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Remarks:

A request for correction has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) **Connector for coaxial cables and electrical connecting system comprising such a connector**

(57) A connector (1) comprising: a main body (2) made of an electrically insulating material, capable of receiving an end section of a coaxial cable (6); and a contact element (3), bearing a terminal (26) which forms a first contact of the connector (1), as well as a further electrically conductive member (3A) which forms at

least partly a second contact of the connector (1). The contact element (3) can be inserted into the main body (2) in order to causes both the electrical connection of a central conductor (6A) of the cable (6) to the first contact and the electrical connection of a peripheral conductor (6C) of the cable (6) to the second contact.

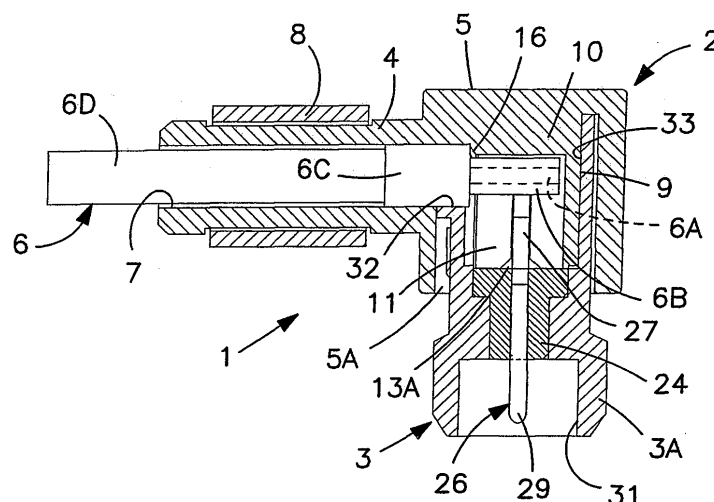


FIG. 9

Description

[0001] The present invention relates to a connector for a coaxial cable, of the type indicated in the preamble of claim 1.

[0002] Document EP-A-0 779 676 discloses a connector having a housing made of an electrically conductive material, capable of receiving the central conductor of a coaxial cable, previously prepared for this purpose; a member made of insulating material is positioned within the housing, said member defining a first passage in which the central conductor of the cable is positioned following its insertion into the housing. The connector further comprises an insert made of insulating material, bearing a terminal having a contact end which is provided to electrically couple with the central conductor of the cable; the insert is capable of being inserted into the housing in a substantially perpendicular direction with respect to the direction of insertion of the cable, in such way that the contact end of the terminal can penetrate a second passage defined in the insulating member, and thus reach the central conductor of cable within the first passage of the same insulating member.

[0003] The method for connecting the connector described in the cited document is difficult to perform, since the required pre-arrangement of the cable requires the removal of several parts thereof, and namely a part of the outer sheath, a part of the braid conductor for ground connection and a part of an inner insulator or dielectric of the cable; moreover, a residual uncovered portion of the braid conductor of the cable must be wrapped on a respective outer portion of the housing, in order to complete the ground connection. The connector described in EP-A-0 779 676 is also of a rather complicated constitution, since it includes a part having a complex geometry, that is the housing, which has to be formed from several distinct members of conductive material, which must be manufactured by casting and subsequent mechanical working, and then be coupled to each other.

[0004] In the light of the above, the present invention has the aim of obtaining a connector for a coaxial cable of simpler and cheaper construction, as well as of easier use with respect to the above identified prior art. The invention has the further aim of providing a connection system, employing such a connector, of advantageous construction.

[0005] These and other aims are attained, according to the invention, by a connector having the features of the attached main claim. Characteristics of other advantageous features of the invention are listed in the dependent claims.

[0006] Further aims, features and advantages of the invention will be apparent from the following description, made with reference to the annexed drawings which are supplied by way of non-limiting example. In the drawings:

- figure 1 is a schematic perspective view of a con-

necting component according to the invention;

- figure 2 is a schematic and partially exploded view of the connector of figure 1;
- figure 3 is a schematic and exploded view of a part of the connector of figure 1;
- figure 4 is a schematic plan view of a housing of the connector of figure 1;
- figure 5 is a schematic plan view of the part of the connector of figure 3, with the components thereof in the respective operating position;
- figure 6 is a schematic exploded view of a contact insert of the connector of figure 1;
- figure 7 is a schematic section of the insert of figure 6, with the components thereof in the respective operating position;
- figure 8 is a schematic and partially exploded view of the connector according to the invention, with the part of figure 5 being sectioned;
- figure 9 is a longitudinal schematic section of the connector of figure 1;
- figure 10 is a schematic cross section of the connector of figure 1;
- figure 11 is a schematic perspective view of a connecting component which can be used in conjunction with the connector according to the invention;
- figure 12 is a schematic perspective view of a body of the component of figure 11,
- figure 13 is a schematic exploded view of an electrical contact portion of the component of figure 11,
- figure 14 is a schematic perspective view of a connecting system employing the component of figure 11 and a plurality of connectors according to the invention;
- figure 15 is a schematic section of a part of the system of figure 14.

[0007] In figure 1 and 2 reference 1 globally indicates a connector for coaxial cables according to the invention, comprising a main body or housing, indicated with 2, and a contact insert, indicated with 3. The housing 2 is made by a single piece of electrically insulating material, for instance obtained by moulding of thermoplastic material, and comprises a first substantially tubular portion, indicated with 4, and a substantially cup-shaped portion, indicated with 5. Portions 4 and 5 have respective intercommunicating cavities, that extend axially in substantially perpendicular directions to each other; in particular, 4A indicates in figure 3 an axial passage of the tubular portion 4, while 5A indicates, for instance in figure 1, an axial seat of the cup-shaped portion 5.

[0008] In the passage 4A a portion of the coaxial cable, indicated with 6 in the figures, is destined to be inserted until its end zone, aimed at realizing the effective electrical connection to the connector 1, protrudes within seat 5A; in the latter, contact insert 3 is to be directly inserted, along a direction which is transverse with respect the axial direction of passage 4A.

[0009] In figures 3-5 the housing 2 of connector 1 is

represented as it can be noticed, tubular portion 4 has an intermediate zone 7 of reduced external diameter, onto which a fixing metal bush 8 is to be crimped, by a suitable clamp. Said bush 8 is provided in order to locally deform zone 7, so as to mechanically lock a respective portion of cable 6 with respect to housing 2, and thus prevent the former from being pulled out from the latter.

[0010] Seat 5A has, in the exemplified case, an almost circular section, with the exception of a flat surface, indicated with 9 in figures 4, 5; such surface 9 is defined in a zone of seat 5A that is diametrically opposite to the one wherein passage 4A opens into seat 5A.

[0011] From the bottom of seat 5A a projecting portion or zone centrally rises, indicated with 10 in figures 4, 5, having an almost circular section; in the projecting portion 10 a groove or positioning seat 11 is defined, having a respective bottom of a substantially semicircular section (see figure 10) and being open in two perpendicular directions. In particular the groove 11, besides being open axially (that is in the sense of the direction of the projecting portion 10), is also open towards the end of passage 4A, in order to form a sort of axial extension of the latter. At the opposite end, groove 11 is delimited by a respective surface 12 of projecting portion 10 that, as will be explained, performs an abutting or end-of stroke function for the insertion of cable 6 into the seat 5A.

[0012] In the projecting portion 10 a slot 13 or positioning seat is also defined, perpendicular to groove 11; slot 13 is slightly deeper, within portion 10, with respect to groove 11. The upper end of slot 13 has a tapered edge, indicated with 13A in figures 3 and 9.

[0013] The projecting portion 10 also has an undercut, indicated with 14 in figure 3, in correspondence with the zone proximate to the end of passage 4A, in order to define a front surface 15 in which groove 11 opens. Undercut 14 also defines a sort of step, indicated with 16 in figure 9, in correspondence with the side opening of groove 11.

[0014] On the circumferential wall of the seat 5A small hooking teeth obtained by undercutting are formed, indicated with 17 in figures 3 and 5, for cooperating with insert 3 in order to mechanically lock the latter with respect to housing 2. Reference 18 indicates, for example in figure 2, passages that are present in the bottom wall of the cup-shaped portion 5, said passages being necessary in order to allow undercut forming of the aforesaid teeth 17 during the moulding of housing 2.

[0015] The contact insert 3, which is represented in exploded fashion in figure 6 and in section in figure 7, comprises a substantially tubular body 3A, made of an electrically conductive material, having a lower portion 20, an upper portion 21 and an intermediate portion 22, the latter having a smaller external diameter than the upper and lower portions. The two longitudinal ends of body 3 have respective tapered edges 3B. The body 3A defines an axial cavity, within which a seat is defined, visible in figure 7, for positioning a support or member 24 made of an electrically insulating material, for exam-

ple teflon, having a respective central axial passage 25. The body 3A can be made by machined phosphorous bronze or brass.

[0016] In the passage 25 of insulating member 24 a respective portion of a contact terminal is inserted, indicated with 26 as a whole, of the type generally known as IDC (Insulation Displacement Contact). To this purpose, terminal 26 comprises a cut-clip region 27, having a slit 28 with bell shaped walls, the slit 28 thus having a substantially widened entry end.

[0017] In such types of connections, the electrical conductor to be put into the contact - here the central conductor of cable 6 - is pushed into slit 28 of the clip region 27, until reaching up the bottom thereof. During the pushing action, the clip walls penetrate the insulator surrounding the central conductor, here represented by the dielectric of the coaxial cable 6, until contact is established between the central conductor of the cable and the cut-clip region.

[0018] Terminal 26 further comprises a pin portion, which is substantially cylindrical, indicated with 29, that constitutes the central connecting contact of connector 1 according to the invention. Terminal 26 can be obtained by blanking a metal strap, with subsequent partial clinching in order to form the cylindrical portion 29.

[0019] Portion 29 of terminal 26 is partially inserted with interference into passage 25, until the cut-clip region 27 abuts against the surface of insulating member 24. The latter is subsequently inserted into the respective axial seat of body 3A, so as to be maintained therein by interference. Thus, insert 3 has a first cavity, indicated with 30 in figure 7, within which the clip region 27 is positioned, and a second cavity 31, within which the pin portion 29 of terminal 26 protrudes.

[0020] As can be seen in figure 6, in the sidewall of the upper portion 21 of body 3A a lateral notch or throat is formed, indicated with 32. At a diametrically opposite part, the sidewall of upper portion 21 is shaped to form a flat external surface, indicated with 33.

[0021] It should be noted that the insulating member 24 bearing the terminal 26 is coupled to body 3A such that the clip region 27 is substantially parallel to surface 33, that is slit 28 ends up facing the centre of throat 32. In order to make such a positioning easier, the coupling of terminal 26 into passage 25 of member 24, as well as the coupling of the latter within the respective seat of body 3A can be by means of a polarized fit, i.e., only insertable in one orientation.

[0022] The coaxial cable 6 for the use in conjunction with the connector according to the invention is of the type comprising a central conductor, indicated with 6A in figure 3, enclosed within an insulator or dielectric 6B. The dielectric 6B is surrounded by a peripheral conductor, in the form of a braid 6C for ground connection. The conductor 6C is in turn covered by an outer insulating sheath 6D.

[0023] The preparation of cable 6 is performed simply by removing an end portion of its sheath 6D, and then

folding backwards the portion of braid 6C that has thus remained uncovered. In this way, the very end portion of cable 6 to be connected is constituted by a dielectric section 6B, with the respective inner conductor 6A.

[0024] The prepared end of cable 6 is then inserted into passage 4A of tubular portion 4 of body 2. As can be seen in figure 5, nearly at the end of such an insertion, the uncovered portion of dielectric 6B laterally penetrates groove 11, with a limit of maximum insertion that is determined by the presence of the stop surface 12. The dimensions of section of groove 11 are such that only the dielectric 6B can penetrate the groove. Moreover, surface 15 of the projecting portion 10 (see figure 3), onto which groove 11 opens laterally, constitutes an abutment also for the part of cable 6 that includes the backwards folded portion of the braid 6C. A similar function is performed by step 16 of figure 9.

[0025] Following the insertion of cable 6 as previously explained, the condition shown in figures 5 and 9 is substantially reached. Now the metallic bush 8 can be crimped over the respective zone 7 of tubular portion 4, so that a corresponding part of the housing is deformed, to hold cable 6 and to prevent it from being pulled out of housing 2.

[0026] Insert 3, or better its portion 21, is subsequently inserted in the seat 5A of portion 5 of housing 2. Such an insertion is polarized, i.e., it can occur in a unique orientation, by virtue of the presence of the flat surfaces 9 and 33, of seat 5A and insert 3, respectively.

[0027] During insertion, projecting portion 10 enters cavity 30 of insert 3 (see figure 9) with the circumferential wall of portion 21 of the insert penetrating the space present between the projecting portion 10 and the circumferential wall of the seat 5A. By continuing the movement, the clip region 27 of terminal 26 penetrates the slot 13 of portion 10, and then enters into contact with a part of the dielectric 6B positioned within groove 11, tearing it. Subsequently, the central conductor 6A of cable 6 reaches firstly the widened entry zone of slit 28 of clip region 27, and then enters with interference into the remainder of slit 28, thus achieving the electrical contact, as can be seen for example in figure 15.

[0028] Following the insertion movement performed for insert 3, the portion of the ground braid 6C of cable 6 is positioned within throat 32 of insert 3 abutting against its surface, as can be seen in figure 10 (wherein, for clarity's sake, some components of the connector are not represented). This action results in the partial squeezing of the portion of cable 6 bearing the folded braid 6C, between the throat and the bottom of undercut 14 shown in figure 3. This is visible for example in figure 9 (where the cable is represented in a non-deformed condition). Upon reaching such a position, teeth 17 (figure 3 and 5) hook the insert 3, by engaging the step formed between portions 21 and 22 of the body 3A of the insert.

[0029] The condition shown in figure 9 is thus substantially attained, in which the central conductor 6A of

cable 6 is electrically and mechanically coupled with the clip region 27 of the terminal 26 (see also figure 15), while the peripheral conductor 6C of cable 6 is electrically coupled with the body 3A of insert 3, that constitutes the ground contact of connector 1.

[0030] It results from the above that the connector according to the invention allows for performing, in a simple and quick way, the connection, inasmuch as only a minimal pre-arrangement of cable 6 is required, and with the great advantage that a single movement, i.e., the insertion of insert 3 within seat 5A, allows for obtaining at the same time the connection of the two conductors 6A, 6C of the cable.

[0031] The manufacturing cost of the connector 1 is reduced, since its more geometrically complex part, that is the housing, can be entirely obtained by moulding of thermoplastic material, in a single piece. Moreover, the required mechanical processes for forming insert 3 are of an elementary nature and can be easily performed in an automatic way.

[0032] Assembly of connector 1, in order to attain the required connection to cable 6, is further extremely quick and simple to be performed. The unique point of the connection procedure that is critical relates to the positioning of the end of the cable 6 within the seat 5A. The quality of such a positioning can however be visually controlled by the operator (see for instance figure 5).

[0033] In figure 11 a connecting component is represented, indicated with 40 as a whole, which can be used in conjunction with a plurality of connectors 1 according to the invention. In the exemplified case, component 40 is equipped with a series of female connectors 41, for a corresponding number of connectors 1; each female connector 41 comprises a respective central contact 42, for receiving a pin portion 29 of a terminal 26, and a peripheral contact 43, for receiving a portion 20 of body 3A of an insert 3.

[0034] Component 40 comprises a hollow box-like body, indicated with 44 in figure 12, made of an electrically insulating material, for example obtained as a single piece of moulded thermoplastic material, in which circular seats 45 are defined. Body 44 also defines, at its two longitudinal ends, respective elastic teeth 46, for the snap-fitting onto a support, such as a printed circuit board. In the lower edges of the longer sidewalls of body 44, slots 47 are formed, for the positioning and the passage of respective portions of contacts 42, 43.

[0035] In figure 13 the contact parts of each female connector 41 is represented, comprising the central contact 42, the peripheral contact 43 and a positioning insert, indicated with 48, having a respective axial passage 49. Contacts 42, 43 can be obtained starting from a metallic strap, which is first blanked and then suitably folded, while insert 48 can be obtained by moulding of synthetic material.

[0036] After blanking from a metal strap, a portion of contact 42, indicated with 50 in figure 13, is folded until reaching a substantially hollow cylindrical shape, while

the remaining part, substantially plate-shaped and, as indicated with 51, is bent to have multiple folds. In the same the way, after blanking from a metal strap, a portion of contact 43, indicated with 53, is folded until assuming a substantially hollow cylindrical shape, which is tapered in an upper region thereof. Portion 53 is blanked so as to have a sort of crenellation along its upper edge so that, following the bending aimed at obtaining the aforesaid cylindrical shape, a series of elastic fins are formed, indicated with 54. In the circumferential wall of portion 53 teeth 55 are also formed, projecting towards the inside of contact 43. Between at least two fins 54, a housing space 56 is formed, for receiving a corresponding positioning projection defined in the body 44 within seat 45. Also, contact 43 has a respective plate-shaped part 57, having multiple folds.

[0037] In order to prepare the female connector 41, portion 53 of contact 43 is inserted in a respective seat 45 formed in body 44, until a respective projection formed in the latter engages with at least one of spaces 56 provided in the upper region of portion 53. Insert 48 is inserted with interference within portion 53 of contact 43, until reaching the teeth 55, which act as an end-of-stroke stop for the insertion. The cylindrical portion 50 of contact 42 is inserted into the passage 49 of insert 48, where it is fixed by interference. The mutual positioning between the two contacts 42, 43 is such that the ends of plate portions 51, 57 of the same contacts are positioned to correspond with respective slots 47 of body 44.

[0038] Once all the female connectors 41 have been mounted, as it is visible in figure 11, component 40 can be fixed, by the coupling teeth 46, to a respective support, and portions 51, 57 of contacts 42, 43 can be electrically connected to respective terminals of an electric circuit.

[0039] Connectors 1 can finally be inserted into respective female connectors 41, as it is shown in figure 14. As can be seen from figure 15, the arrangement is such that portion 20 of insert 3 of each connector 1 is inserted within the cylindrical portion 53 of a respective contact 43 of a respective female connector 41. Due to their elasticity, fins 54 can be slightly widened, thus allowing the aforesaid insertion, and then close again on the intermediate portion 22 of the body 3A of insert 3, and thus guarantee the mechanical and electrical coupling between contact 43 and the conductive body 3A of connector 1. Moreover, as a result of said insertion, pin portion 29 of terminal 26 of each connector 1 penetrates with interference within the cylindrical portion 50 of contact 42, which is also capable in a certain measure to elastically widen, thus allowing it to obtain the electrical and mechanical contact between the parts.

[0040] Also component 40 is advantageous from the point of view of simplicity of construction, inasmuch as its several members can be obtained by simple operations, which can easily be performed in an automated way. To this end, it should be noted that manufacturing

of contacts 42, 43 is extremely cheap, since they can be obtained by starting from a metal strap which is blanked and then folded. Also the operations required for the assembly of contacts 42, 43 of body 44 are of an elementary nature and easy to be automated.

[0041] Naturally, without altering the principle of the invention, the construction details and the embodiments may vary widely relative to what is described and illustrated, purely by way of example, herein, without thereby departing from the scope of the present invention.

[0042] The dimensions of the described members and components could clearly be chosen so as to take account of the sectional dimensions of the coaxial cable used, as well as of the required impedance of the connection.

Claims

1. A connector for a coaxial cable, having an inner conductor (6A) enclosed in a first insulator (6B) onto which a peripheral conductor (6C) is arranged, the latter being in turn enclosed in a second insulator (6D), the connector (1) comprising:

- a main body (2) for receiving an end section of the cable (6) that includes a respective portion of the central conductor (6A), inserted in the main body (2) in a first direction, and
- a contact element (3) bearing a terminal (26) made of an electrically conductive material, which forms a first contact of the connector (1),

where the contact element (3) can be inserted into the main body (2) in a substantially transverse direction with respect to said first direction, in such a way that, as a consequence of the insertion of the contact element (3) into the main body (2), a first end zone (27) of the terminal (26) is brought into electrical connection with the central conductor (6A) of the cable (6), **characterized in that**

- the main body (2) is prepared or configured for also receiving internally a portion of the peripheral conductor (6C) forming part of said end section of the cable (6),
- the contact element (3) comprises an electrically conductive member (3A) which forms at least partly a second contact of the connector (1), said conductive member (3A) having a respective zone (32) provided for abutting against said portion of the peripheral conductor (6C) of the cable (6),

the arrangement being such that the insertion of the contact element (3) into the main body (2) causes both the electrical connection of the central conductor (6A) to the first contact and the electrical

- connection of the peripheral conductor (6C) to the second contact.
2. Connector according to claim 1, **characterized in that** the main body (2) is made of an electrically insulating material. 5
 3. The connector according to claim 2 **characterised in that** the main body (2) is obtained by moulding a single piece. 10
 4. Connector according to claim 1, 2 or 3, **characterized in that** the main body (2) comprises a first and a second portions (4, 5) having respective cavities (4A, 5A) that mutually communicate and extend axially in substantially perpendicular directions relative to each other, wherein: 15
 - in the cavity (4A) of the first portion (4) a cable portion including said end section can be inserted, along said first direction; and 20
 - the cavity (5A) of the second portion (5) is able to receive at least partially said end section of the cable (6) and a portion (21) of the conductive member (3A). 25
 5. Connector according to claim 4, **characterized in that** the cavity (5A) of the second portion (5) comprises a bottom from which a projecting portion (10) rises, the projecting portion (10) defining at least a first positioning seat (11) for receiving a portion of the first insulator (6B) of said end section of the cable (6) in which portion of the first insulator (6B) a respective portion of the central conductor (6A) is enclosed. 30
 6. Connector according to claim 5, **characterized in that** a second positioning seat (13) is defined in the projecting portion (10), for receiving said first end zone (27) of the terminal (26), wherein the first and the second seats (11, 13) are substantially perpendicular to each other. 40
 7. Connector according to claim 5, **characterized in that** the first end zone (27) of the terminal (26) is configured as a cut-clip contact, IDC or insulation displacement contact type contact. 45
 8. Connector according to claim 1, **characterized in that** the contact element (3) comprises a substantially tubular body (3A) that constitutes said conductive member, within which a seat is defined for the positioning of a support (24) made of an electrically insulating material, the support (24) having a respective passage (25) within which an intermediate portion of the terminal (26) is inserted. 50
 9. Connector according to claim 5, **characterized in that** in the contact element (3) at least a first cavity (30) is delimited, within which the first end zone (27) of the terminal (26) is positioned, said first cavity (30) being able to receive at least partially said projecting portion (10). 55
 10. Connector according to claim 9, **characterized in that** in the contact element (3) at least a second cavity (31) is delimited, within which a second end zone (29) of the terminal (26) is positioned.
 11. Connector according to claim 1, **characterized in that** the zone provided for abutting against said portion of the peripheral conductor (6C) of the cable (6) comprises a notch or throat (32) formed in a wall of the conductive member (3A).
 12. Connector according to claim 1, **characterized in that** mutual coupling means (17) are operative between the main body (2) and the contact element (2).
 13. An electric connection system comprising a connector of a first type (1), made in accordance with one or more of the previous claims, and at least a connector of a second type (41), being complementary to the connector of the first type (1), the connector of the second type (41) having a respective central contact (42), for cooperating with the terminal (26) of the connector of the first type (1), and a peripheral contact (42), for cooperating with the conductive member (3A) of the contact element (3) of the connector of the first type (1).
 14. System according to claim 13, wherein at least a connector of the second type (41) is part of a component (40) having a body (44) made of an electrically insulating material, in which at least a seat (45) for a respective connector of the second type (41) is defined, where in said seat (45) the peripheral contact (43) is fixed, the latter supporting a respective positioning insert (48) for the central contact (42).
 15. System according to claim 12 or 13, wherein the central contact (42) and the peripheral contact (43) are obtained from blanked and folded metal strap, at least a portion of each contact (42, 43) being folded to have a substantially cylindrical shape, the cylindrical portion (50) of the central contact (42) being provided to receive at least a part of the second end zone (29) of the terminal (26) of the connector of the first type (1) and the cylindrical portion (53) of the peripheral contact (43) being provided to receive at least a part of the contact element (3) of the connector of the first type (1).
 16. System according to claim 15, wherein at least one

of the cylindrical portion (50) of the central contact (43) and the cylindrical portion (53) of the peripheral contact (43) is at least partly elastically deformable during the coupling of the connector of the first type (1) with the connector of the second type (41).

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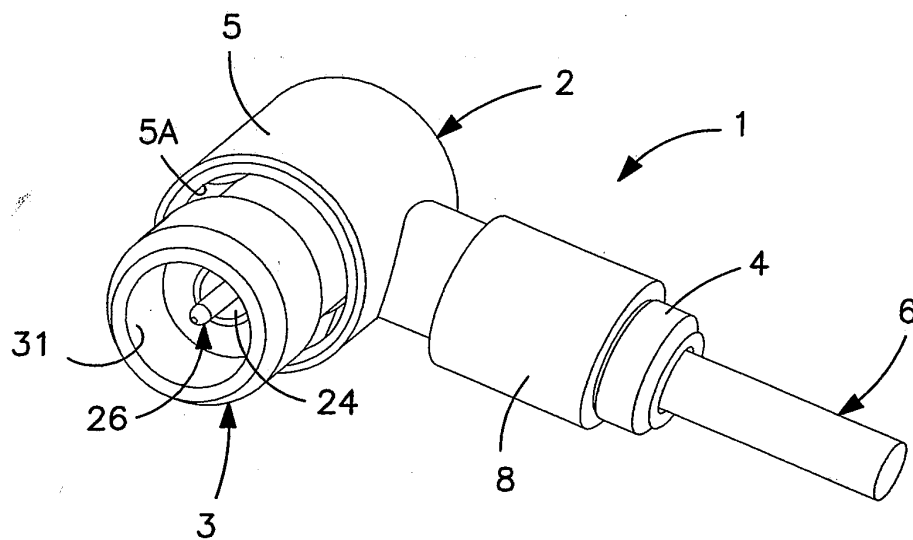


FIG. 1

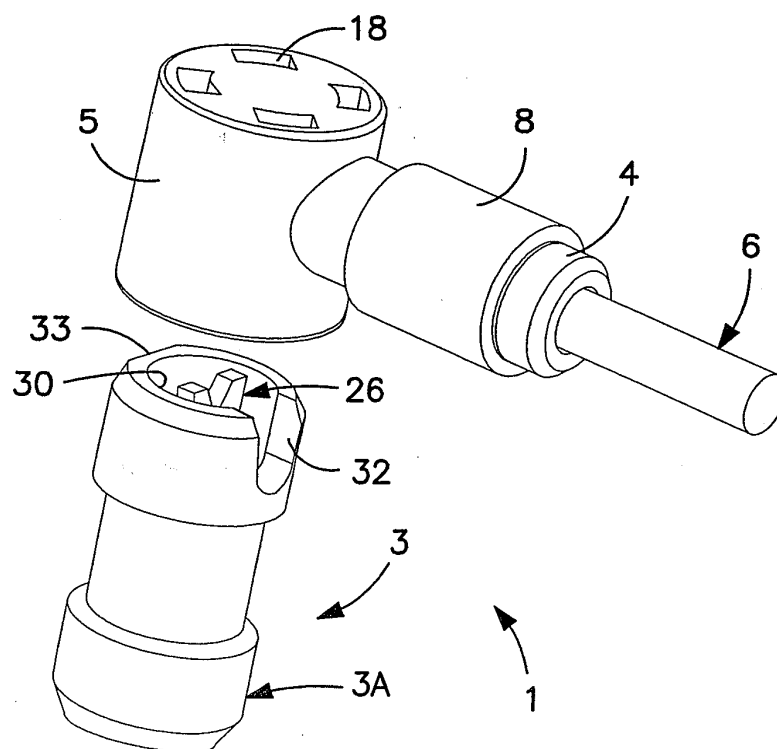


FIG. 2

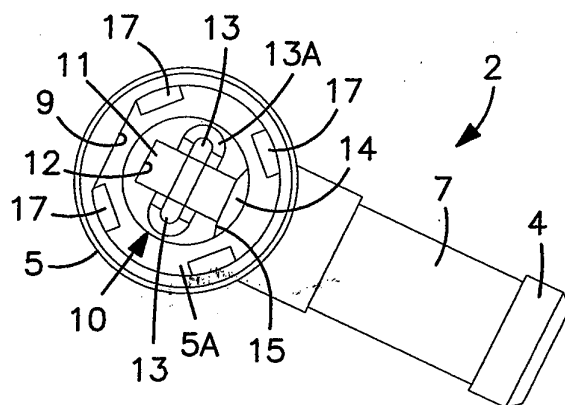


FIG. 3

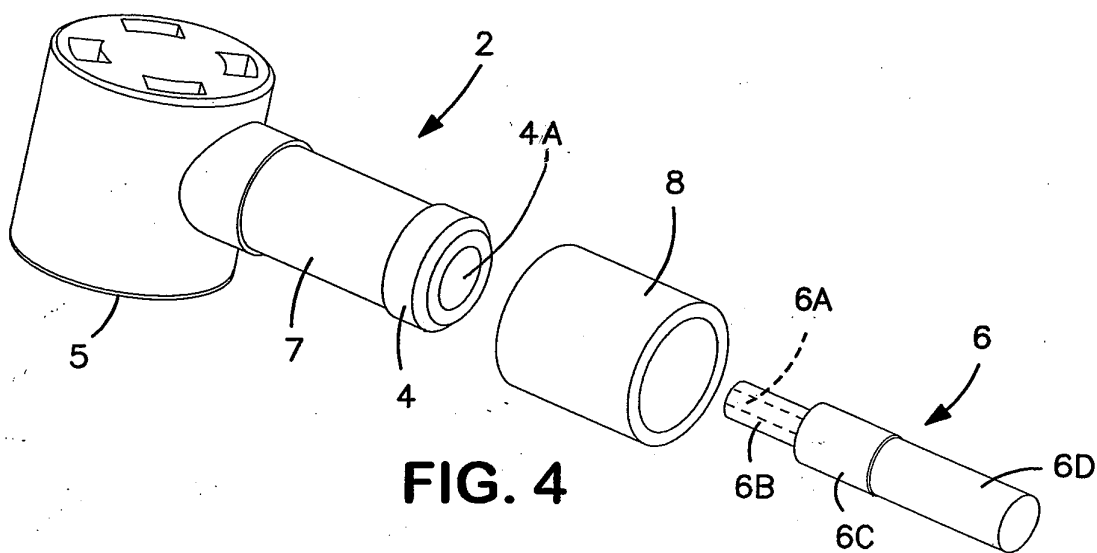


FIG. 4

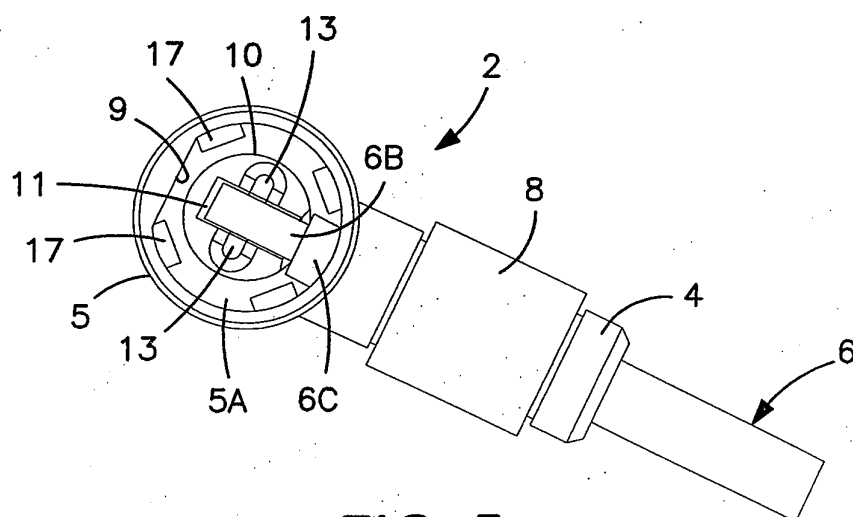


FIG. 5

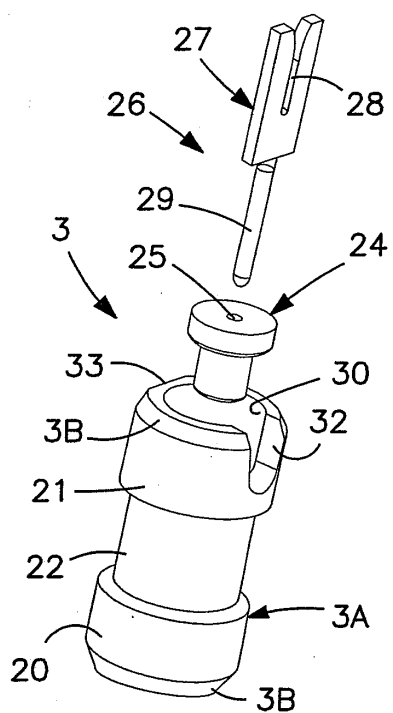


FIG. 6

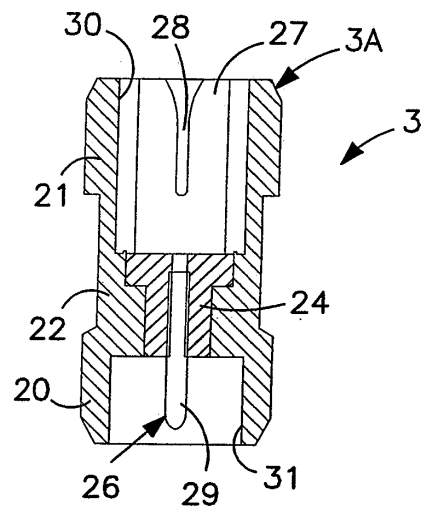


FIG. 7

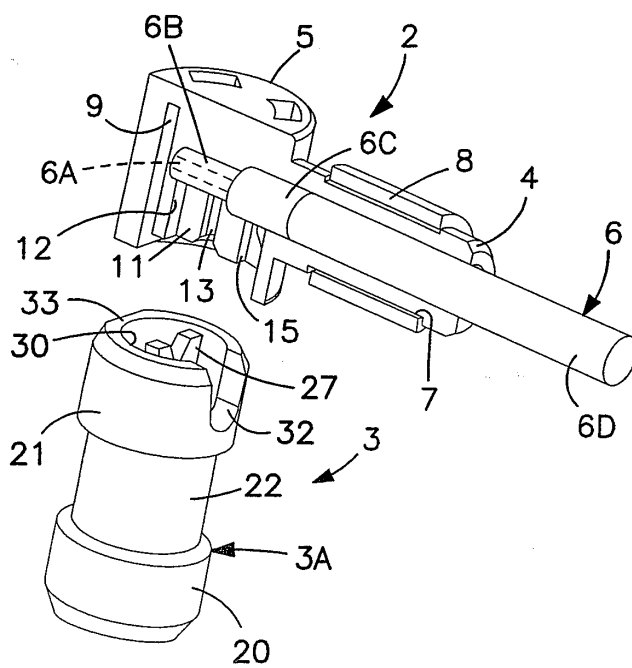


FIG. 8

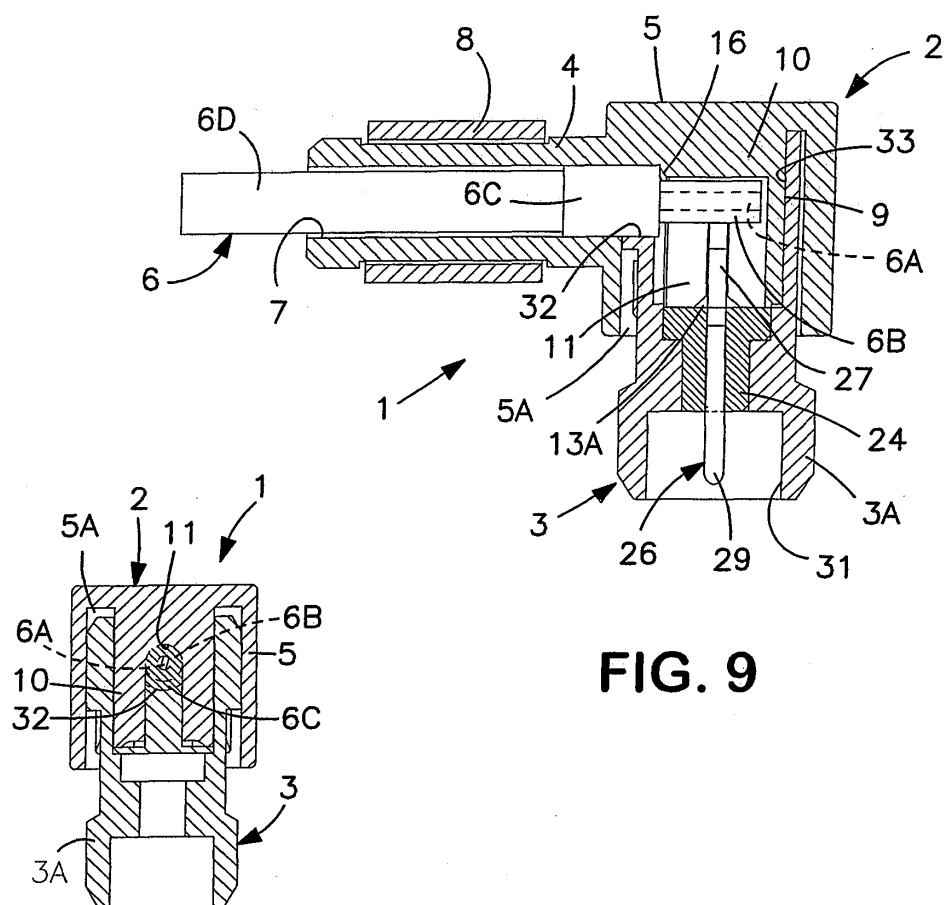


FIG. 9

FIG. 10

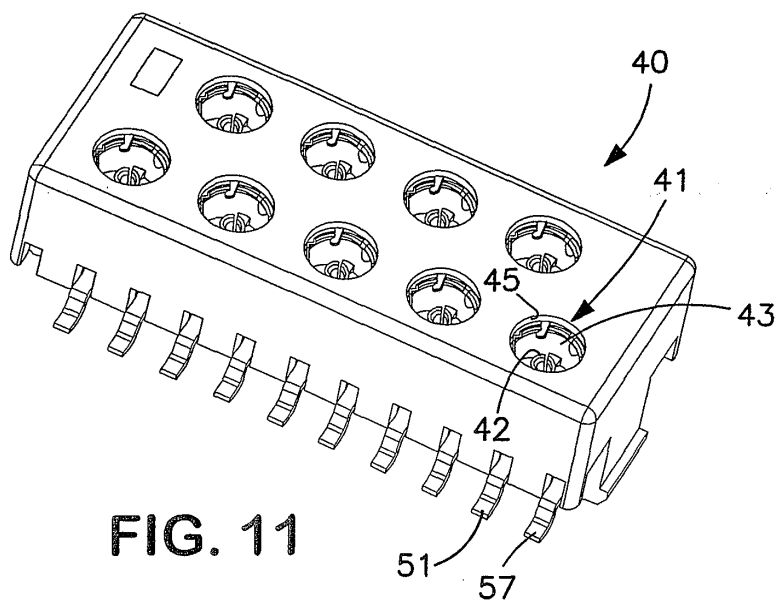


FIG. 11

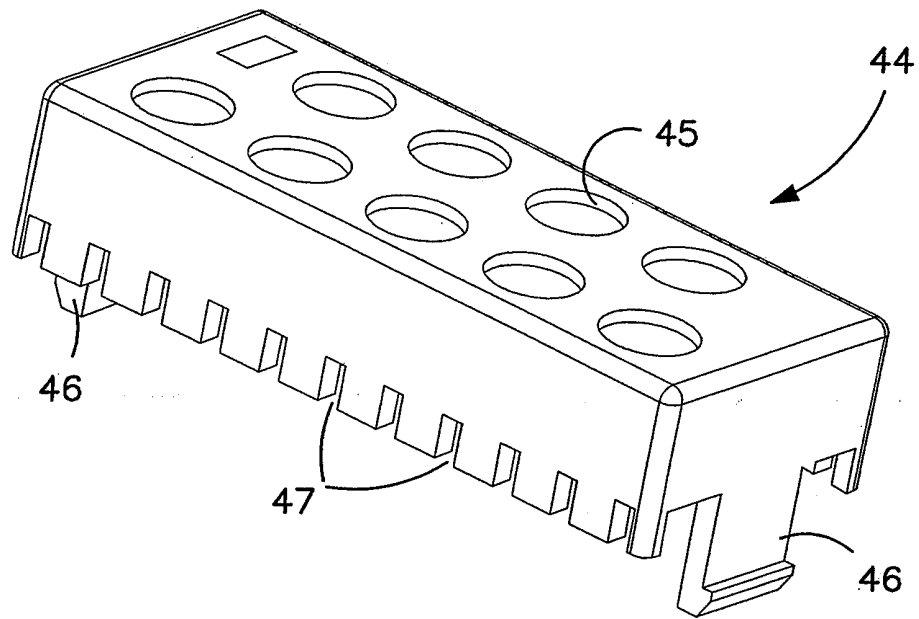


FIG. 12

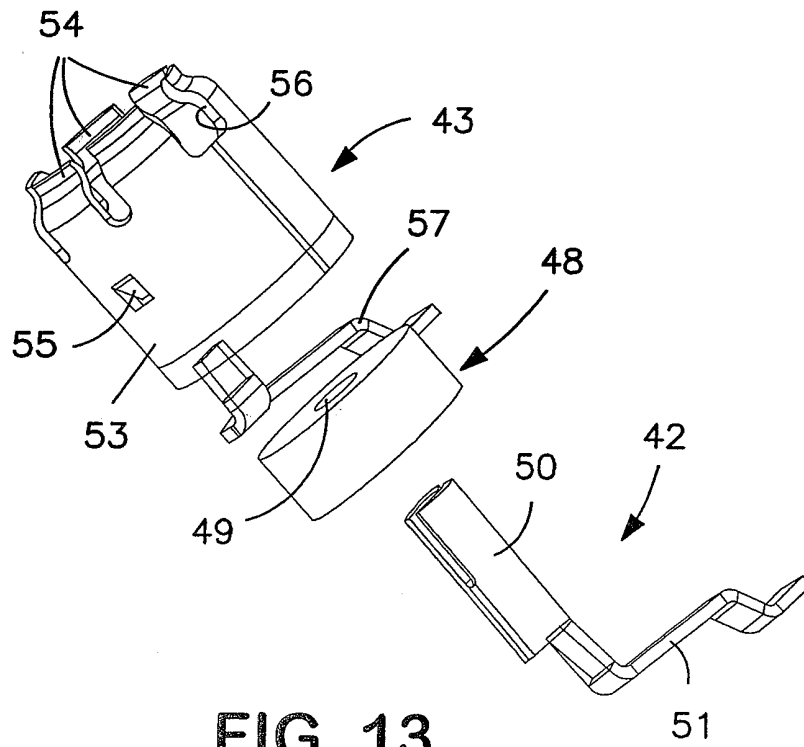


FIG. 13

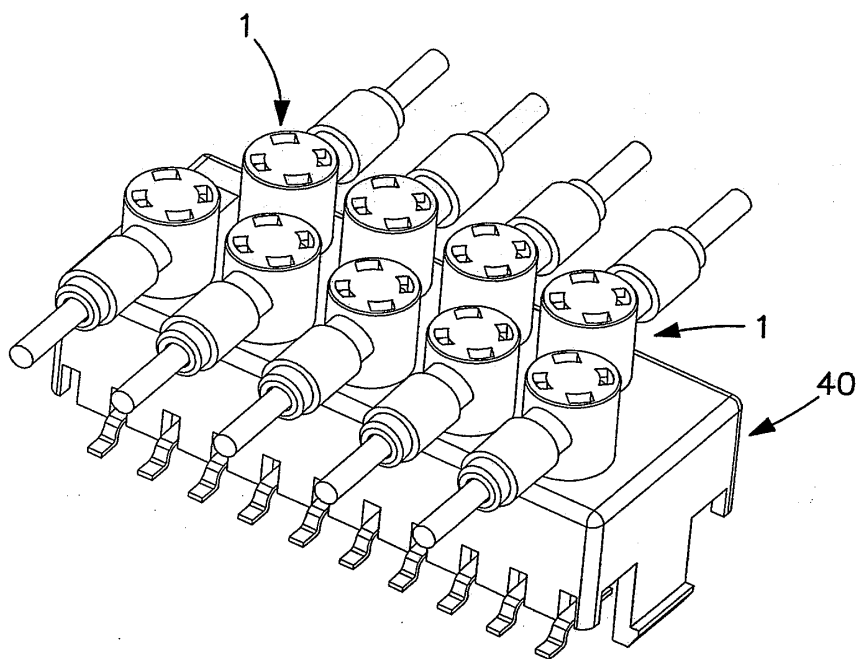


FIG. 14

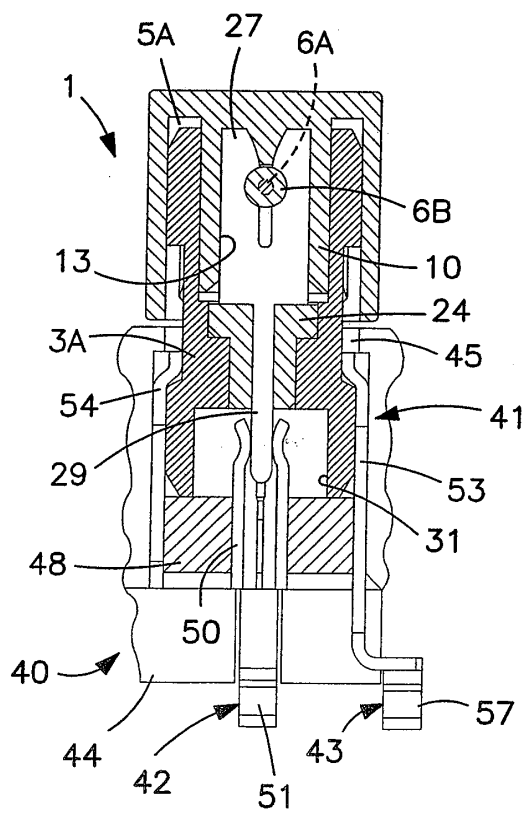


FIG. 15



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 10 2240

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 23 42 447 A1 (SIEMENS AG) 6 March 1975 (1975-03-06) * page 4, line 17 - page 8, line 37 * -----	1	H01R13/646
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01R
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		12 May 2005	Bertin, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

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

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on

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12-05-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2342447	A1	06-03-1975	NONE

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82