



(51) International Patent Classification:
H01R 13/627 (2006.01)

(21) International Application Number:
PCT/EP2010/050140

(22) International Filing Date:
8 January 2010 (08.01.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
102009004458.2 13 January 2009 (13.01.2009) DE

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: ELECTRICAL PLUG-AND-SOCKET CONNECTOR WITH LOCKING MEANS

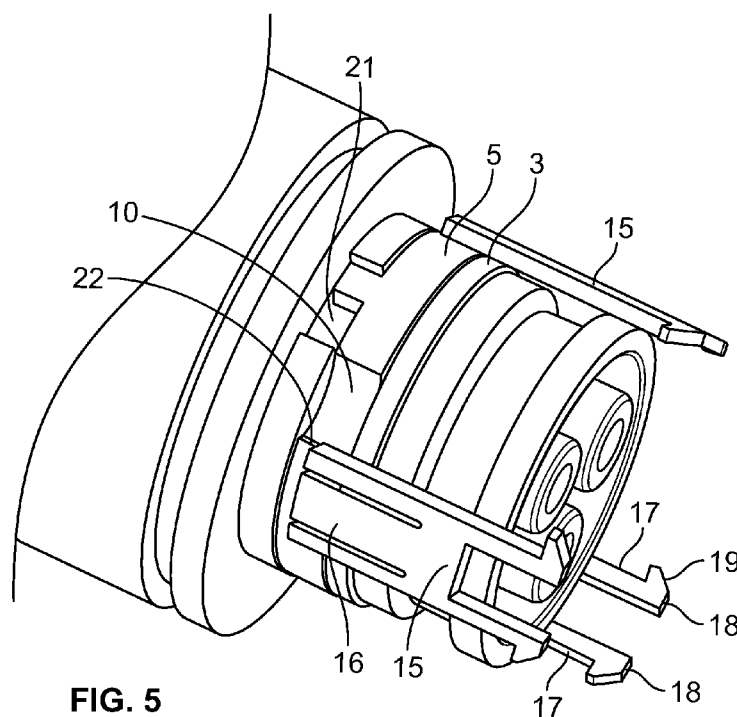


FIG. 5

(57) Abstract: In a plug-and-socket connector with a locking means having an unlocking ring (5), it is proposed according to the invention that the first connector element (1) be provided in its end section (3) with an external circumambient groove, in which the unlocking ring (5) is rotatably guided, which ring has pockets (10) distributed across its periphery for the catch projections (16) of catch hooks (15) fixed in the second connector element (2). The second connector element (2) has a window-like cut-out (13) through which the unlocking ring (5) is accessible and can be turned in the locked state.



Published:

— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

ELECTRICAL PLUG-AND-SOCKET CONNECTOR WITH LOCKING MEANS

The invention relates to an electrical plug-and-socket connector with a first connector
5 element, the end section of which can be inserted into a coaxial second connector element,
and with a locking means having an unlocking ring.

A plug-and-socket connector of this type is known for example from DE 197 49 130 C1. The
locking means of the known plug-and-socket connector has a cylindrical unlocking ring
10 which surrounds the second, outer, connector element in the form of an axially displaceable
unlocking sleeve. Due to axial displacement of the unlocking sleeve, the free ends of the
catch tongues formed on a locking ring are pressed outwards and the plug-and-socket
connector is unlocked.

15 The known locking means having an axially displaceable unlocking ring consist of parts of
relatively complex construction which typically result in an undesirable enlargement of the
external diameter of the plug-and-socket connector. Furthermore, even in the case of locking
means of complicated construction it is seldom possible to check clearly, visually from the
outside, whether the plug-and-socket connector is locked. The situation is made more
20 difficult if a locking means which can be opened only with the aid of a tool is required.

The object of the invention is to provide a plug-and-socket connector with a locking means
which is inexpensive to manufacture and of simple construction and in addition has good
sealing properties.

25 This object is achieved according to the invention with the measures set forth in Claim 1.
Preferred embodiments of the invention are listed in the following dependent claims.

In the plug-and-socket connector according to the invention, beyond the generic features,
30 provision is made for the second connector element to be provided on its end section with
axially extending inner grooves, in which in each case a catch hook is guided which is fixed to
the second connector element and has on the connection side an inward-projecting catch

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projection. Furthermore, the first connector element is provided in its end section with an external circumambient groove in which the unlocking ring is rotatably guided, and the unlocking ring has pockets distributed across its periphery, the catch projections in a locked state of the plug-and-socket connector penetrating elastically into one pocket in each case
5 and in an unlocked state being able to be pressed outwards by a section of the periphery of the unlocking ring which is not provided with pockets. Furthermore, according to the invention provision is made for the end section of the second connector element to have at least one window-like cutout through which the unlocking ring is accessible and can be turned in the locked state.

10

One advantage of the plug-and-socket connector according to the invention is that, apart from the two connector elements, which are only minimally influenced by the locking means and may therefore be of very simple form, and a simply formed unlocking ring, only for example three additional catch hooks are necessary as parts which have to be manufactured
15 separately for producing the locking means. It is regarded as particularly advantageous that the catch hooks, owing to the construction of the locking means, can be designed with relatively high tolerances. The unlocking ring, in cooperation with the window-like cutout, permits simple and clear visualisation of the locked or unlocked state of the plug-and-socket connector.

20

An embodiment of the invention in which the catch hooks on the end opposite the catch projection have at least one anchoring projection with which they are anchored in an external circumambient annular groove on the second connector element, in which groove the axially extending inner grooves end, is particularly preferred. This permits very simple mounting of
25 the catch hooks, which are inserted from the connection face of the second connector element into the axial grooves until they click securely in the annular groove.

25

According to an advantageous development of the aforementioned embodiments, three catch hooks arranged uniformly distributed on the periphery of the second connector element are
30 provided, so that clear catching, supported at three points, is made possible.

30

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According to one development, an unlocking member which projects in the axial direction is arranged on the unlocking ring, which member in the locked state of the plug-and-socket connector can be actuated through the window-like cutout. This variant offers advantages for simple locking and visualisation of the locked state.

5

The transitions of the pockets to the adjoining sections of the periphery of the unlocking ring which are not provided with pockets, according to a further embodiment, are formed obliquely at least to one side, so that an inclined thrust face which cooperates with the respective catch projection is formed.

10

Owing to the unlocking ring which can only be turned through the window-like cutout, it can be ensured in a simple manner that the locking means - if this is required for an application - can be unlocked only with a tool.

15 The first connector element may be provided on its end section with a circumambient radial seal, which is advantageous compared with an end-face seal known from the prior art.

The formation of the catch hooks such that they consist of plastics material at the catch-projection end and of metal at the opposite end is advantageous since it permits a high degree of heat dissipation and thereby a greater current transmission capability.

20

Figure 1 shows a perspective view of the unlocking ring attached to the first connector element of the plug-and-socket connector according to the invention,

25 Figure 2 shows, in the same view as Figure 1, the catch hooks inserted into the second connector element,

Figure 3 shows a perspective view of a plug-and-socket connector assembled from the two connector elements,

30

Figure 4 shows the anchoring of the catch hooks in the second connector element,

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Figure 5 shows, in the same view as the other figures, the arrangement of the catch hooks relative to the first connector element and to the unlocking ring.

Figure 1 shows a first connector element 1 of an electrical plug-and-socket connector which has an end section 3 with a reduced external diameter, in which by way of example three domes 4 are arranged, each of which contains a socket contact (not shown). The end section 3 is provided with an external circumambient groove in which an unlocking ring 5 is rotatably guided, so that the unlocking ring 5 adjoins a first shoulder 6 of the groove on the connection side. In the second shoulder 7 of the groove there is provided a recess 8, into which a projection 9 formed axially on the unlocking ring 5 projects. This projection, which serves as an unlocking member 9, can be moved within the recess 8, i.e. over a short portion of the periphery of the first connector element 1, the unlocking ring 5 turning with it by a corresponding short amount. The unlocking ring 5 furthermore has pockets 10 distributed uniformly across its periphery, one of which can be seen in Figure 1. Figure 1 furthermore shows a radial lip seal 11 which is pressed into a further circumambient groove arranged relatively close to the connection face of the first connector element 1.

Figure 2 shows a second connector element 2, the connection face of which is designed such that the connector element 2 can be assembled with the first connector element 1 to form the plug-in connection, the end section 12 of the second connector element 2 coaxially surrounding the end section 3 of the first connector element 1 in the assembled state, cf. Figure 3. There can be seen a window-like cutout 13 and also three inner grooves 14 extending axially in the end section 12, into each of which a catch hook 15 is inserted. The catch hooks 15 have on their insertion-side end an inward-protruding catch projection 16 in each case.

Figure 3 shows the two connector elements 1 and 2 assembled to form a plug-and-socket connector. What is omitted in Figure 3 for clarity, but shown in Figure 4 in detail, is the end of a catch hook 15 opposite the catch projection 16. This opposite end is formed by two small legs 17, cf. Figure 5, which each end in a laterally projecting anchoring projection 18. Upon assembly, the catch hooks 15 are each inserted with their legs 17, or the anchoring projections 18, which each have a chamfer 19, into the axially extending grooves 14 in the

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second connector element 2, the two legs 17 being pressed laterally together. As soon as the anchoring projections 18 are pushed through into the annular groove 20, the legs 17 with the anchoring projections 18 spring laterally open, so that the respective catch hook 15 is fixed in the second connector element 2.

5

The illustration of Figure 5 shows in a simple manner the cooperation of the different parts of the locking means, the second connector element 2, in which the catch hooks 15 shown are actually located, being omitted to facilitate comprehension. What is shown is an unlocked state, indicated by the visualisation means 21 - for example "open" - of the plug-and-socket connector, in which the inward-directed catch projections 16 of the catch hooks 15 lie on sections of the unlocking ring 5 which are not provided with pockets 10. The catch projections 16 are therefore not engaged. If the unlocking ring 5 is turned a few degrees to the left by means of the unlocking member 9, the catch projections 16 run over the incline 22 into the respective pocket 10 of the unlocking ring, where they catch behind the shoulder 6, on the connection side, of the circumambient groove, cf. Figure 1. Then for example the visualisation means "closed" appears in the recess 8.

10

15

Since the plug-and-socket connector, as illustrated in Figure 1, is sealed not on the end face but radially, the catch hooks 15 advantageously do not have to take up any tensile forces even when the plug-and-socket connector is closed. If the catch hooks 15 are formed with two material components, in particular with a catch projection 16 made of plastics material and legs 17 and also anchoring projections 18 made of metal, a high degree of heat dissipation is possible, which permits a greater current transmission capability.

20

25

CLAIMS

1. An electrical plug-and-socket connector with a first connector element (1), the end section (3) of which can be inserted into a coaxial second connector element (2), and with a locking means having an unlocking ring (5),

characterised in that

- the second connector element (2) is provided on its end section (12) with axially extending inner grooves (14), in which in each case a catch hook (15) is guided which is fixed to the second connector element (2) and has on the connection side an inward-projecting catch

projection (16),

- the first connector element (1) is provided in its end section (3) with an external circumambient groove in which the unlocking ring (5) is rotatably guided, and in that the unlocking ring (5) has pockets (10) distributed across its periphery, the catch projections (16) in a locked state of the plug-and-socket connector penetrating elastically into one pocket (10) in each case and in an unlocked state being able to be pressed outwards by a section of the periphery of the unlocking ring (5) which is not provided with pockets (10),

- and in that the end section (12) of the second connector element (2) has at least one window-like cut-out (13) through which the unlocking ring (5) is accessible and can be turned in the locked state.

2. A plug-and-socket connector according to Claim 1, characterised in that the catch hooks (15) on the end opposite the catch projection (16) have at least one anchoring projection (18) with which they are anchored in an external circumambient annular groove (20) on the second connector element (2), in which groove the axially extending inner grooves (14) end.

3. A plug-and-socket connector according to Claim 1 or 2, characterised in that three catch hooks (15) arranged uniformly distributed on the periphery of the second connector element (2) are provided.

4. A plug-and-socket connector according to one of Claims 1 to 3, characterised in that an unlocking member (9) which projects in the axial direction is arranged on the unlocking ring

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(5), which member in the locked state of the plug-and-socket connector can be actuated through the window-like cutout (13).

5 5. A plug-and-socket connector according to one of Claims 1 to 4, characterised in that the transitions of the pockets (10) to the adjoining sections of the periphery of the unlocking ring (5) which are not provided with pockets (10) are formed obliquely at least to one side, so that an inclined thrust face (22) which cooperates with the respective catch projection (16) is formed.

10 6. A plug-and-socket connector according to one of Claims 1 to 5, characterised in that the locking means can be unlocked only with a tool.

15 7. A plug-and-socket connector according to one of the preceding claims, characterised in that the first connector element (1) is provided on its end section (3) with a circumambient radial seal (11).

8. A plug-and-socket connector according to one of Claims 1 to 7, characterised in that the catch hooks (15) consist of plastics material at the catch-projection end (16) and of metal at the opposite end (17, 18).

20

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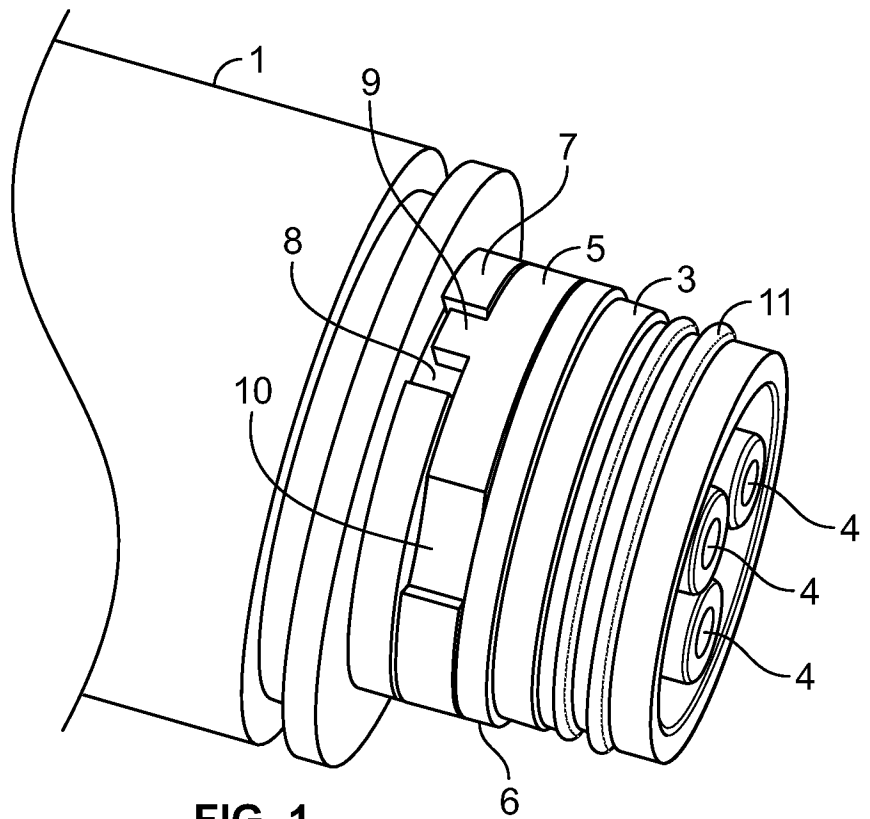


FIG. 1

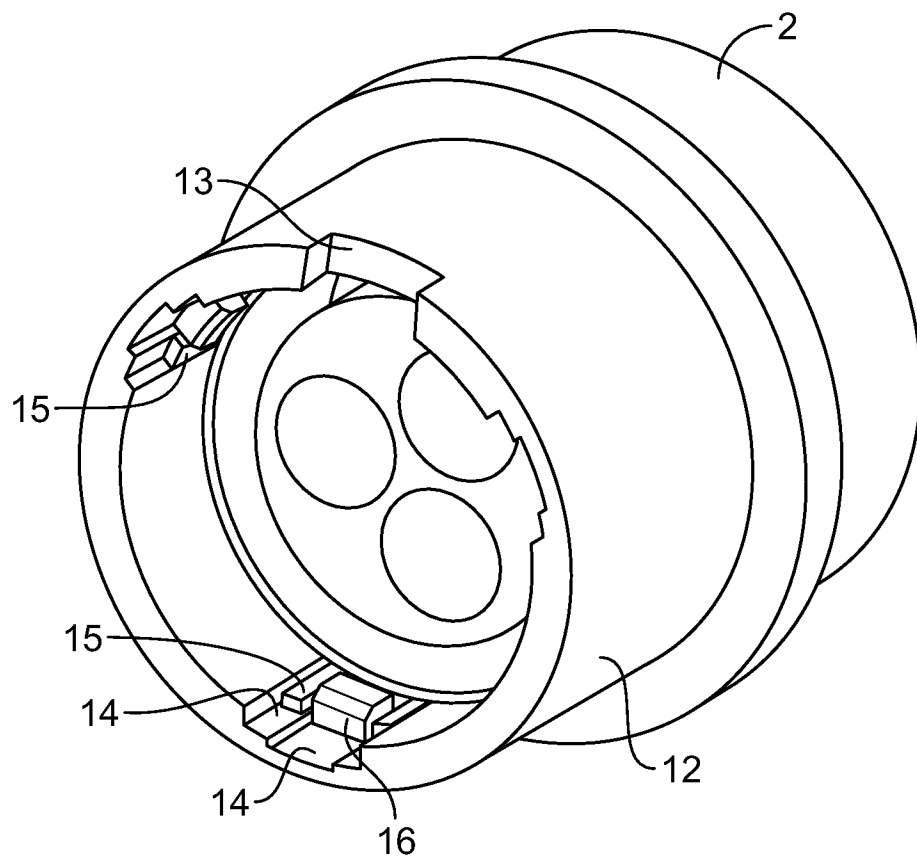


FIG. 2

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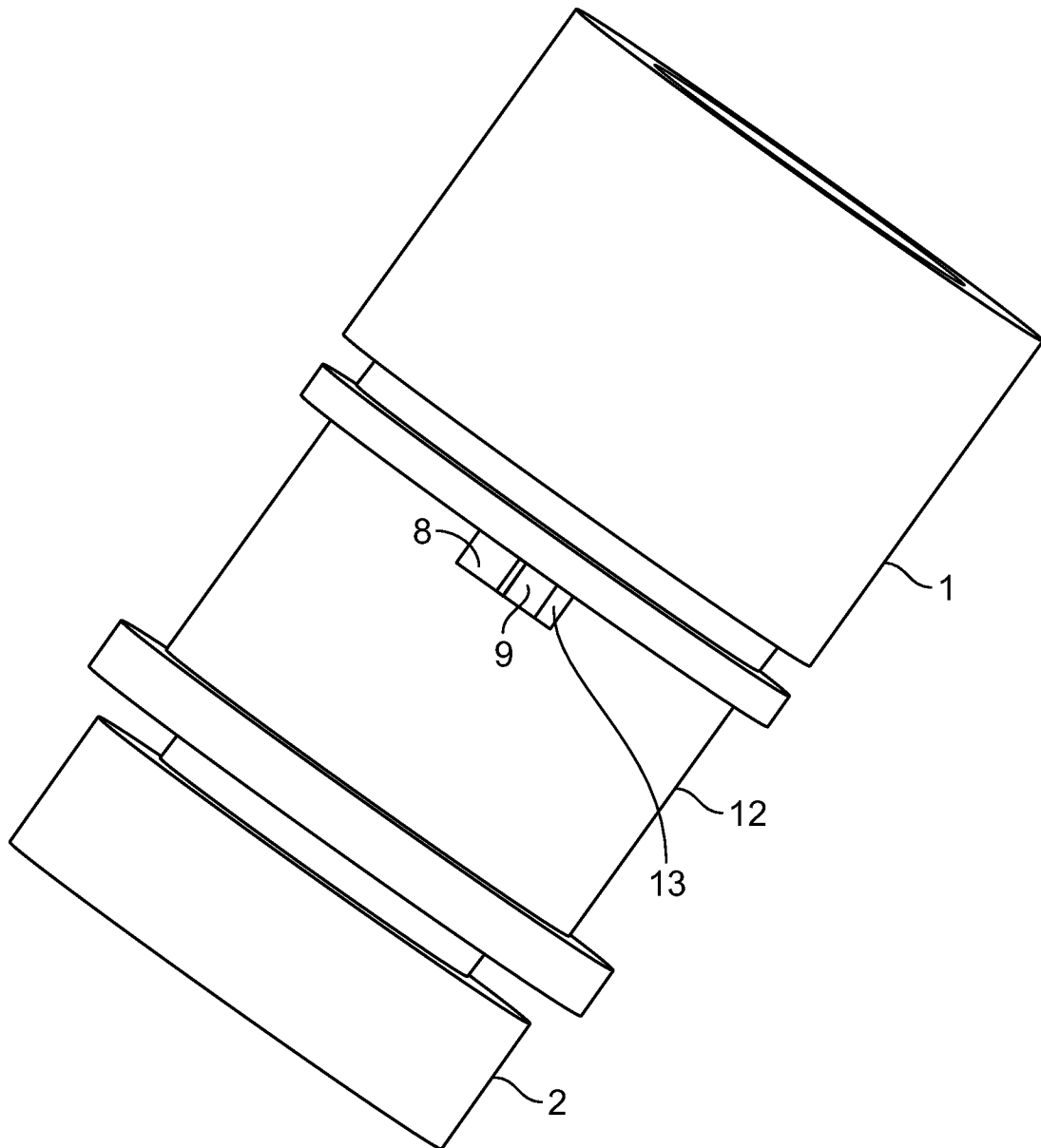


FIG. 3

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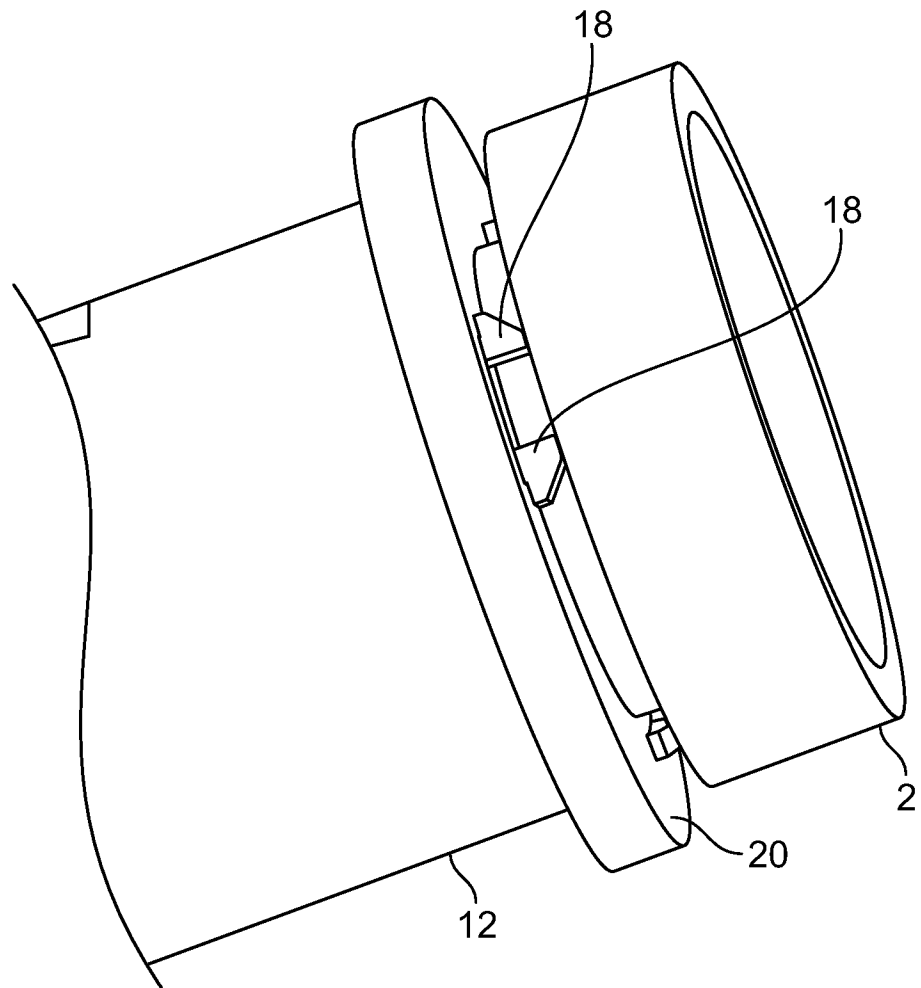


FIG. 4

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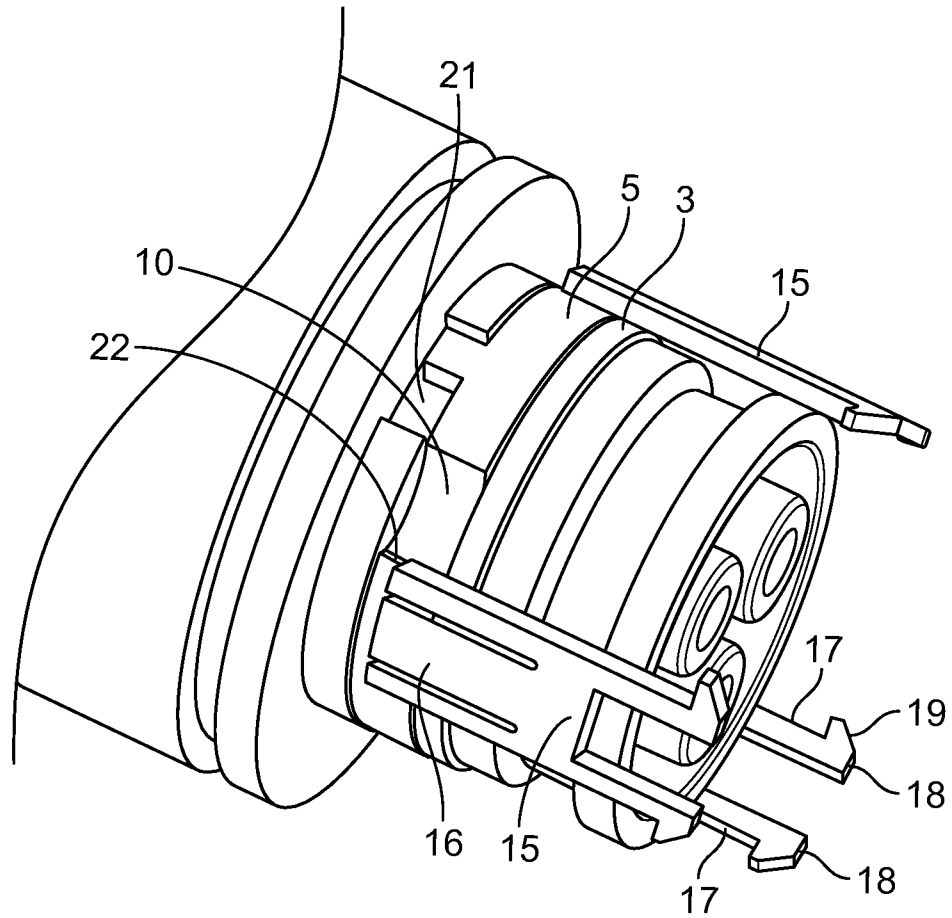


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2010/050140

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R13/627

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7 306 472 B2 (MATSUMOTO HIROYUKI [JP] ET AL) 11 December 2007 (2007-12-11) abstract column 15, line 2 - column 19, line 10; figures 1-4	1-8
A	US 2004/137778 A1 (MATTHEEUWS KRISTOF [BE] ET AL) 15 July 2004 (2004-07-15) abstract paragraph [0019] - paragraph [0025]; figures 1-2	1-8
A	US 5 641 310 A (TIBERIO JR PATRICK J [US]) 24 June 1997 (1997-06-24) abstract claims 1-4; figures 1-5	1-8



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

27 April 2010

Date of mailing of the international search report

07/05/2010

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2010/050140

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