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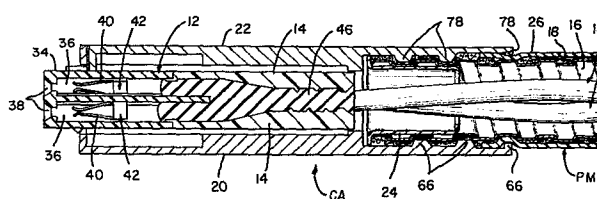
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EUROPEAN PATENT APPLICATION(21) Application number: **82305949.8**(51) Int. Cl.³: **H 01 R 13/58**(22) Date of filing: **09.11.82**(30) Priority: **20.11.81 US 323164**(71) Applicant: **AMP INCORPORATED, Eisenhower Boulevard, Harrisburg Pennsylvania (US)**(43) Date of publication of application: **01.06.83 Bulletin 83/22**(72) Inventor: **Tighe, Charles I. Jr., 987 Beech Avenue, Hershey Pennsylvania 17033 (US)**(84) Designated Contracting States: **BE DE FR GB IT NL**(74) Representative: **Wayte, Dennis Travers et al, 20 Queensmere, Slough, Berkshire SL1 1YZ (GB)**(54) **Shielded ribbon coax cable assembly.**

(57) A ribbon coax cable termination includes the use of a dielectric material (46) coated onto the exposed ends of signal conductors (28) and ground conductors (30) of a ribbon coax cable (10) which are terminated in conductor-receiving sections (44) of electrical contacts (42) which are disposed in an insulating housing (34). Cover members (14) are secured onto the insulating housing (34) and to each other as they extend along dielectric material (46).

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SHIELDED RIBBON COAX CABLE ASSEMBLY

This invention relates to ribbon coaxial cable and more particularly to a ribbon coaxial cable assembly including connectors terminating the ends thereof, elastomeric material extending along the ends of the cables and center and drain conductor terminations to maintain the integrity of the termination, and insulated braided armor sheathing protecting the terminated cable and providing shielding thereof.

U.S. Patent No. 3,775,552 discloses ribbon coaxial cable and U.S. Patent No. 4,040,704 discloses typical connectors for terminating the conductors of the cable thereby forming ribbon coaxial assemblies for use by electronic systems for interconnecting electric circuits thereof. The use of such a terminating arrangement has proven to be successful so long as the terminated cable has not been subjected to twist and bend stresses.

In many cases, terminated ribbon coax cable assemblies are used to electrically connect electronic equipment together. These cable assemblies are bent and twisted thereby subjecting them to stresses which cause the internal elements of the ribbon coaxial cable to move relative to each other which can result in failure of the terminations. Moreover, after a length of cable has been removed from a roll of the cable and its ends have been terminated in electrical connectors, the cable undergoes stress relaxation whereby the internal elements of the cable move relative to each other which places stresses on the cable and its terminations which can result in failure.

According to the present invention, a ribbon coax cable termination comprises a ribbon coax cable including a plurality of center conductors with each center conductor surrounded by dielectric sheathing, drain conductors extending along each dielectric sheathing, metal foil encircling

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each dielectric sheathing and drain conductor associated therewith thereby defining coaxial conductor members and a dielectric jacket covering the coaxial conductor members and maintaining them insulated from each other and coplanar. Electrical connectors include an insulating housings having
5 electrical contacts therein which contain conductor-receiving sections in which exposed ends of the center conductors and the drain conductors are electrically connected. Elastomeric material extends along the section of the insulating housing containing the conductor-receiving sections and covering the conductor-receiving sections with the exposed ends of the
10 center and drain conductors therein and an adjacent section of the ribbon coax cable. Cover members are secured to the insulating housing along the elastomeric material and to each other, the elastomeric material absorbing stresses to the cable to maintain the center conductors and drain conductors of the cable at the connections with the
15 conductor-receiving sections in position.

According to another aspect of the present invention, the ribbon coax cable is in pairs which are encased in a protective sheath including braided metal strain member having a dielectric jacket thereover, the ends of the protective sheath being secured in metal housing members that are
20 secured onto the connector housing.

According to a further aspect of the present invention, a method of terminating an end of a ribbon coax cable comprises the steps of connecting stripped center conductors and drain conductors to conductor-receiving sections of electrical contacts disposed in an insulating
25 housing; applying an elastomeric material to the conductor-receiving sections, stripped center and drain conductors and a section of the ribbon coax cable; and securing cover members to the housing, over the elastomeric material and together.

FIGURE 1 is an exploded perspective view of a ribbon coax cable assembly with parts of the protective sheath broken away.
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FIGURE 2 shows a view similar to Figure 1 with the cable assembly partly terminated.

FIGURE 3 shows a view similar to Figure 2 with the cable assembly completely terminated.

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FIGURES 4-7 illustrate the various steps of terminating an end of a ribbon coax cable to an electrical connector.

FIGURE 8 is a cross-sectional view taken along line 8-8 of Figure 3.

Figures 1-3 illustrate the ribbon coax cable assembly CA which
5 Includes ribbon coaxial cable 10, electrical connector 12, cover members 14, metal strain member 16, braid 18, clamp body 20, clamp cover 22, bushing 24, and jacket 26. Metal strain member 16 is a flexible tubular member having projections in a spiral orientation with metal braid 18 thereover and dielectric jacket 26 covering the braided-metal strain member
10 16, 18.

The ribbon coaxial cable 10 is completely disclosed in U.S. Patent No. 3,775,552 and is incorporated by reference herein. This cable comprises signal conductors 28 disposed in sheaths of insulation along which drain
15 conductors 30 extend with metal foil encircling each dielectric sheathing and drain conductor 30 associated therewith thereby defining coaxial conductor members with a dielectric jacket 32 covering the coaxial conductor members which maintains them insulated from each other. In the present situation, the coaxial conductor members are typically in pairs which have their ends stripped to expose signal conductors 28 and drain
20 conductors 30 as illustrated.

The pairs of coaxial conductor members are disposed in a protective member PM which comprises the metal strain member 16, braid 18 thereover, and jacket 26 of a suitable dielectric material. Bushing 24 of a
25 suitable plastic material is located in the end of protective member PM to protect ribbon coaxial cable 10.

Electrical connector 12 is of a type disclosed in U.S. Patent No. 4,040,704 which is incorporated by reference herein, but other suitable connectors can, of course, be utilized. Electrical connector 12 includes a dielectric housing 34 molded from a suitable dielectric material.
30 Contact-receiving passageways 36 extend through housing 34 which communicate with beveled openings 38 at the front of housing 34 to enable pins (not shown) of a complementary electrical connector to electrically connect with electrical contact sections 40 of electrical contact members 42 secured in contact-receiving passageways 36. Electrical contact members
35 42 also include conductor-receiving sections 44 in which signal conductors

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28 and drain conductors 30 are respectively electrically connected therein according to conventional electrical terminating practices.

After signal conductors 28 and drain conductors 30 are electrically connected to respective conductor-receiving sections 34 of electrical contact members 42, an elastomeric material 46 is applied onto terminated conductor-receiving sections 44 and a section of ribbon coaxial cable 10 as illustrated in Figure 6 thereby covering the terminations of signal conductors 28 and drain conductors 30 in their respective conductor-receiving sections 44. Elastomeric material 46 is preferably a Silastic Rubber No. 3110 which uses a Silastic Rubber Catalyst Type S from Dow-Corning. The elastomeric material is in a flowable condition when applied to the terminated ends of signal conductors 28 and drain conductors 30 in conductor-receiving sections 44 and onto the end of ribbon coaxial cable 10 to enable the elastomeric material 46 to be readily applied thereto. The elastomeric in this state also completely surrounds the conductors thereby isolating them from one another.

Cover members 14 include projections 48, inner inclined surfaces 50, spaced projections 52, and latching arms 54 which have lugs 56 thereon for engagement in recesses 58 located in the top surfaces of cover members 14.

In use, projections 48 of cover members 14 are disposed in passageways 36 which retain cover members 14 in connection with housing 34. Cover members 14 are then moved toward each other as illustrated in Figure 6 whereupon they engage elastomeric material 46 and then cover members 14 are latchably secured together via latching arms 54, lugs 56, and recesses 58. Cover members 14 are also provided with recesses 60 which meet with projections 62 of housing 34.

The movement of cover members 14 into engagement with elastomeric material 46 causes elastomeric material 46 to conform to the configuration of cover members 14 thereby molding elastomeric material 46 into a final configuration when cover members 14 are latched together as illustrated in Figure 7. As a result of this operation, excess elastomeric material 46 is expressed exteriorly of housing member 34 and cover members 14 which is wiped away by a rag or some similar object. Elastomeric material 46 is then subjected to the action of room temperature vulcanizing thereby

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causing elastomeric material 46 to have a rubber consistency with a durometer of the same as or substantially the same as that of dielectric jacket 32. Thus, any twisting or bending of ribbon coaxial cable 10 will transmit any stresses applied to cable 10 by such bending or twisting
5 action to vulcanized elastomeric material 46 thereby maintaining the integrity of the terminations of the conductors of cable 10 to electrical contact members 42. The bending stresses can occur by bending the cable in the vertical and/or horizontal planes.

Thus, stresses applied to the cable are transmitted to the vulcanized
10 elastomeric material which absorbs such stresses to maintain the stresses in equilibrium and the electrical terminations will not fail or the conductors become shorted.

Terminated ribbon coax cables as hereinabove disclosed can be used to interconnect electronic circuits.

15 As shown in Figures 1-3 and 8, terminated electrical connector 12 with cover members 14 secured thereto is positioned within a profiled section 64 of clamp body 20 to accommodate electrical connector 12, cover members 14, exposed braided metal strain member 16, 18 and a section of jacket 26. Internal projections 66 are located in clamp body 20 for
20 engagement with the braided metal strain member and jacket 26. Clamp cover 22 fits onto clamp body 20 and is secured thereto by screws 68 extending through holes 70 in clamp cover 22 and threadably engaging threaded holes 72 in clamp body 20. Recesses 74 are located in the sides of clamp cover 22 which mate with lugs 76 extending outwardly from clamp
25 body 20. Projections 78 are also located on an inside surface of clamp cover 22 and along with projections 66 of clamp body 20 engage braided-metal strain member 16, 18 and jacket 26 as illustrated in Figure 8. Clamp body 20 and clamp cover 22 electrically connect with
30 braided-metal strain member 16, 18 via projections 66 and 78 when body 20 and cover 22 are secured together on connector 12, cover members 14, braided-metal strain member 16, 18, and jacket 26. Moreover, when body 20 and cover 22 are clamped onto the end of protective member PM, it is deformed from a circular configuration to a modified elliptical configuration which prevents relative rotational movement between body 20, cover 22,
35 and the end of the protective conduit member. Ears 80 with holes 82

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therethrough are located on clamp body 20 to secure terminated electrical connector 12 in position onto electronic equipment in electrical engagement with the electrical connector thereof to provide an input-output connection to such electronic equipment.

- 5 The use of protective member PM, clamp body 20 and clamp cover 22 provides shielding to cable 10 that enables the terminated cable to comply with FCC requirements that reduces radiation to acceptable levels required by the FCC and to protect the ribbon coax cable therein. Twist and bend stresses applied to this protected cable termination will be absorbed by the
- 10 elastomeric material to maintain the integrity of the electrical terminations to prevent failure thereof. This protected cable can also take substantial punishment without any damage thereto. The braided-metal strain member 16, 18 also prevents any elongation of the terminated and protected cable.

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CLAIMS:

1. A ribbon coax cable termination of the type which comprises a ribbon coax cable (10) including a plurality of center conductors (28) with each center conductor (28) surrounded by dielectric sheathing, drain conductors (30) extending along each dielectric sheathing, metal foil
5 encircling each dielectric sheathing and a drain conductor (30) associated therewith thereby defining coaxial conductor members and a dielectric jacket (32) covering the coaxial conductor members and maintaining them insulated from each other, an electrical connector (12) including an insulating housing (34) having electrical contacts (42) therein which
10 contain conductor-receiving sections (44) in which exposed ends of the center (28) and drain conductors (30) are electrically connected, and cover members (14) secured on said housing (34) and together covering the conductor-receiving sections (44), said ribbon coax cable termination characterized in that:
- 15 dielectric material (46) extending along a section of said connector housing (34) containing the conductor-receiving sections (44) and covering the conductor-receiving sections (44) with the ends of the center (28) and drain conductors (30) therein and a section of the ribbon coax cable (10);
20 said cover members (14) secured to the insulating housing (34) along said dielectric material (46), the dielectric material (46) absorbing stresses to the cable (10) to maintain the center conductors (28) and drain conductors (30) in position in the conductor-receiving sections (44) and in position relative to one another.
2. A ribbon coax cable termination as set forth in claim 1
25 characterized in that said cover members (14) have latch arms (54) provided with lugs (56), recesses (58) in said cover members (14), said lugs (56) engaging said recesses (58) thereby latching said cover members (14) in position over said dielectric material (46).
3. A ribbon coax cable termination as set forth in claim 1
30 characterized in that the durometer of said dielectric material (46) closely matches that of said dielectric jacket of said ribbon coax cable (10).
4. A ribbon coax cable termination as set forth in claim 1
characterized in that a protective member (PM) covers said ribbon coax cable (10).

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5. A ribbon coax cable termination as set forth in claim 4 characterized in that said protective member (PM) includes a metal armor member (16) covered by metal braid (18) and a dielectric jacket member (26).

5 6. A ribbon coax cable termination as set forth in claim 5 characterized in that a metal clamp body (20) and clamp cover (22) are secured over said electrical connector (12) and cover members (14) and onto said braid (18) on said armor member (16) and said jacket member (26) thereby protecting and electrically shielding said connector (12) and
10 cable (10).

7. A method of terminating exposed ends of center conductors (28) and drain conductors (30) of a ribbon coax cable (10) having an insulating jacket (26) characterized by the steps of:

connecting the exposed ends of the center (28) and drain conductors
15 (30) to respective conductor-receiving sections (44) of electrical contact members (42) insulatingly disposed in an insulating housing (34);

applying a dielectric material (46) onto the exposed ends of the center (28) and drain conductors (30) and conductor-receiving sections (44) and a section of the insulating jacket (26); and

20 securing cover members (14) to the insulating housing (34), over dielectric material (46) and together thereby causing the dielectric material (46) to conform to the inside configuration of the cover members (14) so that said dielectric material (46) absorbs stresses applied to the ribbon coax cable to maintain the integrity of the electrical connections of the
25 exposed ends of the center (28) and drain (30) conductors to the electrical contact members (42).

8. A method as set forth in claim 7 characterized by the further step of:

inserting the ribbon coax cable (10) into a protective member (PM) comprising a metal strain member (16) covered by an insulating jacket member (26) prior to the exposed ends of the center (28) and drain (30) conductors being connected to the conductor-receiving sections (44).

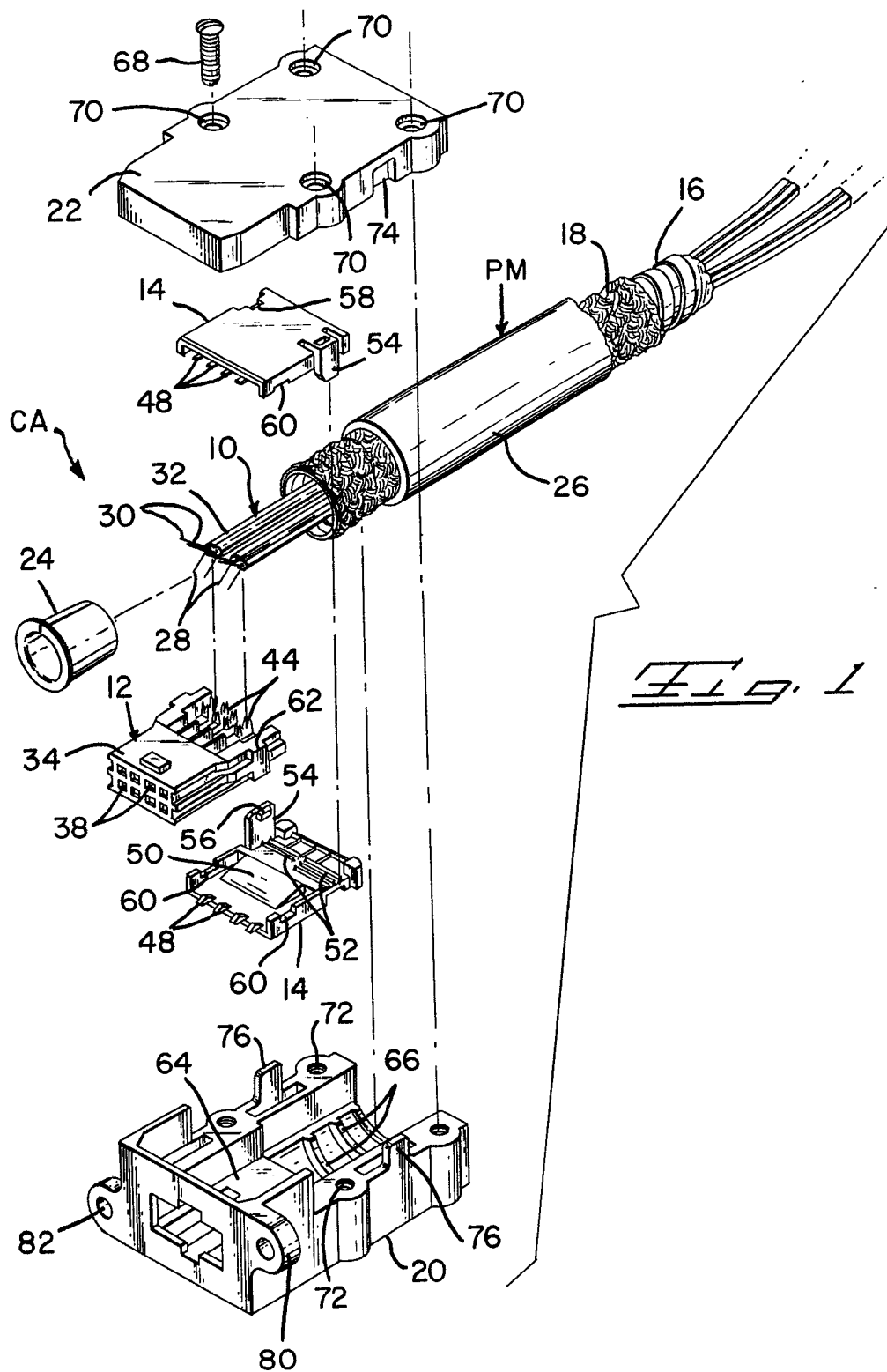
9. A method as set forth in claim 8 characterized by the further steps of:

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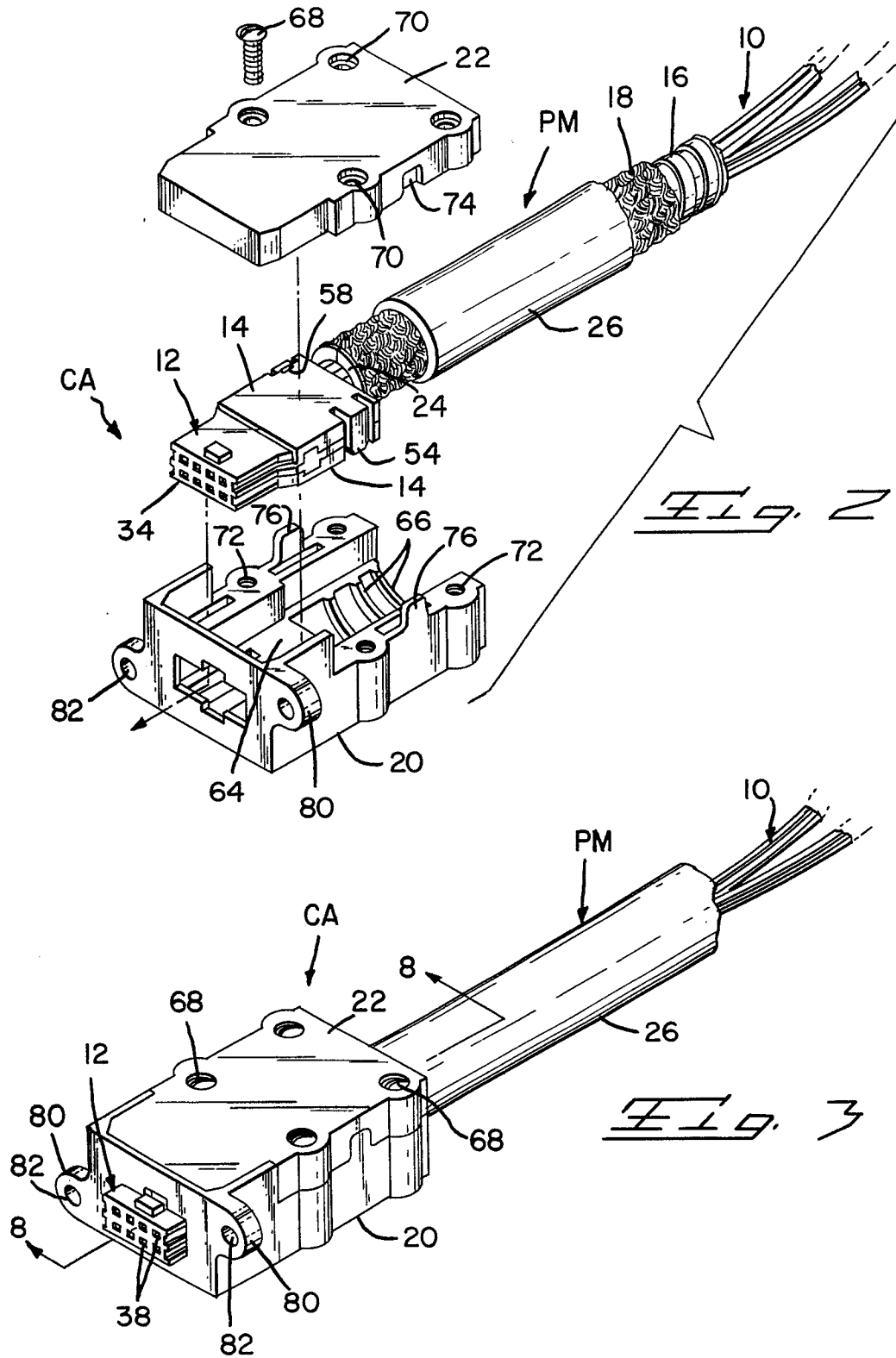
positioning the insulating housing (34) and cover members (14) secured thereto into metal body members (20, 22); and

5 securing said metal body members (20, 22) together onto said insulating housing (34) and cover members (14) and into engagement with an exposed section of said metal strain member (16) and said insulating jacket member (26).

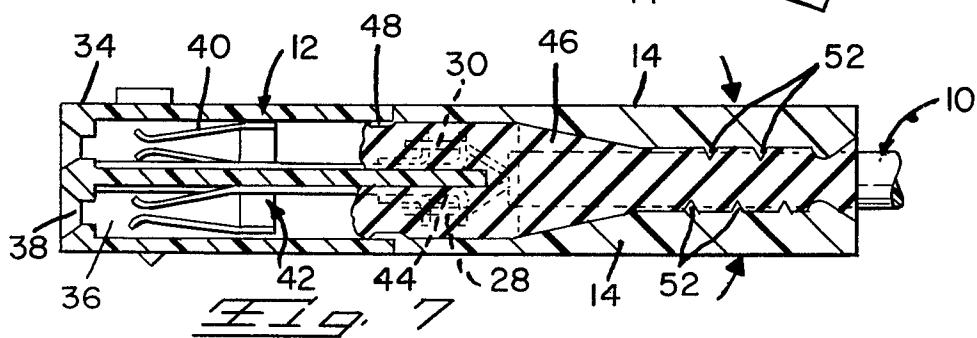
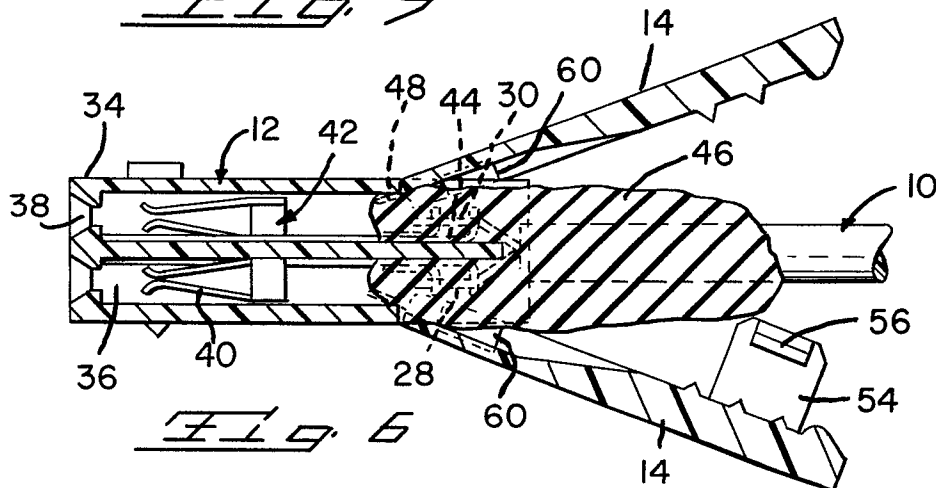
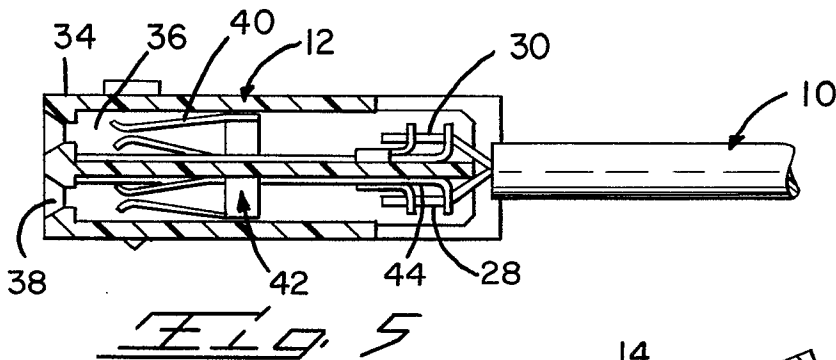
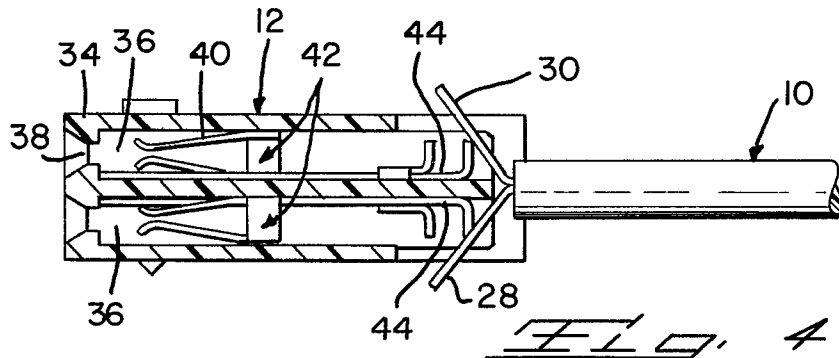
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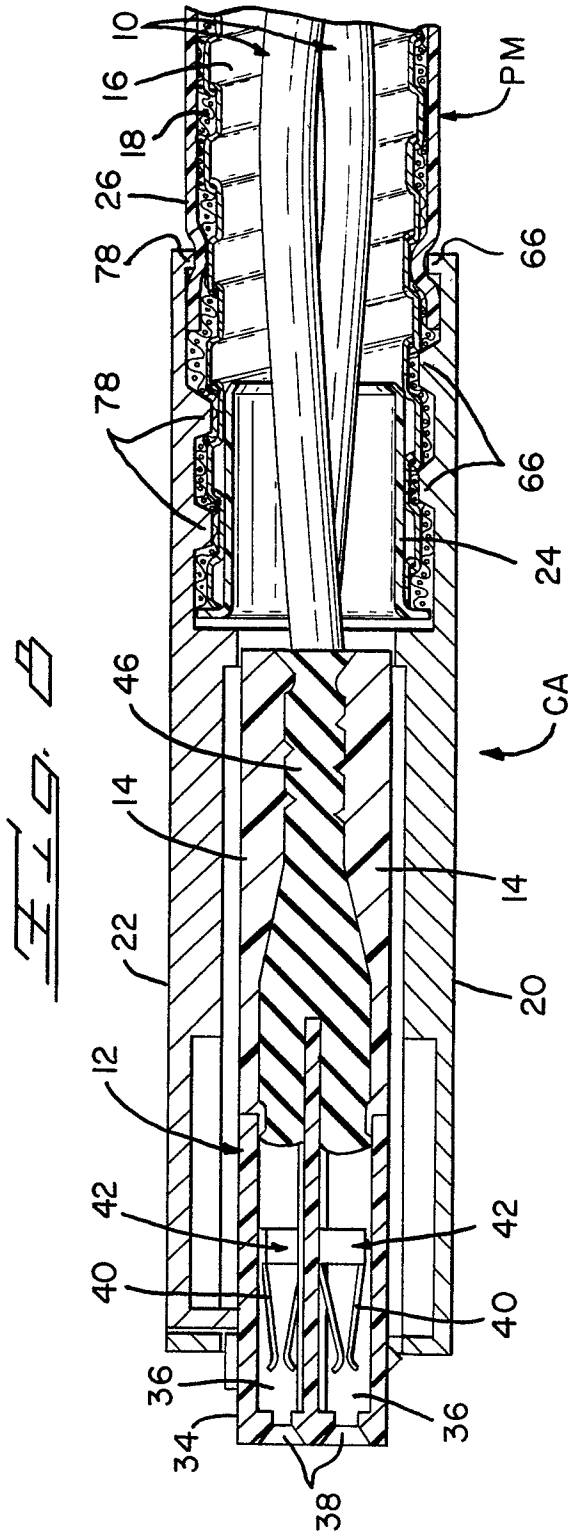
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EUROPEAN SEARCH REPORT

Application number

EP 82 30 5949

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. 9)
Y	US-A-4 243 288 (AMP) *Column 2, line 19 to column 3, line 19; figures 1-5*	1,2,7	H 01 R 13/58
Y	GB-A-2 040 603 (BICC) *Page 2, line 85 to page 3, line 103; figures 1-8*	1,7	
A	DE-B-1 020 395 (RHEYDT) *Column 2, line 53 to column 5, line 2; figures 1-3*	1,7	
A	DE-B-1 056 221 (SIEMENS) *Column 2, line 38 to column 4, line 3; figures*	1,7	
A	US-A-1 643 658 (HILLIX) *Page 1, line 40 to page 2, line 5; figures 1-6*	1	TECHNICAL FIELDS SEARCHED (Int. Cl. 9)
A	GB-A-1 524 684 (BICC) *Page 2, line 78 to page 3, line 53; figures 1-9*	1,7	H 01 R 13/00 H 01 R 23/00 H 01 R 19/00
A	US-A-3 678 438 (GAMSON) *Column 1, line 39 to column 2, line 20; figures 1-3*	4,5,8	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01-03-1983	Examiner LOMMEL A.
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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EUROPEAN SEARCH REPORT

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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. ³)
A	US-A-2 022 785 (ROLLMANN) *Page 1, left-hand column, line 24 to right-hand column, line 46; figures 1-4*	4, 8	
A, D	--- US-A-4 040 704 (AMP) *Column 2, line 15 to column 4, line 50; figures 1-6* -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01-03-1983	Examiner LOMMEL A.
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			