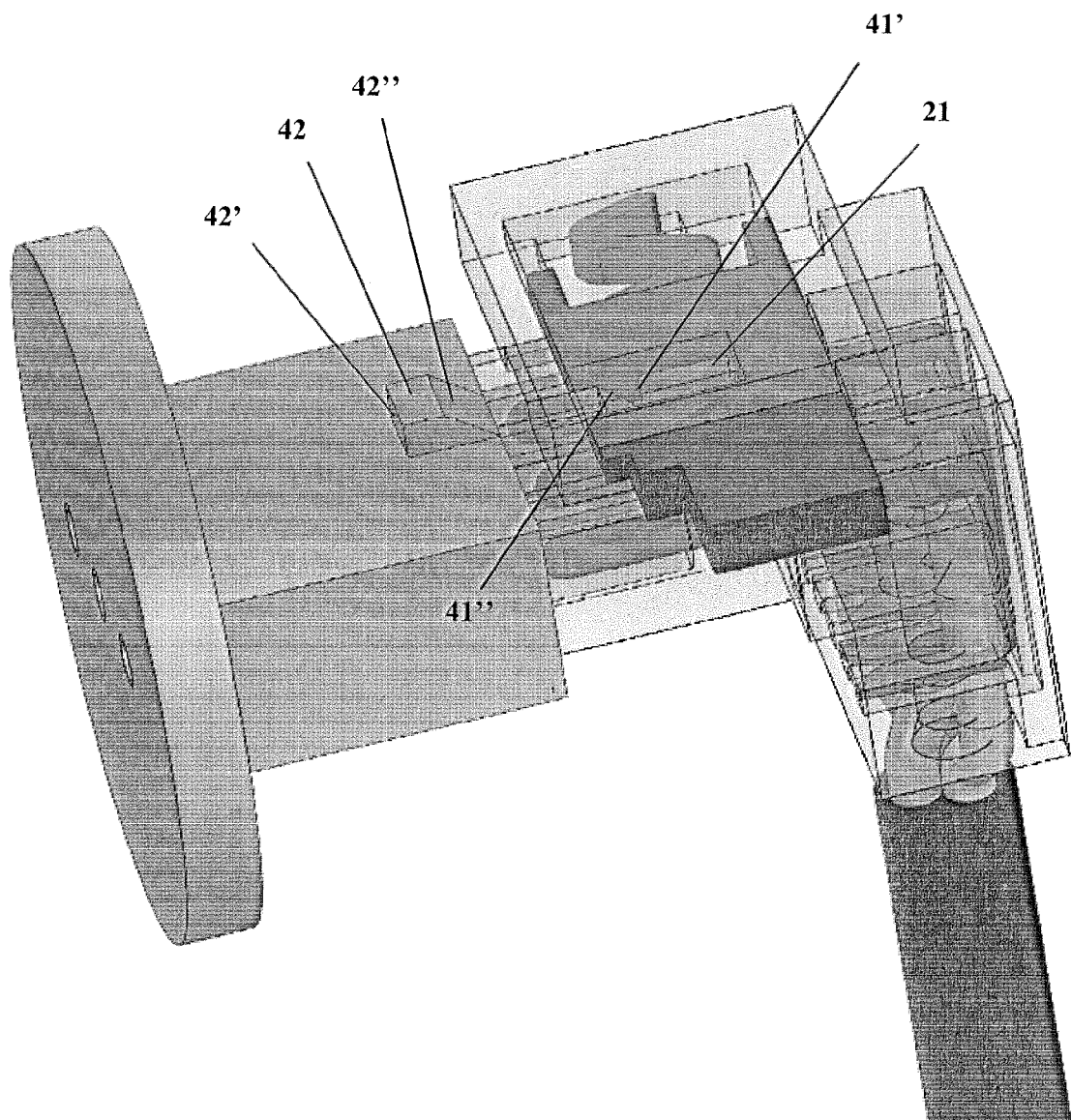
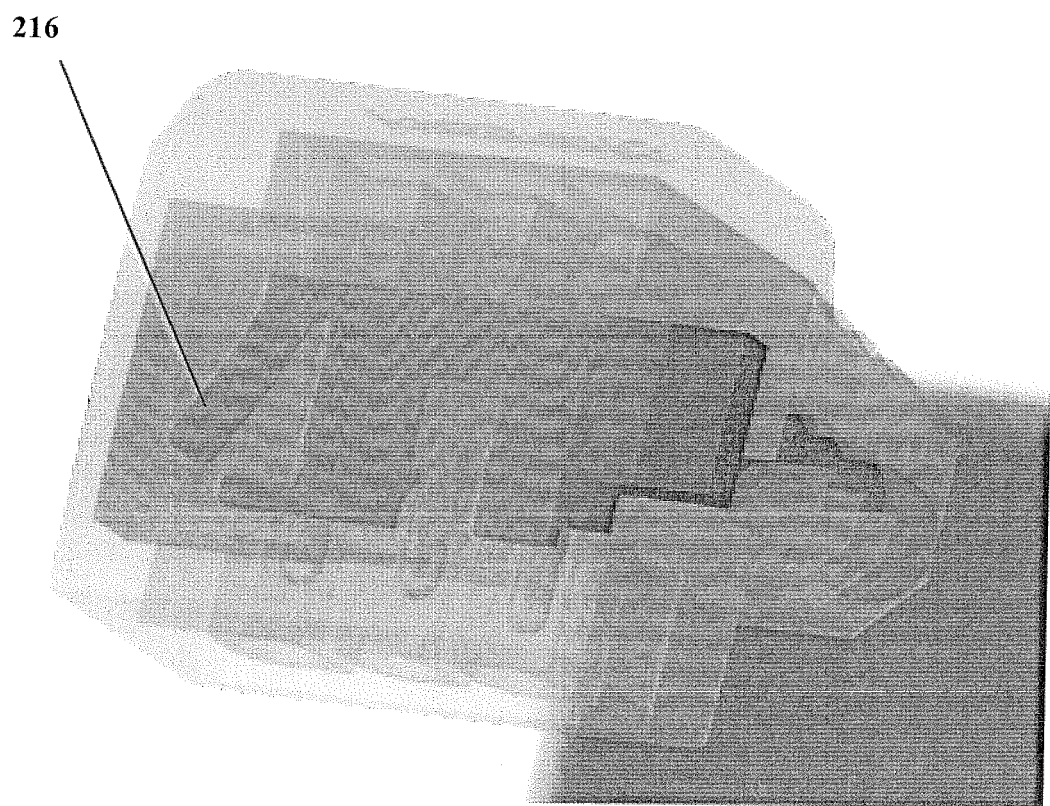


FIG. 14





EUROPEAN SEARCH REPORT

Application Number
EP 12 42 5127

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* paragraphs [0009] - [0027]; figures 1-3 *	15	H01R13/627 H01R13/635
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X	US 7 077 683 B1 (ROSS NICKY CHARLES [US]) 18 July 2006 (2006-07-18) * paragraphs [0057] - [0058]; figures 3-5 *	1-4,6-8, 11-13	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 10 December 2012	Examiner Jiménez, Jesús
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
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EP 12 42 5127

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10-12-2012

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