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(54) **CONNECTOR FOR A COAXIAL CABLE**

(57) The present invention provides a connector (30) for a coaxial cable (42) comprising a front housing (31), a back housing (32), and a rotating element (33) hingedly connected to the back housing (32). The back housing (32) and the rotating element (33) both comprise a cavity (39, 40) for defining a receiving chamber for receiving a coaxial cable (42). The connector (30) furthermore comprises two pins (34) on the rotating element (33) and two slots (35) on the back housing (32) for receiving the two pins (34) of the rotating element (33), wherein the two pins (34) are held in the two slots (35) by means of one hinge screw (36). According to the invention, a plane of rotation (P_{RE}) of the rotating element (33) is perpendicular to a longitudinal axis (A_{RC}) of the receiving chamber. The present invention furthermore provides an electric or electronic device (50) comprising such a connector (30) for a coaxial cable (42).

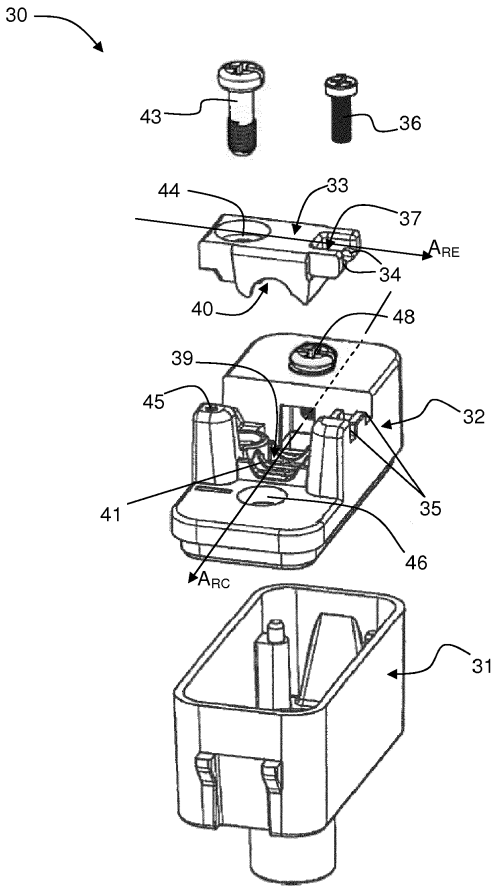

FIG. 2

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Description

Technical field of the invention

[0001] The present invention relates to a connector for a coaxial cable. More particular, the present invention relates to a connector for a coaxial cable that is suitable for being used with different types of coaxial cables with different diameter and that, in particular cases, can be combined with another electrical or electronical function in a same electric or electronic device. Furthermore, the present invention relates to an electric or electronic device comprising such a connector for a coaxial cable.

Background of the invention

[0002] Connectors for coaxial cables, such as TV outlets, also referred to as TV sockets, are well known in the art. Such connectors are connected to an incoming cable TV signal by the coaxial cable. A coaxial cable is a type of cable that has an inner conductor surrounded by a tubular insulating layer, again surrounded by tubular conducting shield. The term coaxial indicates that the inner conductor and the outer shield share a geometric axis. For the electrical performance of a high bandwidth TV transmission line, it is very important that the coaxial cable is correctly mounted to the connector.

[0003] More specific, the conducting shield of the coaxial cable has to make a low-ohmic contact with the housing of the connector, in order to have sufficient EMC (electromagnetic compatibility) performance. If the EMC performance, more specific the screening effectiveness, is not sufficient, the connector may emit a strong electromagnetic field that can disturb the operation other apparatuses in the neighbourhood of the connector. The other way around, if the EMC performance or screening effectiveness is not sufficient, the TV signal might be disturbed by electromagnetic radiation present in the neighbourhood, such as e.g. wifi signals, radio frequency signals, radiation from a microwave oven, etc, which may result in poor image quality.

[0004] EP 1 914 842 describes a connector for coaxial cables comprising a housing 1 consisting of a first part 11 and a second part 12, which are connected together by means of a swivel element 2 (see Fig. 1). The swivel element 2 comprises two pins 21, two recesses 23 and two screws 22 for fixing the pins 21 in the recesses 23. The first part 11 and the second part 12 of the housing 1 define an inner zone 3 for receiving a coaxial cable 5 in a channel 4.

[0005] A disadvantage of the connector of EP 1 914 842 is that the whole second part 12 of the housing 1 is rotating. This means it forms quite a big lever, by which the force that can be exerted on the coaxial cable 5 that is inserted in the channel 4 is limited. Thus, when a coaxial cable with a larger diameter than the diameter of the channel 4 is inserted, there may be a chance that the connector cannot be completely closed because the force that can be exerted is not high enough.

[0006] Hence, a connector as described in EP 1 914 842 is only suitable for coaxial cables with one particular diameter who fit in the channel 4, and is thus not suitable for being used for different types of coaxial cables with different diameters.

Summary of the invention

[0007] In a first aspect, the present invention provides a connector for a coaxial cable comprising a front housing, a back housing, and a rotating element hingedly connected to the back housing. The back housing and the rotating element both comprise a cavity for defining a receiving chamber for receiving a coaxial cable. On the rotating element the connector comprises two pins and on the back housing the connector comprises two slots for receiving the two pins of the rotating element, the two pins being held in the two slots by means of one hinge screw. According to the invention, a plane of rotation of the rotating element is substantially perpendicular to a longitudinal axis of the receiving chamber or of the housing. Or in other words, according to the invention, the rotating element is oriented such that its longitudinal axis is substantially perpendicular to the longitudinal axis of the receiving chamber or of the housing.

[0008] An advantage of a connector according to embodiments of the invention is, because of the orientation of the rotating element, it forms a short lever which can exert a high power to the coaxial cable when the coaxial cable is inserted and the rotating element is closed.

[0009] Further, also because of the orientation of the rotating element with respect to the longitudinal direction of the back housing, it is an advantage of a connector according to embodiments of the invention that additional features, such as for example adjustable fixing means for an inner conductor of the coaxial cable, can be provided at or in the back housing, and that such features will not hamper or hinder the opening and closing of the rotating element or the other way around, that the rotating element does not hamper or hinder the working of the additional features.

[0010] The cavities in the back housing and in the rotating element may have a shape of a half circle or half oval, such that when the rotating element is in the closed position, the receiving chamber has the shape of a circle or an oval. According to embodiments of the invention, the cavities in the back housing and the rotating element may comprise at least one rim.

[0011] According to embodiments of the invention, the rotating part may be oriented such that its longitudinal axis is substantially perpendicular to a longitudinal axis of the receiving chamber. The connector may furthermore comprise a locking screw for fixedly connecting the rotating part to the back housing.

[0012] According to embodiments of the invention, the connector may furthermore comprise a screw provided on the back housing and extending through the back

housing for fixedly connecting an inner conductor of a coaxial cable to the connector.

[0013] In a second aspect, the invention provides an electric or electronic device comprising a connector for a coaxial cable according to embodiments of the invention. The device may comprise a plastic adapter into which the connector fits and may furthermore comprise a metal frame into which the plastic adapter can be snapped.

[0014] According to embodiments of the invention, the device may furthermore comprise an additional electrical or electronical function, such as for example an RJ45 outlet, a HDMI socket, an USB socket, a SAT socket, an FM socket, a line-in, a loudspeaker connection or the like.

Brief description of the drawings

[0015] It has to be noted that same reference signs in the different figures refer to same, similar or analogous elements.

Fig. 1 shows a prior art connector for a coaxial cable.
Fig. 2 schematically illustrates an exploded view of a connector for a coaxial cable according to an embodiment of the invention.
Fig. 3 schematically illustrates a rotating element of a connector for a coaxial cable according to an embodiment of the invention.
Fig. 4A schematically illustrates a back housing and Fig. 4B schematically illustrates a rotating element of a connector for a coaxial cable according to an embodiment of the invention.
Fig. 5A to Fig. 5C schematically illustrate the rotating movement of the rotating element.
Fig. 6A to Fig. 6D schematically illustrate the provision of a coaxial cable in a connector for a coaxial cable according to an embodiment of the invention.
Fig. 7A and Fig. 7B respectively schematically illustrate an exploded view and a front view of an electric or electronic device according to an embodiment of the invention.

Description of illustrative embodiments

[0016] In the description different embodiments will be used to describe the invention. Therefore reference will be made to different drawings. It has to be understood that these drawings are intended to be non-limiting, the invention is only limited by the claims. The drawings are thus for illustrative purposes, the size of some of the elements in the drawings may be exaggerated for clarity purposes.

[0017] The term "comprising" is not to be interpreted as limiting the invention in any way. The term "comprising", used in the claims, is not intended to be restricted to what means is described thereafter; it does not exclude other elements, parts or steps.

[0018] The term "connected" as used in the claims and in the description has not to be interpreted as being restricted to direct connections, unless otherwise specified. Thus, part A being connected to part B is not limited to part A being in direct contact to part B, but also includes indirect contact between part A and part B, in other words also includes the case where intermediate parts are present in between part A and part B.

[0019] Not all embodiments of the invention comprise all features of the invention. In the following description and claims, any of the claimed embodiments can be used in any combination.

[0020] According to a first aspect, the present invention provides a connector for a coaxial cable comprising a front housing, a back housing, and a rotating element hingedly connected to the back housing. The back housing and the rotating element both comprise a cavity for defining a receiving chamber for receiving a coaxial cable. The connector furthermore comprises two pins on the rotating element and two slots on the back housing for receiving the two pins of the rotating element, the two pins being held in the two slots by means of one hinge screw. According to the invention, a plane of rotation of the rotating element is perpendicular to a longitudinal axis of the receiving chamber.

[0021] An advantage of a connector according to embodiments of the invention is, because of the orientation of the rotating element, it forms a short lever which can exert a high power to the coaxial cable when the coaxial cable is inserted and the rotating element is closed. Hence, coaxial cables with different diameters can fit into the connector according to embodiments of the invention. Thus, the connector according to embodiments of the invention can be used for different cables because it is independent on the cable diameter, which is a big advantage over some existing prior art connectors.

[0022] Further, also because the orientation of the rotating element with respect to the longitudinal direction of the back housing, it is an advantage of a connector according to embodiments of the invention that additional features, such as for example adjustable fixing means for an inner conductor of the coaxial cable, can be provided at or in the back housing, and that such features will not hamper or hinder the opening and closing of the rotating element or the other way around, that the rotating element does not hamper or hinder the working of the additional features.

[0023] The present invention will hereinafter be described by means of different embodiments. It has to be understood that these embodiments are only for the ease of understanding the invention and are not intended to limit the invention in any way.

[0024] Fig. 2 schematically illustrates an exploded view of a connector 30 for a coaxial cable according to an embodiment of the invention. The connector 30 comprises a front housing 31. The front housing 31 defines the interface where a plug has to be connected to the connector 30. Further, a PCB with necessary electronics and a central pin of the connector 30 are herein posi-

tioned. The connector 30 furthermore comprises a back housing 32, which is connected to the front housing 31 by a press-fit connection. Optionally, a back-up screw (not illustrated) may be provided in a back-up screw hole 46 in the back housing 32 for securing the press-fit connection during transport and/or handling, to make sure that the front housing 31 and the back housing 32 stay together at all times. The connector 30 furthermore comprises a rotating element 33 hingedly connected to the back housing 32. The rotating element 33 is illustrated in detail in Fig. 3. It comprises two pins 34 who fit into two slots 35 in the back housing 32. The two pins 34 on the rotating element 33 are held in the two slots 35 in the back housing 32 by means of one hinge screw 36 which is located in between the two slots 35 and the two pins 34. Therefore, the rotating element 33 comprises a hinge screw opening 37. Correspondingly, a hinge screw receiving opening 38 is provided on the back housing 32 (see Fig. 4A). Preferably, the hinge screw 36 is mounted and fixed in its position during the manufacturing process of the connector 30, for example with glue, such that it cannot be removed anymore.

[0025] The back housing 32 and the rotating element 33 both comprise a cavity 39, 40 for defining a receiving chamber 39, 40 for receiving a coaxial cable. The cavities 39, 40 may have the shape of a half circle and are complementary to each other such that, when the rotating element 33 is fixed to the back housing 32, they form a substantially circular shaped receiving chamber 39, 40 for receiving the coaxial cable. Hence, when the coaxial cable is inserted, the cavities encircle the cable, thereby forming the receiving chamber 39, 40. According to other embodiments, the receiving chamber 39, 40 may also be oval shaped.

[0026] According to embodiments of the invention, the cavities 39, 40 may have at least one rim 41. This can best be seen in Fig. 4A and Fig. 4B which respectively show the back housing 32 and the rotating element 33. During compression of the coaxial cable by the rotating element (see further), the at least one rim 41 on the back housing 32 and the at least one rim 41 on the rotating element 33 provide a pattern of local indentations in the coaxial cable. This pattern of local indentations in the cable makes sure that the coaxial cable will stay in the correct position when a force is exerted on the coaxial cable, e.g. by positioning the connector 30 in a plastic adapter and metal frame (see further). Therefore, once the rotating element 33 is closed and fixed to the back housing 32, the receiving chamber 39, 40 serves as a strain relief for the coaxial cable. Because the rims 41 make indentations in the coaxial cable, these rims 41 help to fix the coaxial cable in the receiving chamber 39, 40 even when the coaxial cable has a diameter which is higher than or equal to the diameter of the receiving chamber 39, 40.

[0027] The receiving chamber formed by the cavities 39, 40 may have a longitudinal axis A_{RC} that is parallel with a longitudinal axis of the back housing 32, and in general that is parallel with a longitudinal axis of the connector 30. The rotating element 33 may be oriented such that its longitudinal axis A_{RE} is substantially perpendicular to the longitudinal axis A_{RC} of the receiving chamber 39, 40. Or, as can be seen from Figs. 5A to 5C, the rotating element 33 may be oriented such that its longitudinal axis A_{RE} is substantially perpendicular to the longitudinal axis A_{CC} of a coaxial cable 42 that is inserted in the connector 30, or in other words, that its longitudinal axis A_{RE} is substantially perpendicular to the longitudinal axis of the A_{RC} of the receiving chamber.

[0028] According to the invention, the rotating element 33 is able to rotate in a plane P_{RE} that is perpendicular to the longitudinal axis A_{RC} of the receiving chamber 39, 40 (see also Figs. 5A to 5C). Because of this, a connector 30 according to embodiments of the invention has the advantage of forming only a short lever which can exert a high power to the coaxial cable when the coaxial cable is inserted and the rotating element is closed. Hence, coaxial cables with different diameters can fit into the connector according to embodiments of the invention. Thus, a connector 30 according to embodiments of the invention can be used for different cables because it is independent on the cable diameter, which is a big advantage over some existing prior art connectors.

[0029] Further, also because the orientation of the rotating element with respect to the longitudinal direction of the back housing, it is an advantage of a connector according to embodiments of the invention that additional features, such as for example adjustable fixing means for an inner conductor of the coaxial cable, can be provided at or in the back housing, and that such features will not hamper or hinder the opening and closing of the rotating element or the other way around, that the rotating element does not hamper or hinder the working of the additional features.

[0030] The connector 30 furthermore comprises a locking screw 43 for fixing the rotating element 33 in a closed position to the back housing 32. Therefore, a locking screw opening 44 is provided in the rotating element 33 and a locking screw receiving opening 45 is provided in the back housing 32.

[0031] When the rotating element is in the closed and fixed position (as illustrated in Fig. 5A), the EMC performance or screening effectiveness of the connector 30 is guaranteed for the following reasons. First, at this closed and fixed position, the low-ohmic electrical contact between the conducting shield of the coaxial cable 42 and the back housing 32 is optimal. Secondly, in the closed and fixed position the gap between the rotating element 33 and the back housing 32 is minimized and optimal, hereby forming a Faraday's cage. This ensures sufficient EMC performance or screening effectiveness. The locking screw 43 is mounted such that it cannot accidently fall out of the connector 30 during transport and/or handling of the connector 30. Therefore, during manufacturing of the connector 30, the locking screw 43 is provided in the locking screw hole 44 on the rotating element 33.

In the locking screw hole 44 an edge is provided through which the locking screw 43 is screwed, but once it has passed the edge, it cannot be taken back out of the locking screw hole 44 without screwing.

[0032] Figs. 6A to 6D illustrate the fitting and fixing of a coaxial cable 42 in a connector 30 according to an embodiment of the invention. Fig. 6A shows the rotating element 33 in the open position. In that position the coaxial cable 42 can be placed in the receiving chamber 39, 40 of the connector 30.

[0033] During rotation of the rotating element 33 the locking screw 43 is guided towards the locking screw receiving opening 45 in the back housing 42 such that it can be fixed to that back housing 42 (see Fig. 6B to Fig. 6D). The locking screw 43 is guided towards the correct position for the start of locking (by screwing) by an oblique plane 47 that acts as a slide. Because of this oblique plane 47 the locking screw 43 smoothly fits into the locking screw receiving opening 45 in the back housing 32.

[0034] The connector 30 may furthermore comprise an adjustable fixing means 48 for fixing the inner conductor of the coaxial cable in the connector 30. In the example given in the drawings, this adjustable fixing means may be a screw 48 provided in a hole 49 in the back housing 32. This is also an advantage of a conductor according to embodiments of the invention, that the connector 30 comprises space for providing such adjustable fixing means. This adjustable fixing means makes sure that the inner conductor of the coaxial cable can be fixed very well in the connector 30 so that, even when a coaxial cable is used with a diameter smaller than the receiving chamber 39, 40 of the connector 30, the coaxial cable can still be fixed very well and will be difficult to remove from the connector 30 when handling it or pulling the cable.

[0035] According to a second aspect, the present invention provides an electric or electronic device 50 comprising a connector for a coaxial cable according to any of the embodiments described above.

[0036] An example is illustrated in Fig. 7A and Fig. 7B. Fig. 7A schematically illustrates an exploded view of an electric or electronic device according to embodiments of the invention. The device 50 comprises a connector 30 for a coaxial cable according to any of the above embodiments. The device 50 comprises a plastic adapter 51 into which the connector 50 fits. The plastic adapter 51 can be snapped into a metal frame 52. The metal frame 52 with the plastic adapter 51 and the connector 30 can be provided in a mounting box in the wall. A front plate 53 can then be provided over the metal frame 52 for finishing.

[0037] An advantage of the invention is that the device 50 can furthermore comprise an additional electrical or electronical functional (54), such as for example an RJ45 outlet, a HDMI socket, an USB socket, an SAT socket, an FM socket, a line-in, a loudspeaker connection or the like.

[0038] Hence, when it is necessary for certain applications, such as for example digital television or the like, to have a television connection and an RJ45 outlet connection next to each other, a device 50 according to embodiments of the invention would be an excellent choice, because it has the advantage that both functions can be provided in one device, and thus only one hole has to be provided in the wall for providing a mounting box in which a device according to embodiments of the invention can be provided.

Claims

1. A connector (30) for a coaxial cable (42) comprising:

   - a front housing (31), a back housing (32), and a rotating element (33) hingedly connected to the back housing (32), the back housing (32) and the rotating element (33) both comprising a cavity (39, 40) for defining a receiving chamber for receiving a coaxial cable (42), and
   - two pins (34) on the rotating element (33) and two slots (35) on the back housing (32) for receiving the two pins (34) of the rotating element (33), wherein the two pins (34) are held in the two slots (35) by means of one hinge screw (36);

   characterized in that a plane of rotation (P_{RE}) of the rotating element (33) is perpendicular to a longitudinal axis (A_{RC}) of the receiving chamber.

2. Connector (30) according to claim 1, wherein the cavities (39, 40) in the back housing (32) and the rotating element (33) comprise at least one rim (41).

3. Connector (30) according to claim 1 or 2, wherein the rotating element (33) is oriented such that its longitudinal axis (A_{RE}) is substantially perpendicular to a longitudinal axis (A_{RC}) of the receiving chamber.

4. Connector (30) according to any of the previous claims, furthermore comprising a locking screw (43) for fixedly connecting the rotating part (33) to the back housing (32).

5. Connector (30) according to any of the previous claims, furthermore comprising a screw (48) provided on the back housing (32) for fixedly connecting an inner conductor of a coaxial cable to the connector (30).

6. An electric or electronic device (50) comprising a connector (30) for a coaxial cable (42) according to any of the previous claims.

7. An electric or electronic device (50) according to claim 6, wherein the device (50) comprises a plastic adapter (51) into which the connector (30) fits.

8. An electric or electronic device (50) according to claim 8, wherein the device (50) furthermore comprises a metal frame (52) into which the plastic adapter (51) can be snapped.

9. An electric or electronic device (50) according to any of claims 6 to 8, wherein the device (50) furthermore comprises an additional electrical or electronical function (54).

10. An electric or electronic device (50) according to claim 9, wherein the additional electrical or electronical function (54) is one of an RJ45 outlet, a HDMI socket, an USB socket, an SAT socket, an FM socket, a line-in, a loud speaker connection or the like.

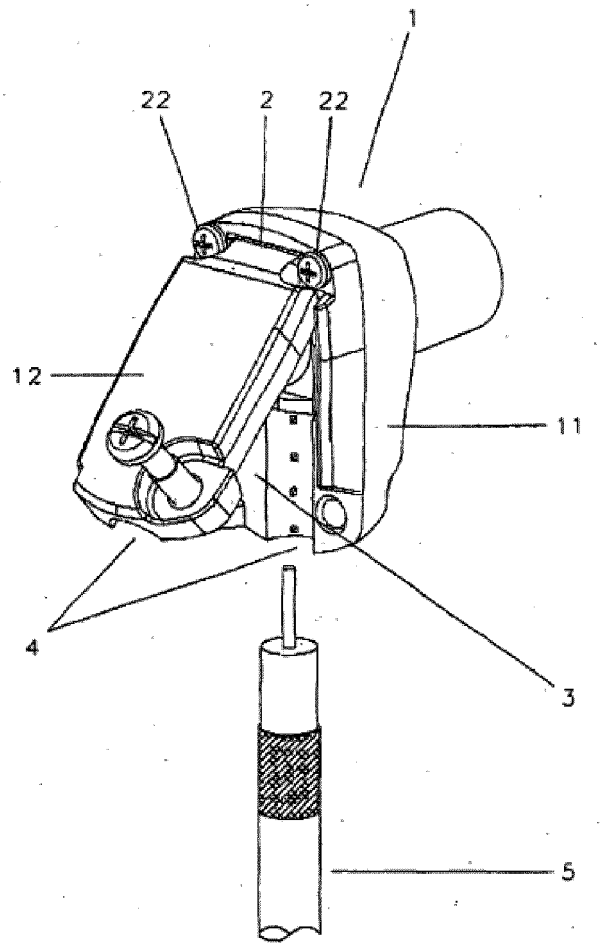

FIG. 1 – PRIOR ART

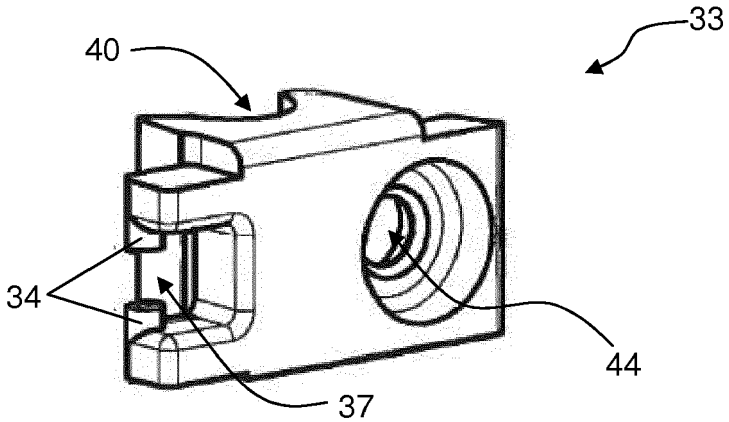

FIG. 3

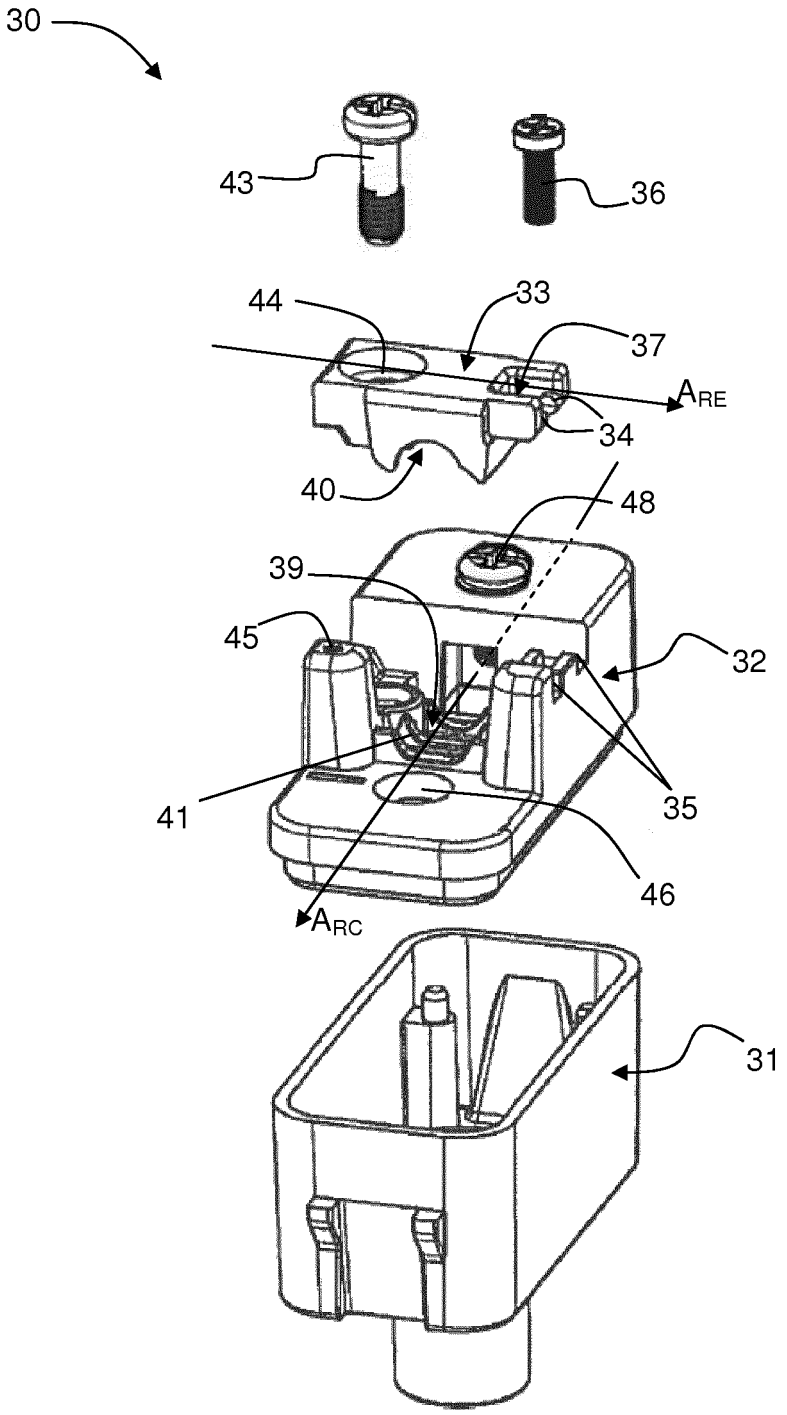

FIG. 2

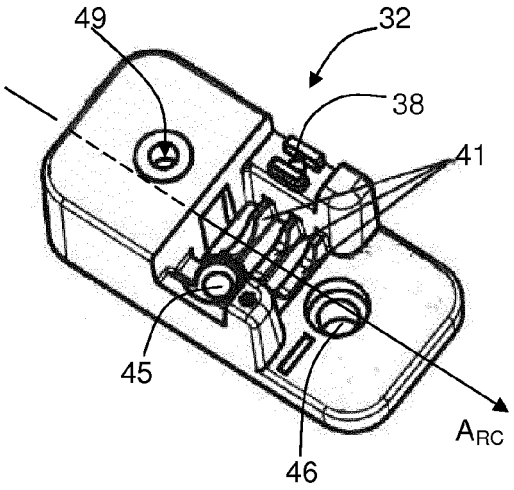

FIG. 4A

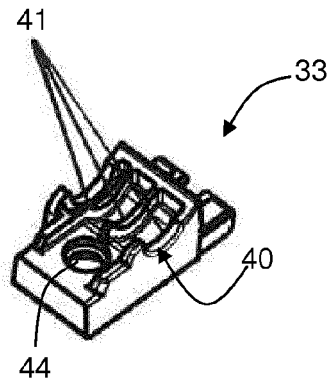

FIG. 4B

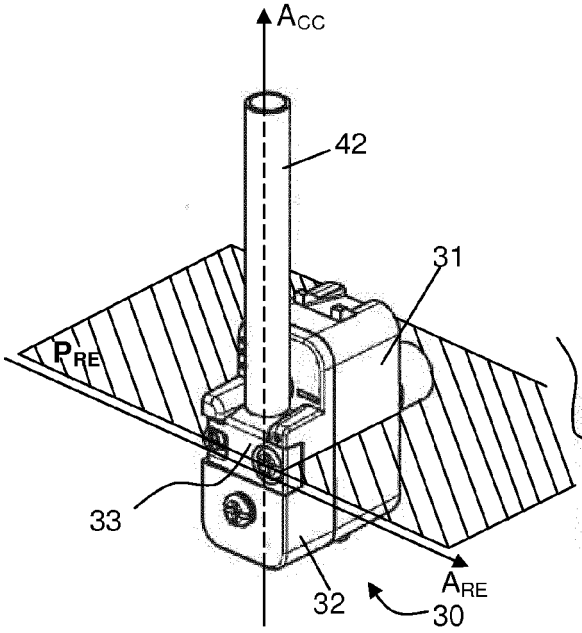

FIG. 5A

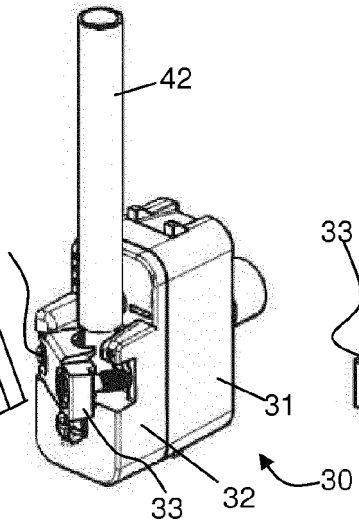

FIG. 5B

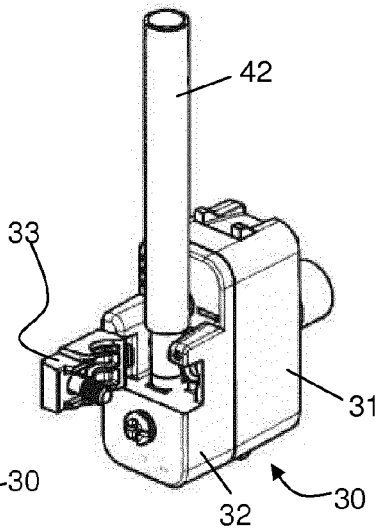

FIG. 5C

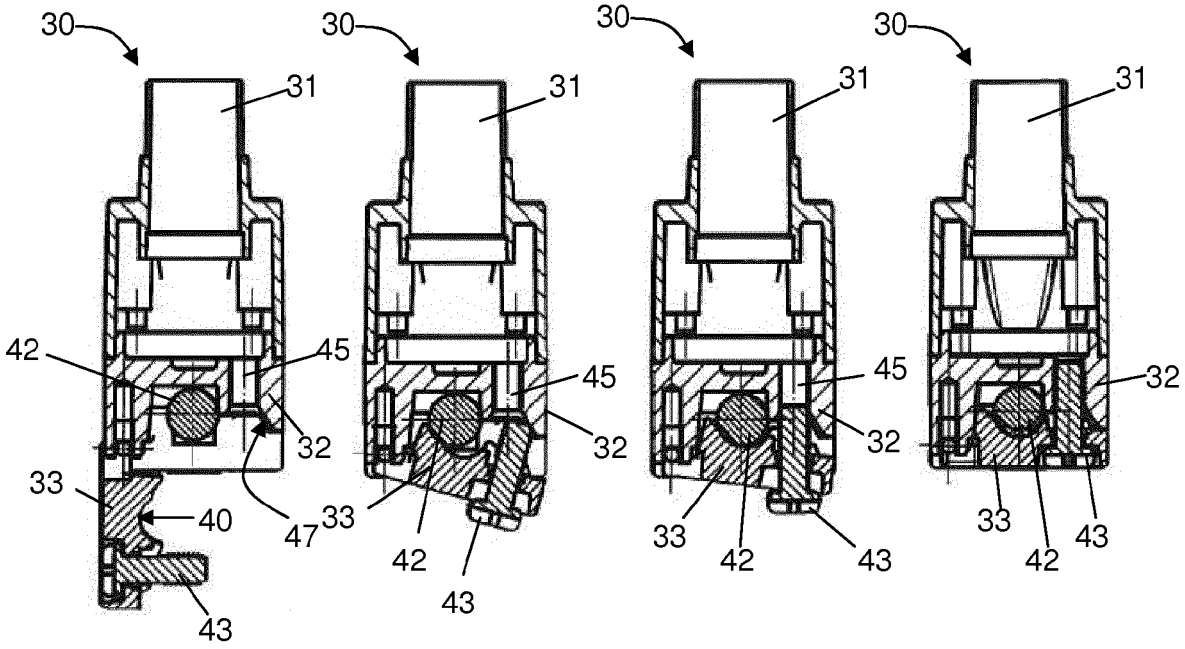

FIG. 6A FIG. 6B FIG. 6C FIG. 6D

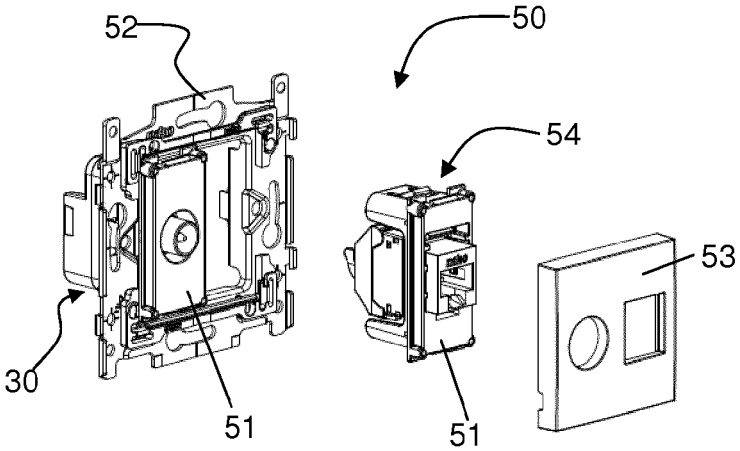

FIG. 7A

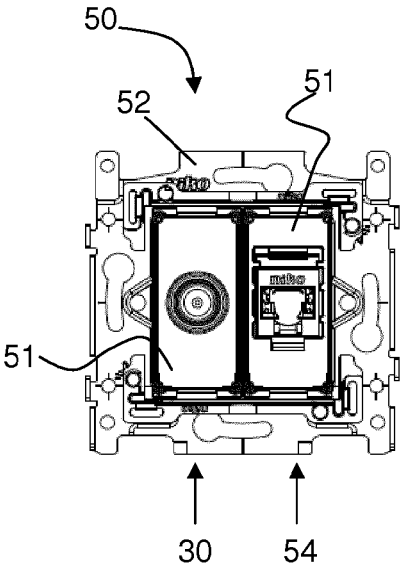

FIG. 7B

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 0549

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	EP 2 063 496 A1 (JYH ENG TECHNOLOGY CO LTD [TW]) 27 May 2009 (2009-05-27) * the whole document *	1-10	INV. H01R13/512 H01R13/424 H01R9/18
X	EP 1 914 842 A1 (TELEVES SA [ES]) 23 April 2008 (2008-04-23) * the whole document *	1-10	H01R13/58
X	ES 1 049 159 U (TELEVES S A Y EN SU REPRESENTA [ES]) 16 November 2001 (2001-11-16) * the whole document *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 March 2017	Gomes Sirenkov E M.

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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15-03-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2063496 A1	27-05-2009	NONE	
EP 1914842 A1	23-04-2008	AT 514206 T	15-07-2011
		EP 1914842 A1	23-04-2008
		ES 2323610 A1	21-07-2009
		ES 2374256 T3	15-02-2012
		PT 1914842 E	01-09-2011
ES 1049159 U	16-11-2001	NONE	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1914842 A **[0004] [0005] [0006]**