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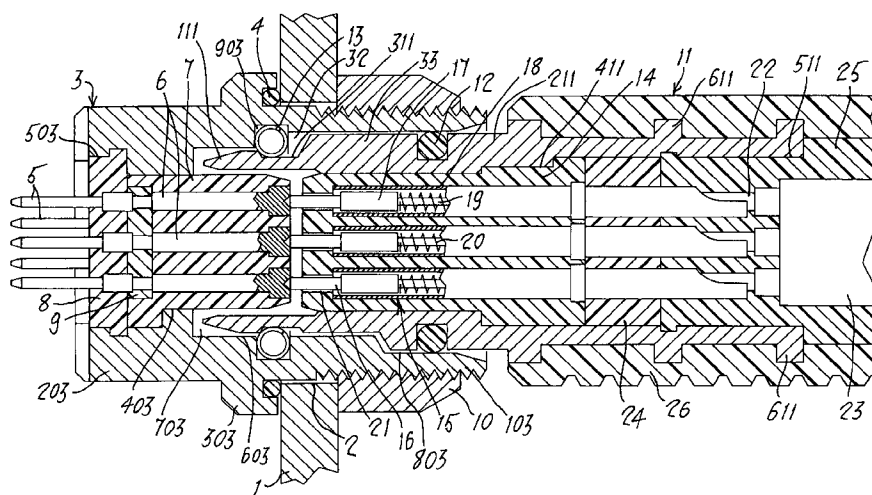
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Published:

- with international search report
- with amended claims

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CONNECTION DEVICE FOR ELECTRICAL OR ELECTRONIC CONNECTIONS



(57) Abstract: Connection device for electrical or electronic connections, comprising a socket connector (3, 43) with a plurality of contact sockets (6) and a pin connector (11, 34) connected to an electric cable (23) and with a plurality of contacts (15) provided with pins (16) able to engage with these contact sockets (6) following insertion of this pin connector (11, 43) inside this socket connector (3, 43); this pin connector (11, 43) comprises an internally hollow main body (211, 234) which houses, inside it, at least one first bush (14, 37) which is made of insulating material and inside which these contacts (15) are inserted and from which these pins (16) protrude, and this socket connector (3, 43) comprises an internally hollow main body (203, 243) which houses, inside it, a second bush (7, 42) which is made of insulating material and inside which these contact sockets (6) are inserted; this main body (211, 234) of the pin connector (11, 34) is provided with a free section (111, 334) able to engage sealingly inside an annular cavity (703, 41) formed between this second bush (7, 42) made of insulating material and the inner walls of the main body (203, 243) of this socket connector (3, 43).

Connection device for electrical or electronic connections

DESCRIPTION

- 5 The present invention relates to a connection device for electrical or electronic connections.

As is known the normal connection devices for electrical or electronic connections are provided with a socket connector connected, for example, to the wall of a panel
10 or a container and a pin connector having, on the one hand, pins able to engage inside suitable sockets of the socket connector and, in the other hand, connections for a normal electric cable. The pin connector must be made with a form which matches exactly the socket connector so that, when this pin connector is inserted inside the socket connector, an efficient electrical or electronic connection is
15 guaranteed and moreover a certain sealing action preventing the entry of external agents, such as dust or the like, is ensured. These connectors generally have a cylindrical, rectangular or square shape and the electric cable, with respect to the pin connector, may be in alignment with the contact pins or arranged perpendicularly with respect thereto. In the pin connector contacts formed by a pin provided with an
20 axial stem around which a resilient-tensioning helical spring is wound may be used. This spring is arranged between said pin and a scored hyperboloid, which is connected to a connection terminal, and able to ensure contact with the external surface of said stem.

- 25 These known connectors have various drawbacks including, in the case where these contacts provided with a scored hyperboloid are used, the difficulty of alignment between the hyperboloid and the stem of the pin. Moreover, since the pin connector, whether it be cylindrical or rectangular, is inserted inside the socket connector in order to perform the connection of the pins with the associated sockets, often
30 problems relating to the sealing action may arise, with the possibility of entry of dust

or other external agents which adversely affect the reliability and the wear of these connectors.

The object of the present invention, therefore, is to provide a connection device for electrical or electronic connections which overcomes the drawbacks of the known devices mentioned above.

This object is achieved by the present invention by means of a connection device for electrical or electronic connections, comprising a socket connector with a plurality of contact sockets and a pin connector connected to an electric cable and having a plurality of contacts provided with pins able to engage with these contact sockets following insertion of this pin connector inside this socket connector, characterized in that this pin connector comprises an internally hollow main body which houses, inside it, at least one first bush which is made of insulating material and inside which these contacts are inserted and from which these pins protrude, and this socket connector comprises an internally hollow main body which houses, inside it, a second bush which is made of insulating material and inside which these contact sockets are inserted; this main body of the pin connector is provided with a free section able to engage sealingly inside an annular cavity formed between this second bush made of insulating material and the inner walls of the main body of this socket connector.

Further advantages and characteristic features of the device according to the present invention will become clear from the following detailed description of certain embodiments thereof, provided by way of a non-limiting example, with reference to the accompanying plates of drawings, in which:

- Fig. 1 shows a cross-sectional view of a first embodiment of a connector device for electrical or electronic connections according to the present invention, comprising a first socket connector fixed to a panel and a second pin connector connected to an

electric cable;

- Fig. 2 shows a cross-sectional view of one of the contacts, forming the subject of a simultaneous application in the name of the owners of the present application,
5 provided in the pin connector of the connection device according to Fig. 1;

- Fig. 3 shows a side view of the socket connector of the connection device according to Fig. 1;

10 - Fig. 4 shows a side view of the pin connector of the connection device according to Fig. 1;

- Fig. 5 shows a partially sectioned view of a second embodiment of the connection device according to the present invention, provided with a socket connector fixed to a
15 panel and with a pin connector connected to an electric cable perpendicular to said socket connector;

- Fig. 6 shows a side view of the socket connector of the connection device according to Fig. 5; and

20 - Fig. 7 shows a side view of the pin connector of the connection device according to Fig. 5.

With reference to these accompanying drawings and with particular reference to Fig.
25 1 thereof, 1 denotes a panel in which a hole 2 for receiving a socket connector 3 is formed, said connector comprising a main body 203 which is preferably made of metallic material and has, on one side, a threaded cylindrical section 103, projecting outwards from said panel 1, and a flange 103 for resting against the inner wall of said panel 1. A sealing ring 4 is provided between this flange 303 and the wall of the
30 panel 11 close to the through-hole 2. On the opposite side to said threaded

cylindrical section 103, this main body 203 comprises a cylindrical opening 503 from which a series of electronic contact terminals 5, for example for printed circuit boards (PCB), emerge. These terminals 5 are connected to associated contact sockets 6 embedded in a bush 7 made of insulating thermoplastic material. This bush 7 is inserted inside a first cylindrical seat 403 formed inside the main body 203 of the socket connector. A sealing plug 8, for example made of epoxy resin, and a sealing base piece 9 made of elastomer material, such as rubber or the like, are provided between these contact sockets 6 and these terminals. In particular, the plug 8 is arranged inside said cylindrical opening 503 with a T-shaped cross-section, while the base piece 9 is positioned between said bush 7 and said plug 8 inside a seat formed on one side of this bush 7. This bush 7, this plug and this base piece 9 ensure an optimum seal of the socket connector 3, preventing the entry, on the side of the terminals 5, of atmospheric or polluting agents such as dust or the like. The socket connector 3 is fixed to the wall of the panel 1 by means of a ring 10 which is screwed around the threaded cylindrical section 103 protruding from said panel 1. The main body 203 of said socket connector 3 comprises a second cylindrical seat 603 adjacent and coaxial with said first cylindrical seat 403, but with a greater diameter. The bush 7 with the contact sockets 6 projects inside said second cylindrical seat 603 so as to form between it and the wall of said second cylindrical seat 603 a cylindrical annular cavity 703 inside which the cylindrical end section 111 of the main body 211 of a pin connector 11 is housed. As can be seen, the main body 211 - preferably made of metallic material - of the pin connector 11 is inserted inside a substantially cylindrical mouth 803 formed inside the threaded cylindrical section 103 of the socket connector 3, and between the outer wall of this main body 211 of the pin connector 11 and the inner wall of this mouth 803 of the threaded cylindrical section 103 of the socket connector 3 a sealing ring 12 is provided. This substantially cylindrical mouth 803 is formed with a diameter greater than that of said second and first cylindrical seats 603 and 403. A toroidal spring 13 is provided between this second cylindrical seat 603 of the main body 203 of the socket connector 3 and this cylindrical end section 111 of the main body 211 of the pin connector 11, said spring

being seated inside a first annular groove 903 formed in said cylindrical seat 603 and able to engage, during insertion of said pin connector 11 inside said socket connector 3, inside a second annular groove 311 formed in the outer wall of said cylindrical end section 111. The main body 211 of the pin connector 11 is internally hollow and comprises a cylindrical seat 411 with various diameters increasing from the inside towards the outside of this pin connector 11. Starting from the inside of the pin connector 11, 14 denotes a first bush which is made of elastomer material, for example neoprene, and is housed inside a first section of this cylindrical seat 411. Contacts 15 forming the subject of a patent application filed simultaneously with the present application and in the name of the same owners of the present application are embedded in this bush 14. Each of these contacts 15 comprises a pin 16 able to enter into contact with the associated contact socket of the socket connector 3 and provided with an end lug 17 inserted inside a tubular container body 18. From the end of the end lug 17 opposite the pin 16 there extends an axial stem 19 which passes through the entire length of the tubular container body 18. A helical spring 20 is wound around this axial stem 19. This pin 16 protrudes from the bush 14 via suitable through-holes 21 formed at the end of said bush 7 directed towards the contact sockets 6. These contacts 15 are connected to electrical wires 22 which are entirely known and protrude from a generic electric cable 23. Proceeding from the inside towards the outside of the main body 211 of the pin connector 11, 24 denotes a second bush which is made of thermoplastic material and is inserted inside an associated section of said cylindrical seat 411 and is adjacent to said first bush 14. The main body 211 of the pin connector 11 comprises at the outer end of the cylindrical seat 411 a mouth 511 inside which a plastic plug 25 containing the electric cable and inserted inside the end section of said cylindrical seat 411 is inserted. This main body 211 comprises externally ribs 611 and has fitted around it, for example, by means of over-moulding, a gripping sleeve 26 made of plastic.

Fig. 2 shows one of the contacts 15 embedded inside the bush 14 of the pin connector 11. A seal 27 is inserted between the end lug 17 and the bottom of the

tubular container body 18 close to the through-hole 21 formed in the bush 14. The helical spring 20 wound around the axial stem 19 presses on one side against said end lug 17 and on the other side against a constriction 28 formed in said tubular container body 18. The free end of this axial stem 19 passes beyond said constriction 28 and is inserted inside a scored contact hyperboloid 29. This scored hyperboloid 29 therefore presses on one side against the constriction 28 of the tubular container body 18 and on the other side against the base of a blind cavity 30 of a contact terminal 31.

Fig. 3 shows a side view of the socket connector 3 inside which it is possible to see the keying system envisaged for the connection device according to the present invention. The cylindrical seat 603 formed inside the main body 203 of the socket connector 3 is provided internally with two longitudinal grooves 32 able to engage with two corresponding ribs (see Fig. 4) formed on the outside of the cylindrical end section 111 of the main body 211 of the pin connector 11 inserted inside the cylindrical annular cavity 703 formed between the bush 7 and said cylindrical seat 603. These longitudinal grooves 32 engaged by the ribs 33 form the keying system of the present connection device, allowing a single position for insertion of the pin connector 11 inside the socket connector 3. 106 denotes the holes of the contact sockets 6 inside which the pins 16 of the contacts 15 according to Figs. 1, 2 and 4 are inserted.

Fig. 5 shows a second embodiment of the present connection device. In this variant the electric cable 23 is connected to the pin connector 34 so as to form substantially an L-shaped connection device. The pin connector 34 comprises a first outer body 134 with a rectangular or square cross-section inside which a second internal body 234 with a square or rectangular and internally hollow cross-section is inserted. This inner body 234 is provided externally with a flange 35 for fixing, by means of bolts 36, to the outer body 134 and internally with a bush 37 which is made of elastomer material and inside which the contacts 15 provided with associated pins 16

protruding from the through-holes 21 are embedded. Adjacent to said bush 37 inserted inside the inner body 234 of the pin connector 34, a base piece 38 made of thermoplastic material and finally a plug 39, partially shown in the figure, and similar to the plug 25 of the embodiment of the present device according to Fig. 1, are provided. An annular seal 40 is provided between the base piece 38 and the inner wall of the hollow inner body 234. This inner body 234 comprises, on the side where the pins 16 of the contacts 15 emerge, an end section 334 which is able to be inserted inside an annular cavity 41, in this case with a rectangular or square shape, formed between the outer wall of a bush 42 made of thermoplastic material and the inner wall of a hollow seat 143 formed in the main body 243 of a socket connector 43. This main body 243 is inserted inside an opening 44 with a rectangular or square cross-section formed in a panel 45 and is fixed thereto by means of a flange 343 engaged by associated bolts 46. This flange 343 also has fixed thereto, by means of these bolts 46 and outside the panel 45, two plates 47 each with two hooks 48 able to receive two lugs 49 fixed to the outer body 134 of the pin connector 34. In a similar manner to the first embodiment of the present device shown above, the contact sockets 6 are embedded inside this bush 42 of the socket connector and, in the direction towards the inner side of the panel 45, a sealing base piece 50 made of elastomer material and a closing end cap 51 made of sealing material such as epoxy resin or the like is provided adjacent to this bush. A seal 52 is provided between the inner wall of the main body 243 of the socket connector 43 and the outer wall of the inner body 234 of the pin connector 34.

The device shown in Fig. 5 is also provided with a keying system, shown in Figs. 6 and 7. The annular cavity 41, with a substantially rectangular shape, of the main body 243 of the socket connector 43 comprises on one side a hollow section 141 with a particular shape, for example a V-shape as shown in Figure 6, so as to engage with a corresponding projecting section 434 (see Fig. 7) of the end section 334 of the inner body 234 of the pin connector 34. In this way the insertion of the pin connector 34 inside the socket connector 43 may be performed in a uniquely defined

manner, ensuring correct insertion of the pins 16 inside the corresponding contact sockets 6.

As can be understood from the above description, when the pin connector 11 or 34 is inserted inside the socket connector 3 or 43, an effective seal is ensured, preventing the entry of atmospheric agents owing to the various bushes, base pieces, seals and plugs provided in the positions described and made preferably using the materials indicated in the description above. In the connection device shown in Fig. 1, when the pin connector 11 is introduced inside the socket connector 3, by gripping the sleeve 26, the toroidal spring 13 is already inserted inside the associated annular groove 903 and is slightly compressed by the insertion of the cylindrical end section 111 of the main body 211 of this pin connector 11, until it substantially snap-engages inside the annular groove 311 formed in the outer wall of said cylindrical end section 111. In order to extract the pin connector 11 from the socket connector 3 it is sufficient to grip the sleeve 26 and pull it towards the outside of the panel 1 so that the cylindrical end section 111 compresses again the toroidal spring 13. The use, moreover, of contacts 15, in which the axial stem 19 with the associated helical spring 20 and scored hyperboloid 29 are enclosed inside a tubular container body 18, ensures maximum continuity and efficiency of the electrical or electronic connection and prevents any misalignment in the assembly of the unit, thus resulting in a connection device which is long-lasting and highly reliable both mechanically and electrically speaking.

CLAIMS

1. Connection device for electrical or electronic connections, comprising a socket connector (3, 43) with a plurality of contact sockets (6) and a pin connector (11, 34) connected to an electric cable (23) and with a plurality of contacts (15) provided with pins (16) able to engage with said contact sockets (6) following insertion of said pin connector (11, 43) inside said socket connector (3, 43), characterized in that said pin connector (11, 43) comprises an internally hollow main body (211, 234) which houses, inside it, at least one first bush (14, 37) which is made of insulating material and inside which said contacts (15) are inserted and from which said pins (16) protrude, and said socket connector (3, 43) comprises an internally hollow main body (203, 243) which houses inside it a second bush (7, 42) which is made of insulating material and inside which said contact sockets (6) are inserted, said main body (211, 234) of the pin connector (11, 34) being provided with a free section (111, 334) able to engage sealingly inside an annular cavity (703, 41) formed between said second bush (7, 42) made of insulating material and the inner walls of the main body (203, 243) of said socket connector (3, 43).
2. Connection device according to Claim 1, characterized in that each of said pins (16) of said contacts (15) inserted in said first bush (14, 37) comprises resilient-tensioning means (20) which act in the axial direction on said pin (16) provided with a coaxial stem (19) which extends at the end opposite to that intended for connection, said stem (19) being inserted inside a contact means (29) in the form of a scored hyperboloid enclosed, together with said resilient-tensioning means (20), inside a tubular container body (18) in which means (17, 28) are provided for locating said resilient-tensioning means (20), and through-holes (21) for allowing said pins (16) to pass out being formed on one side of said first bush (14, 37).
3. Connection device according to Claim 2, characterized in that an end lug (17) is provided between said pin (16) and said coaxial stem (19) of each of said contacts

(15), said end lug being adjacent to the through-hole (21) for allowing the pin (16) formed in said first bush (14, 37) to pass out, a seal (27) being housed between the bottom of said tubular container body (18) and said end lug (17).

5 4. Connection device according to Claim 1, characterized in that said pin connector (11, 34) is inserted in said socket connector (3, 34) by means of suitable keying means (33, 32, 141, 434) which allow a single position for insertion of said pin connector (11, 34) in said socket connector (3, 43) for correct formation of the contact between said pins (16) and said sockets (6).

10 5. Connection device according to Claim 4, characterized in that the main body (203) of the socket connector (3) has, formed inside it, a cylindrical seat (603) provided with longitudinal grooves (32) which are suitably positioned and able to engage with corresponding ribs (33) formed on the outside of the cylindrical end section (111) of the main body (211) of the pin connector.

15 6. Connection device according to Claim 4, characterized in that said annular cavity (41) of said socket connector (43) has a substantially rectangular or square cross-section and comprises on at least one side a hollow section (141) with a particular shape, for example a "V" shape, so as to engage with a corresponding projecting section (434) of the end section (334) of the main body (234) of the pin connector (34).

20 7. Connection device according to Claim 1, characterized in that said first bush (14, 37) of the pin connector (11, 34) is made of elastomer material, such as rubber, neoprene or the like.

25 8. Connection device according to Claim 1, characterized in that said second bush (7, 42) of the socket connector (3, 43) is made of thermoplastic material.

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9. Connection device according to Claim 1, characterized in that the main body (203) of said socket connector (3) comprises a first cylindrical seat (603) in which an annular groove (903) for housing a toroidal spring (13) is formed, said cylindrical end section (111) of the pin connector (11) being inserted in said first cylindrical seat (603), and an annular groove (311) able to receive said toroidal spring (13), during the substantially snap-type engagement of the pin connector inside the socket connector, being formed on the outside of said pin connector (11).
10. Connection device according to Claim 1, characterized in that said second bush (7, 42) is inserted inside a first seat (403) formed inside the main body (203) of the socket connector (3, 43) and followed by an opening (503) inside which a sealing plug (8, 51) made of materials such as epoxy resin or the like is inserted.
11. Connection device according to Claim 1, characterized in that said socket connector (3, 43) comprises a sealing base piece (9, 50) which is made of elastomer material, such as rubber or the like, and is positioned between said bush (7, 42) and said plug (8, 51) in a seat formed on one side of said bush (7, 42).
12. Connection device according to Claim 1, characterized in that said socket connector (3, 43) comprises a mouth (803) for insertion of the pin connector (11, 34), sealing means (12, 52) being inserted between the inner wall of the mouth (803) of said socket connector (3, 42) and the outer wall of the main body (211, 234) of the pin connector (11, 34).
13. Connection device according to Claim 1, characterized in that said pin connector (11, 34) comprises an additional bush or base piece (24, 38) which is preferably made of thermoplastic material, is situated adjacent to said first bush (14, 37) and is passed through by suitable contact wires (22) of said electric cable (23).
14. Connection device according to Claim 13, characterized in that said pin

connector (11, 34) comprises a mouth (511) for receiving a closing plug (25, 39) which is made of plastic and inside which said electric cable (23) is inserted, said plug being adjacent to said additional bush or base piece (24, 38).

- 5 15. Connection device according to Claim 1, characterized in that the main body (211) of said pin connector (11) comprises a gripping sleeve (26) which is made of plastic and fitted around the outer wall of said main body (211) and said closing plug (25).
- 10 16. Connection device according to Claim 1, characterized in that said pin connector (11) comprises an outer main body (134) and an inner main body (234) which is inserted inside said outer main body (134) and fixed thereto by means of suitable means (35, 36), said outer main body (134) being provided with a series of lugs (49) for fixing to associated hooks (48) connected to a flange (343) formed in the
- 15 main body (243) of the socket connector (43).

**AMENDED CLAIMS received by the International Bureau
on 10 October 2007 (10.10.2007).**

Claims 1 and 2 amended, claim 3 cancelled

1. Connection device for electrical or electronic connections, comprising a socket connector (3, 43) with a plurality of contact sockets (6) and a pin connector (11, 34) connected to an electric cable (23) and with a plurality of contacts (15) provided with pins (16) able to engage with said contact sockets (6) following insertion of said pin connector (11, 43) inside said socket connector (3, 43), said pin connector (11, 43) comprises an internally hollow main body (211, 234) which houses, inside it, at least one first bush (14, 37) and inside which said contacts (15) are inserted and from which said pins (16) protrude; and said socket connector (3, 43) comprises an internally hollow main body (203, 243) which houses inside it a second bush (7, 42) and inside which said contact sockets (6) are inserted, said main body (211, 234) of the pin connector (11, 34) being provided with a free section (111, 334) able to engage sealingly inside an annular cavity (703, 41) formed between said second bush (7, 42) made of insulating material and the inner walls of the main body (203, 243) of said socket connector (3, 43), characterized by the fact that said first and second bushes are made from insulating material and in that each of said pins (16) of said contacts (15) inserted in said first bush (14, 37) comprises resilient-tensioning means (20) which act in the axial direction on said pin (16) provided with a coaxial stem (19) which extends at the end opposite to that intended for connection, said stem (19) being inserted inside a contact means (29) in the form of a scored hyperboloid enclosed, together with said resilient-tensioning means (20), inside a tubular container body (18) in which means (17, 28) are provided for locating said resilient-tensioning means (20), and through-holes (21) for allowing said pins (16) to pass out being formed on one side of said first bush (14, 37).

2. Connection device according to Claim 1, characterized in that an end lug (17) is provided between said pin (16) and said coaxial stem (19) of each of said contacts (15), said end lug being adjacent to the through-hole (21) for allowing the pin (16) formed in said first bush (14, 37) to pass out, a seal (27) being housed between the bottom of said tubular container body (18) and said end lug (17).

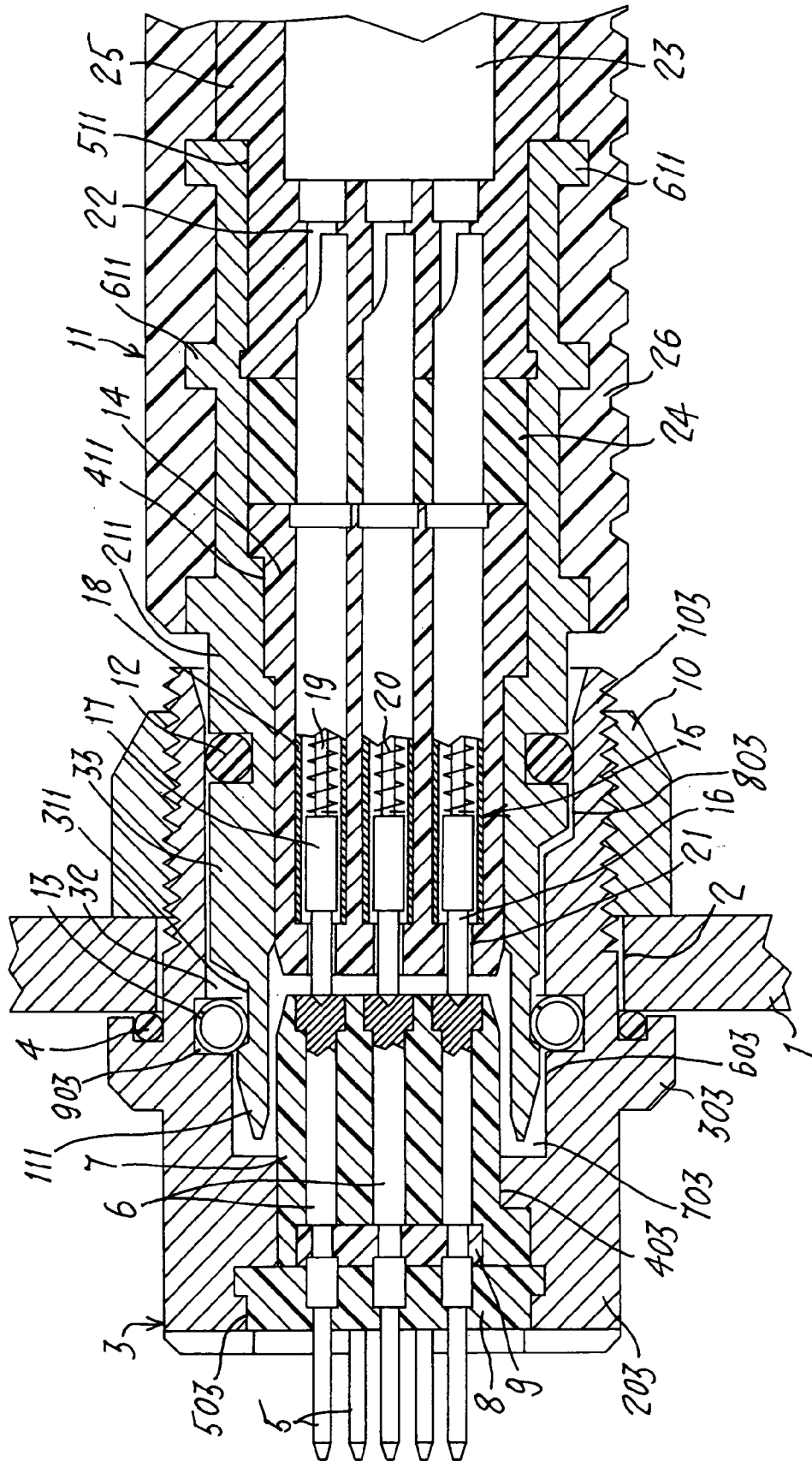


Fig. 1

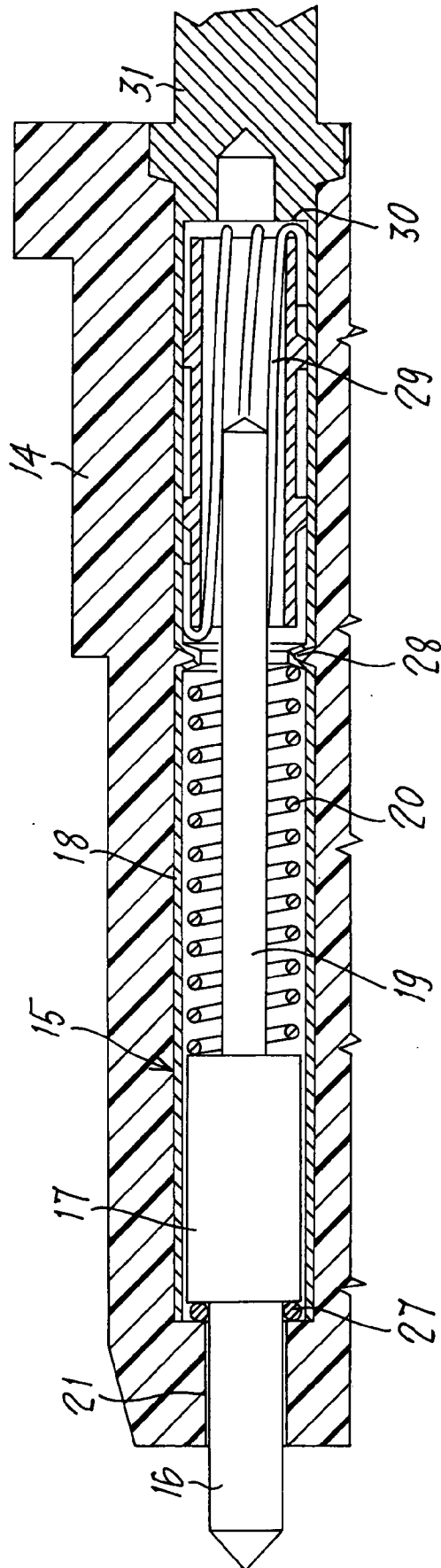


Fig. 2

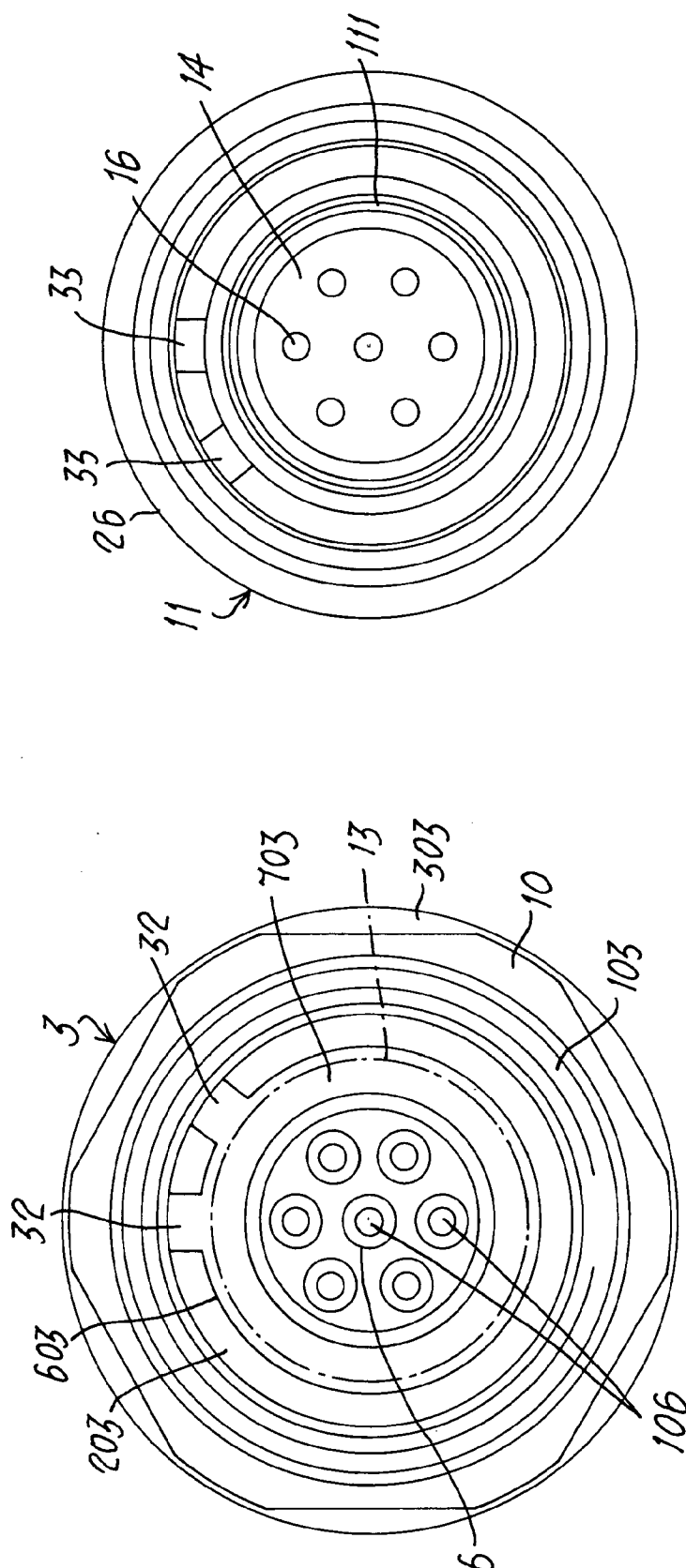
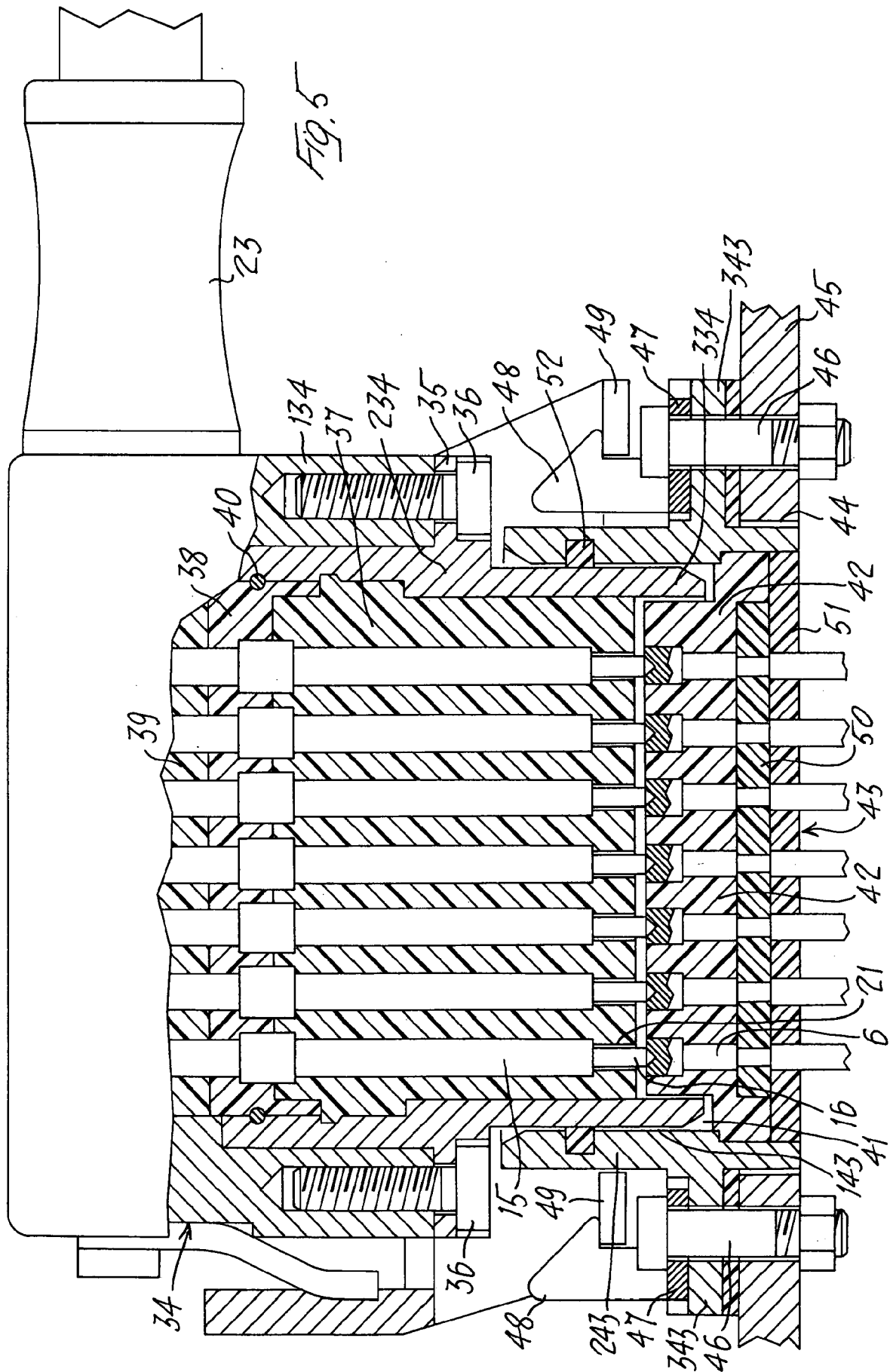
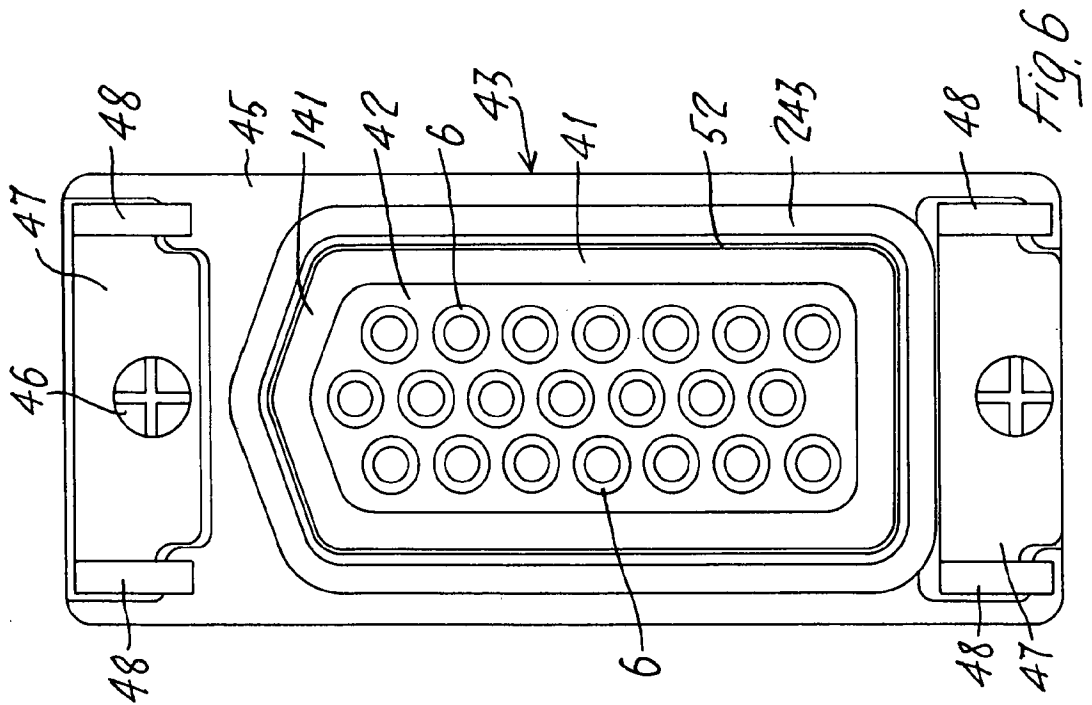
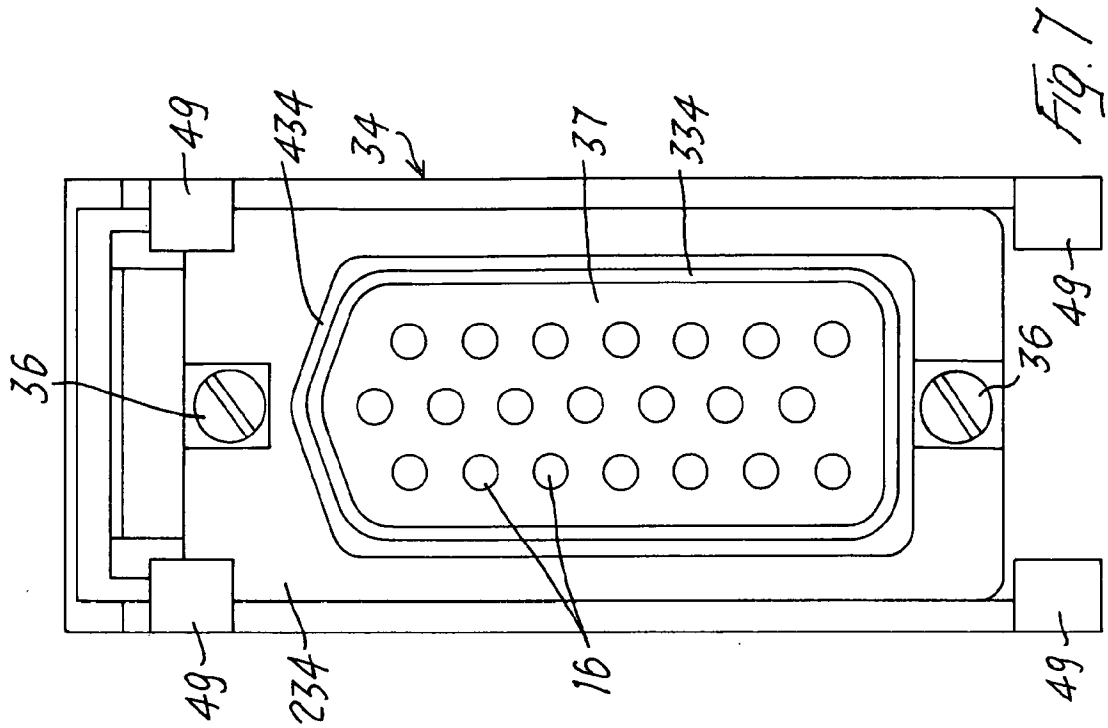


Fig. 4

Fig. 3





INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2007/054210

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R13/24

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.
X	DE 103 24 794 B3 (WOODHEAD CONNECTIVITY GMBH [DE]) 9 December 2004 (2004-12-09) paragraph [0024]; figures 1-3	1
A	EP 1 237 230 A (GENIE AUDIO VISUEL ET APPLIC P [FR]) 4 September 2002 (2002-09-04) figure 2	2

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

* & * document member of the same patent family

Date of the actual completion of the international search

11 June 2007

Date of mailing of the international search report

21/09/2007

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Authorized officer

Langbroek, Arjen

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2007/054210

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-3

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3

A connection device with resilient tensioning means

2. claims: 4-6

A connection device with keying means

3. claims: 7,8

A connection device with elastomer bushings

4. claim: 9

A connection device with a groove and a spring

5. claims: 10,11

A connection device with a sealing plug in an opening

6. claim: 12

A connection device with sealing means on the inner wall of
a mouth

7. claims: 13,14

A connection device with a bush between the cable and the
first bush

8. claim: 15

A connection device with a gripping sleeve

9. claim: 16

A connection device with an outer and an inner main body

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2007/054210

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10324794	B3	09-12-2004	AT 366468 T 15-07-2007
		AU 2004246315 A1 16-12-2004	
		CA 2527899 A1 16-12-2004	
		CN 1799170 A 05-07-2006	
		WO 2004109865 A1 16-12-2004	
		EP 1629573 A1 01-03-2006	
		JP 2006526262 T 16-11-2006	
		KR 20060026857 A 24-03-2006	
EP 1237230	A	04-09-2002	FR 2821492 A1 30-08-2002