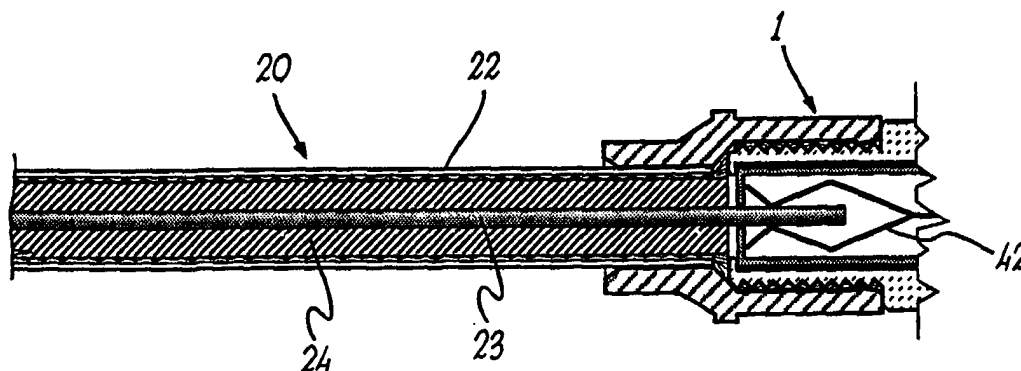




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(51) International Patent Classification <sup>6</sup> :</b><br><br><b>H01R 17/12, 9/05</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>A1</b> | <b>(11) International Publication Number:</b> <b>WO 98/24155</b><br><br><b>(43) International Publication Date:</b> 4 June 1998 (04.06.98)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>(21) International Application Number:</b> PCT/IT96/00236<br><b>(22) International Filing Date:</b> 29 November 1996 (29.11.96)<br><br><b>(71) Applicant (for all designated States except US):</b> ETE ITALIANA S.P.A. [IT/IT]; Via Trionfale, 11060, I-00135 Roma (IT).<br><br><b>(72) Inventor; and</b><br><b>(75) Inventor/Applicant (for US only):</b> DI MARIO, Umberto [IT/IT]; Piazza dell'Unità, 13, I-00192 Roma (IT).<br><br><b>(74) Agents:</b> IANNONE, Carlo, Luigi et al.; Ing. Barzanò & Zanardo Roma S.p.A., Via Piemonte, 26, I-00187 Roma (IT). |           | <b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).<br><br><b>Published</b><br><i>With international search report.</i> |

**(54) Title:** CONNECTION SLEEVE FOR COAXIAL CONNECTORS



**(57) Abstract**

The invention concerns a coaxial connector (1), particularly for the mechanical and electrical connection of the outer screening conductor (21) of a coaxial cable (20) with the outer screening (41) of a female coaxial connector (40), said coaxial connector (1) comprising a slidable sleeve (1) having a first (2) and a second (3) coaxial inner cylindrical seat, said first seat (2) having an inner diameter (d1) corresponding to or slightly greater than the outer diameter of said cable (20) and said second seat (3) having an inner diameter (d2) slightly greater than the outer diameter of the outer wall (41) of said connector (40), in such a way to obtain a pressure coupling of the coaxial cable (20) screen (21) between the sleeve of coaxial connector (1) and the outer wall (41) of the female coaxial connector (40).

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## CONNECTION SLEEVE FOR COAXIAL CONNECTORS

5 The present invention concerns a connector coupable by pressure for telecommunications systems.

More specifically, the invention concerns a connector of the above kind to be employed to couple in a quick and electrically perfect way a coaxial cable with a female coaxial connector, for example provided with an outer thread and a central contact, e.g. an elastic central contact  
10 of the F kind connectors.

As it is known, to connect coaxial cables with electrical or electronic circuits, and more particularly for the coaxial connections employed for the realisation of systems for the distribution of radioTV signals, metallic clamps are generally employed, said clamps being cheap  
15 but having different technical drawbacks.

The above drawbacks are even more evident if considering that the advancement of the state of the art makes it common the use of signal reception and distribution systems having frequencies higher than 2000 MHz, such as the satellite reception systems, the cable networks, the  
20 MMDS systems and so on.

In order to obviate to these drawbacks it is advisable the use of male and female coaxial connectors, the first one coupled to the coaxial cable and the other one to the final circuit.

The technique already known generally provides, for the  
25 connection of coaxial cables with coaxial connectors, the welding or screwing of the two poles to the cable of the connector ends, or the screwing or crimping of the male coaxial connector on the screen conductor of the coaxial cable.

Further, the coupling of the cable with a connector is realised  
30 by screwing or by coupling or introduction of two metallic parts, a rigid one and an elastic one, respectively.

On the basis of these solutions, all the past and present systems, patented or not, and all the commercial coaxial connectors have been developed.

35 The choice of this kind of solution for the coupling of coaxial cables is due to the limited use of the coaxial joints employed on professional apparatuses only, highly expensive with respect to the cost of one or two traditional coaxial joints.

The most updated technological development has instead greatly widened the fields of use of the coaxial cables and consequently of the relevant connectors which, if employed for uses such as the radiofrequencies distribution in the domestic buildings, highly influence the cost of the work necessary to obtain a technically efficient but cheap and easy to apply coupling.

Within this general situation, it is included the solution suggested according to the present invention which is able to satisfy the above needs, being completely different with respect to the systems already employed.

Main object of the present invention is that of obtaining a connector allowing to realise a coupling between a coaxial cable and a female coaxial connector so as to obtain, within a frequencies range between 0 and more than 2000 MHz, a constant impedance power transfer, with maximum concentricity, maximum electromagnetic screening, minimum loss of the signal, minimum mismatching and minimum parasitic capacitance.

It is a further object of the present invention that of realising a connector allowing a connection between a coaxial cable and a female coaxial connector having a good mechanical coupling but which is at the same time easily removable.

A further object of the invention is that of realising a connector allowing a connection between a coaxial cable and a female coaxial connector very easy to be realised, to be used without the need of any specific tool, with minimum sizes and very cheap.

These and other results are obtained according to the present invention suggesting a connector coupable by pressure for telecommunication systems employing as central pin of the connection the rigid central conductor of the coaxial cable fixed by pressure on the outer surface of the female connector by a sleeve slidable on the cable and having on its rear portion a diameter corresponding to or slightly greater than the diameter of the coaxial cable and on its front portion a diameter slightly greater than the one of the outer surface of the female connector.

It is therefore specific object of the present invention a coaxial connector, particularly for the mechanical and electrical connection of the outer screening conductor of a coaxial cable with the outer screening of a female coaxial connector, said coaxial connector comprising a slidable

sleeve having a first and a second coaxial inner cylindrical seat, said first seat having an inner diameter corresponding at or slightly greater than the outer diameter of said cable and said second seat having an inner diameter slightly greater than the outer diameter of the outer wall of said connector, in such a way to obtain a pressure coupling of the coaxial cable screen between the sleeve coaxial connector and the outer wall of the female coaxial connector.

Preferably, according to the invention, at least one projection can be provided within said second seat.

Still according to the invention, the portion of the connector corresponding to said first seat can be long in order to obtain a greater coupling stability, or this portion can be short to reduce the dimensions.

Furthermore, according to the invention, outside said second seat, close to the outer connection zone with said first seat, a circular projection can be provided.

Further, according to the invention, the connection zone between said first and second seats can be realised by a sloped wall.

Still according to the invention, spaced longitudinal ribs can be provided outside said second seat.

Always according to the invention, on the inner surface of said first and second seat a roughness can be provided.

Within said first seat, longitudinal lugs can be further provided, preferably three lugs circumferentially spaced at 120°.

Furthermore, within said second seat, longitudinal lugs can be further provided, preferably three lugs circumferentially spaced at 120°.

Always according to the invention, said connector is used for the connection of the coaxial cable screen made up of metallic braid, with the threaded outer screening of a female coaxial connector, or it is used for the connection of the coaxial cable screen made up of one or more metallic foils, with the threaded outer screening of a female coaxial cable, or still for the connection of the coaxial cable screen, made up of metallic braid and one or more metallic foils, with the outer screening of a female coaxial connector.

Furthermore, according to the invention, said coaxial connector can be made up with plastic material, elastic material, such as rubber, or elastic metallic material.

The present invention will be now described, for illustrative but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figure 1 is a perspective view of a first embodiment of a slidable sleeve connector according to the invention;

figure 2 is a perspective view of a second embodiment of a slidable sleeve connector according to the invention;

figure 3 is a section lateral view of the head of the coaxial cable ready for the connection;

figure 4 is a section view of a connector according to the invention;

figure 5 is a section view of the coaxial cable, of the sleeve connector and of the female coaxial connector of the F kind ready for the realisation of the coaxial connection;

figure 6 is a section view of a connection of a coaxial cable with a female coaxial connector of the F kind realised employing the slidable sleeve connector according to the invention; and

figure 7 is a partially sectioned view of a connection between two cables realised employing two slidable sleeve connector according to the invention and a double female coaxial connector of the F kind.

Making reference to the figures of the drawings enclosed, the slidable sleeve coaxial connector 1 according to the present invention is comprised of an integral body of material preferably semirigid or elastic, in the hollow inner part of which two coaxial cylindrical seats 2, 3 are obtained, said seats being connected by a sloped wall 4, and having the inner smaller diameter  $d_1$  corresponding to or greater than the outer diameter of the coaxial cable 20 used for the connection and the bigger inner diameter  $d_2$  slightly bigger than the outer diameter of the threaded surface 41 of the coaxial connector 40 in order to allow to fix the screen 21 of the coaxial cable 20 between the threaded outer surface 41 of the coaxial connector 40 and the inner surface 5 having the diameter  $d_2$  of the slidable sleeve connector 1.

The cylindrical portion 2 of the connector 1 wounding the coaxial cable 20 is quite long, as shown in figure 1, in order to obtain a greater mechanical stability for the connection, or shorter, as shown in figure 2, to realise a connection in limited spaces, such as the embedded boxes for the fittings of the distribution systems of the radioTV signals.

The inner surfaces of the coaxial connector 1 according to the invention can be rough in order to increase the adherence of the connector 1 with the outer sheath 22 of the coaxial cable 20 and with the threaded outer surface 41 of the female coaxial connector 40. The circular opening 6 of the connector 1 having diameter  $d_1$  ends with a flared part 7 making it easier the introduction of the connector 1 on the terminal of the coaxial cable 20.

The circular opening 8 of the connector 1 having the diameter  $d_2$  ends with a flared portion 9 making it easier the introduction of the connector 1 on the female coaxial connector 40.

For particular uses the slidable sleeve connector 1 can be provided in the inner part with projections 10 making it much more difficult the extraction of the female coaxial connector 40.

The thickness of the slidable sleeve coaxial connector is a function of the dimensions of the coaxial cable 20 to be connected and of the material employed for the realisation of the connector 1. The outer wall 11 of the slidable sleeve coaxial connector 1 has a cylindrical bump 12 to make it easier, by creating a grip upon which it is possible to exert a higher pressure with the hands, the insertion and extraction operations of the slidable sleeve coaxial connector 1 from the female coaxial connector 40.

Lugs (not shown) can be provided within the seat 2, preferably three lugs at  $120^\circ$ , to avoid the sliding of the connector 1 along cables having smaller diameter.

The use of the slidable sleeve coaxial connector 1 as described is particularly simple:

as first step, the connector 1 is introduced from the part with the smaller diameter  $d_1$  on the terminal of the coaxial cable 20 to be connected;

then, the coaxial cable 20 is suitably prepared as shown in figure 3, widening the screen 21 of the same cable and obtaining the situation shown in figure 5;

now the central conductor 23 of the coaxial cable 1 within the central tap 42 of the female coaxial connector 40;

finally, the sleeve slidable connector 1 slides along the coaxial cable 20 toward the female connector 40 up to the complete coupling with the threaded outer surface 41 of the connector 40 with the connector 1, as

shown in figure 6: by this step, the screen 21 of the coaxial cable 20 is automatically lied on and tightened on the thread 41 of the female coaxial connector 40 at the same time obtaining the double mechanical and electrical coupling between the cable 20 and the connector 40.

5 From the description of the coaxial coupling obtained by the solution according to the present invention, the advantages that said coaxial slidable sleeve connector 1 allows to obtain with respect to the known coaxial connection systems are quite evident.

10 It is in fact evident the ease and the convenience of use of the solution according to the invention, which can be set up without employing any tool but the one necessary to strip the coaxial cable 20.

15 Further, the electrical features of the coaxial coupling are optimal: the concentricity and the complete screening of the connection are ensured by the immediate electric contact between the cable screen 21 and the screening outer surface 41 of the connector 40, contact obtained immediately after that the screen 21 of the coaxial cable 20 is widened and detached from the dielectric 24 dividing the same screen 21 from the central conductor 23 of the coaxial cable 20.

20 These features allow to have a perfect working of the coaxial connection within a frequencies range between 0 and more than 2000 MHz.

25 The connector 1 according to the invention further allows to make coaxial connection within small spaces, such as the space available within the usual connection blocks of the radioTV signal distribution systems provided within the houses.

30 A further remarkable advantage is due to the low total cost of the coaxial connection that such a connector allows to realise, cost obtained adding the cost for the material of the connector with the cost of the labour necessary for the realisation of the connection: as it is evident from the above specification of the solution according to the invention and of its use, both costs are very low and in any case lower than the costs necessary to make a valid coaxial connection employing different connectors.

35 The cable 20 can freely rotate about the axis of the central connector also after the coupling.

Further, the connector 1 according to the invention completely covers the connector, protecting the same.

Another advantage is due to the fact that the connector 1 according to the invention can be used more than once in case it is necessary to make the connection again.

Moreover, the squeezing of the cable does not occur, squeezing instead occurring with the other solutions of the prior art.

All the above mentioned advantages are such to make the present invention advantageously usable in any application involving the coupling of coaxial cables.

The present invention has been described for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that modifications and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

## CLAIMS

1. Coaxial connector (1), particularly for the mechanical and electrical connection of the outer screening conductor (21) of a coaxial cable (20) with the outer screening (41) of a female coaxial connector (40), characterized in that it comprises a slidable sleeve (1) having a first (2) and a second (3) coaxial inner cylindrical seat, said first seat (2) having an inner diameter (d1) corresponding to or slightly greater than the outer diameter of said cable (20) and said second seat (3) having an inner diameter (d2) slightly greater than the outer diameter of the outer wall (41) of said connector (40), in such a way to obtain a pressure coupling of the coaxial cable (20) screen (21) between the sleeve coaxial connector (1) and the outer wall (41) of the female coaxial connector (40).

2. Coaxial connector according to claim 1, characterized in that at least one projection (10) is provided within said second seat (3).

3. Coaxial connector according to one of the preceding claims, characterized in that the portion of the connector corresponding to said first seat (2) is long.

4. Coaxial connector according to claim 1 or 2, characterized in that the portion of the connector corresponding to said first seat (2) is short.

5. Coaxial connector according to one of the preceding claims, characterized in that outside said second seat, close to the outer connection zone with said first seat, a circular projection is provided.

6. Coaxial connector according to one of the preceding claims, characterized in that the connection zone between said first and second seats is realised by a sloped wall.

7. Coaxial connector according to one of the preceding claims, characterized in that spaced longitudinal ribs are provided outside said second seat.

8. Coaxial connector according to one of the preceding claims, characterized in that on the inner surface of said first and second seat a roughness is provided.

9. Coaxial connector according to one of the preceding claims, characterized in that within said first seat, longitudinal lugs are provided, preferably three lugs circumferentially spaced at 120°.

10. Coaxial connector according to one of the preceding claims, characterized in that within said second seat, longitudinal lugs are further provided, preferably three lugs circumferentially spaced at 120°.

5 11. Coaxial connector according to one of the preceding claims, characterized in that said connector is used for the connection of the coaxial cable (20) screen (21) made up of metallic braid, with the threaded outer screening (41) of a female coaxial connector (40).

10 12. Coaxial connector according to one of the preceding claims 1 - 10, characterized in that said connector is used for the connection of the coaxial cable (20) screen (21) made up of one or more metallic foils, with the threaded outer screening (41) of a female coaxial connector (40).

15 13. Coaxial connector according to one of the preceding claims 1 - 10, characterized in that said connector is used for the connection of, the coaxial cable screen, made up of metallic braid and one or more metallic foils, with the outer screening of a female coaxial connector.

14. Coaxial connector according to one of the preceding claims, characterized in that said coaxial connector is made up with plastic material.

20 15. Coaxial connector according to one of the preceding claims 1 - 13, characterized in that said coaxial connector is made up with, elastic material, such as rubber.

16. Coaxial connector according to one of the preceding claims 1 - 13, characterized in that said coaxial connector is made up with elastic metallic material.

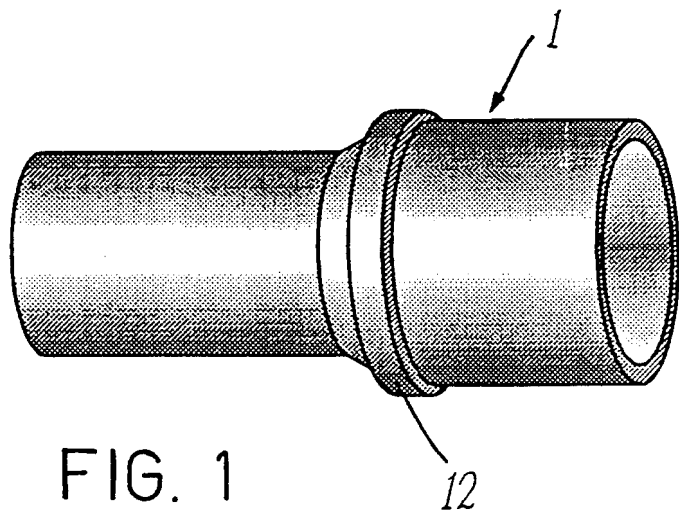


FIG. 1

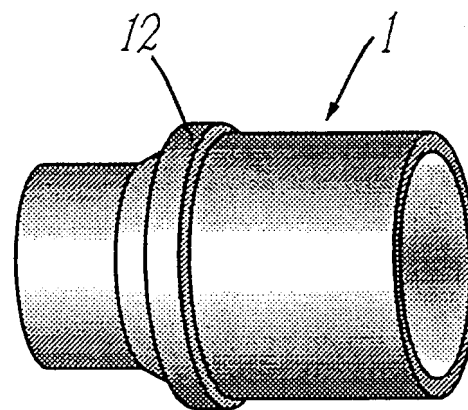


FIG. 2

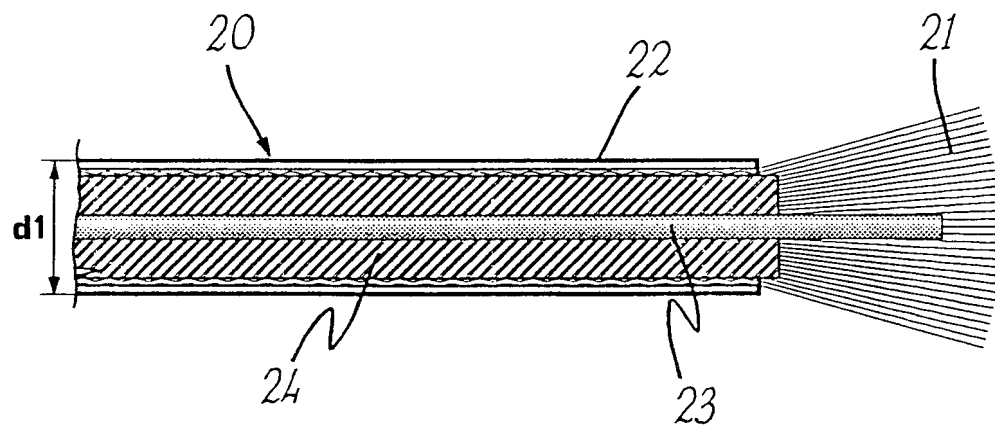


FIG. 3

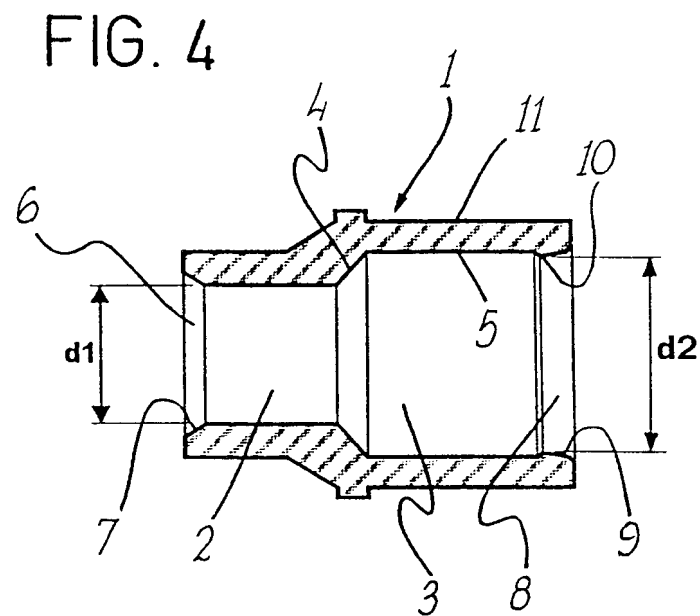
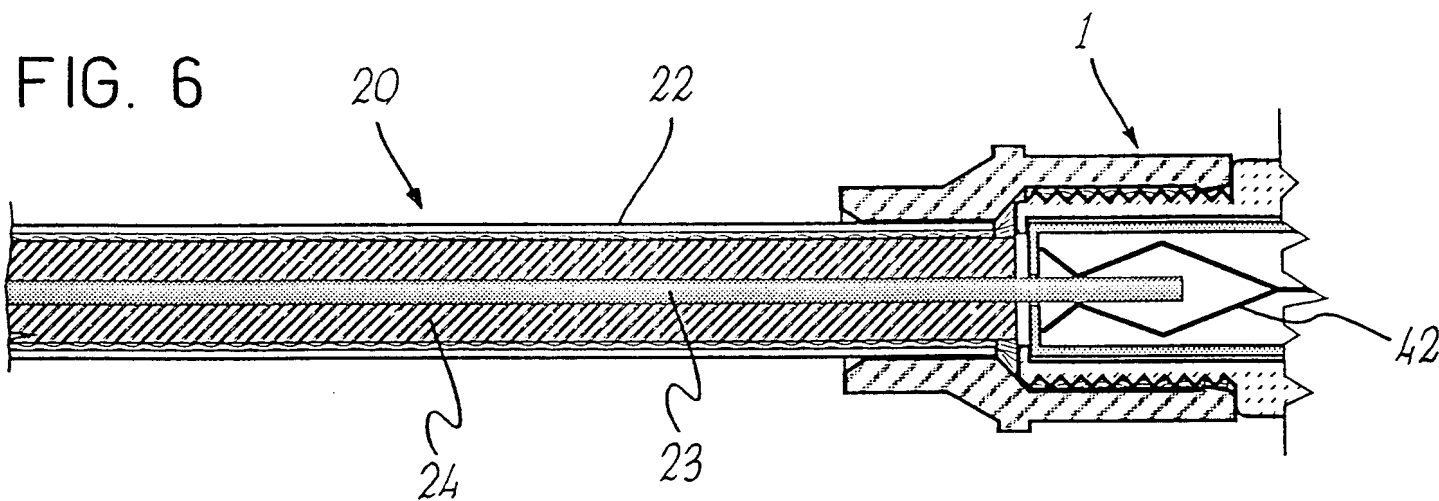
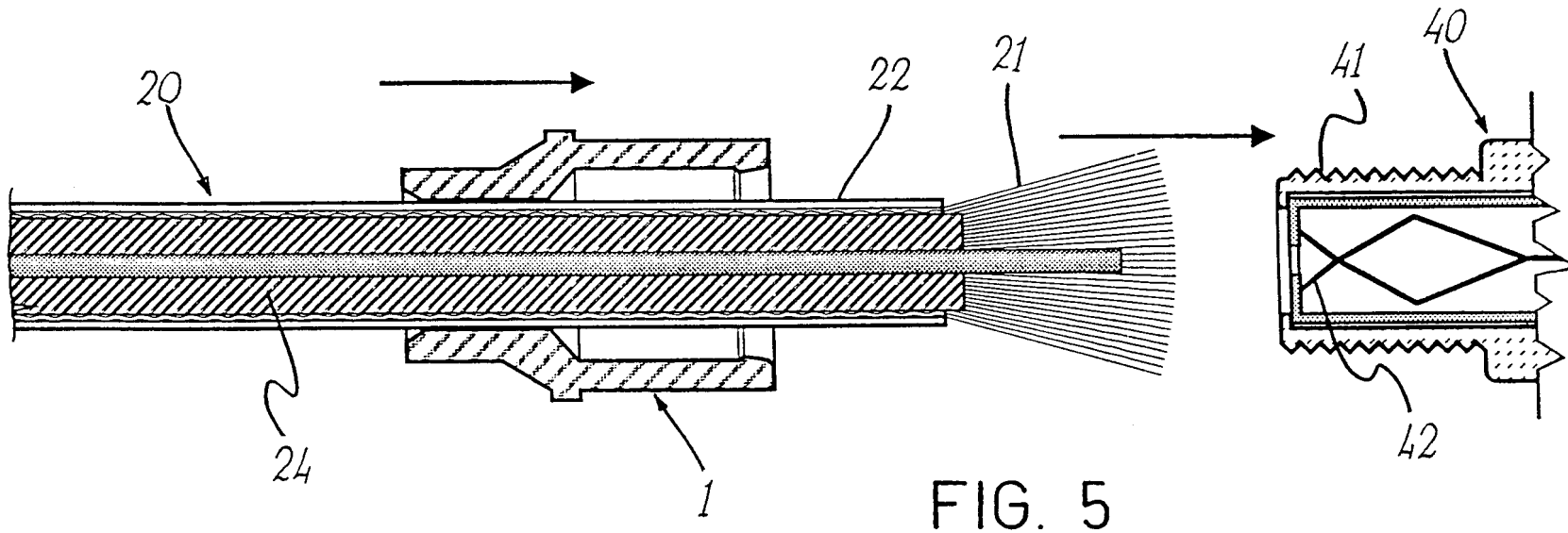


FIG. 4



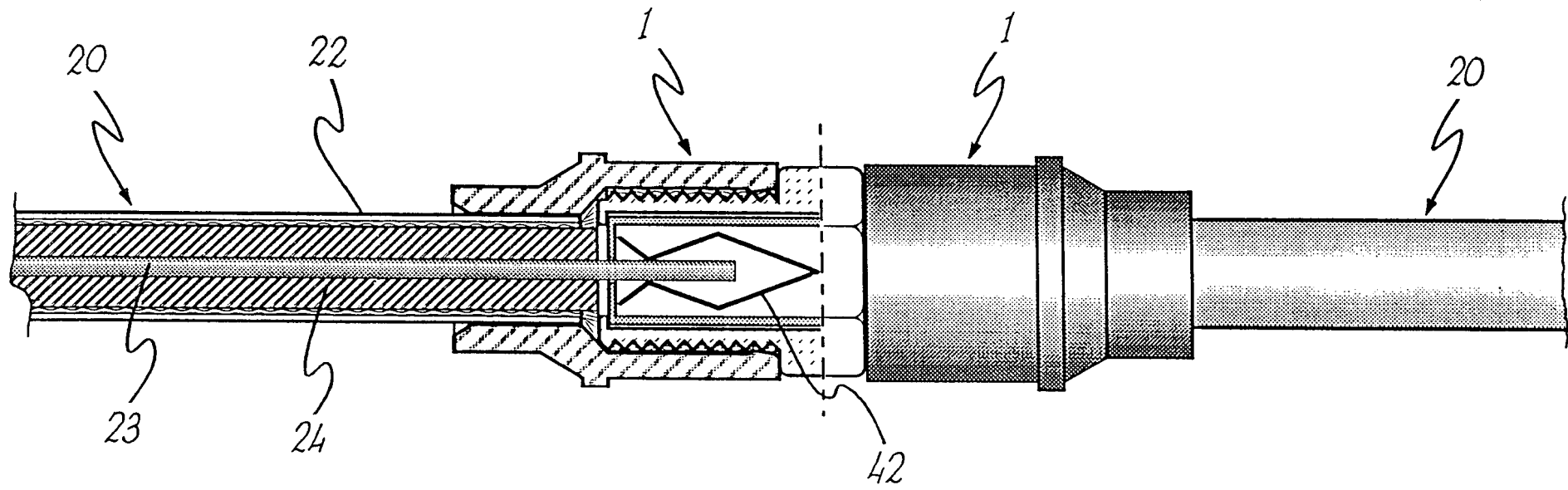


FIG. 7

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IT 96/00236

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 H01R17/12 H01R9/05

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

## B. FIELDS SEARCHED

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                         | Relevant to claim No. |
|------------|------------------------------------------------------------------------------------------------------------|-----------------------|
| X          | EP 0 020 188 A (BENDIX CORP) 10 December 1980<br>see figures 3-5                                           | 1,3-7,<br>12,13       |
| X          | EP 0 693 805 A (DAIMLER BENZ AEROSPACE AIRBUS) 24 January 1996<br>see column 1, line 1 - line 17; figure 3 | 1-4,6                 |
| X          | US 5 061 206 A (KAWANAMI NORIHIIDE ET AL) 29 October 1991<br>see column 3, line 7 - line 14; figure 1      | 1-4,6,<br>14,15       |
| X          | US 5 321 207 A (HUANG GEORGE Y) 14 June 1994<br>see column 1, line 34 - line 45; figures 1,10              | 1,3,4,6,<br>16        |
|            | -/-                                                                                                        |                       |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

20 June 1997

Date of mailing of the international search report

25.06.97

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International Application No  
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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|------------|-----------------------------------------------------------------------------------------------------|-----------------------|
| A          | US 3 858 156 A (ZARRO M) 31 December 1974<br>see figure 1<br>---                                    | 1                     |
| A          | US 3 828 303 A (SLADEK N ET AL) 6 August 1974<br>see column 2, line 50 - line 52; figure 5<br>----- | 9,10                  |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT 96/00236

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                                                                  | Publication<br>date                                                              |
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| US 5321207 A                              | 14-06-94            | NONE                                                                                                        |                                                                                  |
| US 3858156 A                              | 31-12-74            | NONE                                                                                                        |                                                                                  |
| US 3828303 A                              | 06-08-74            | AR 196155 A<br>AU 6073073 A<br>CA 980888 A<br>DE 2348645 A<br>FR 2204058 A<br>GB 1434311 A<br>JP 49071484 A | 30-11-73<br>27-03-75<br>30-12-75<br>04-04-74<br>17-05-74<br>05-05-76<br>10-07-74 |