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54 **Electrical connector for coaxial cables.**

57 The connector for splicing a plurality of coaxial cables (22, 24, 26) includes a cover (40) and a base (42). The cover has a plurality of U-shaped slots (44) for the receipt of the coaxial cables and an electrically conductive metallic shield connector (46) secured thereto. The metallic shield connector includes a plurality of electrically interconnected, downwardly extending, insulation piercing contacts (48) having cutting edges (50) for cutting through the outer insulating layers (22) of the coaxial cables and for physically and electrically contacting and for electrically interconnecting the metallic shields (32) of the coaxial cables. The base (42) includes an electrically insulating substrate (65) that has an electrically conductive central conductor connector (68) disposed thereon. The central conductor connector includes a plurality of electrically interconnected, upwardly extending, insulation piercing contacts (64) having cutting edges (66) for cutting through the inner insulating layers (30) of the coaxial cables which may be shaped as at 36 and for physically and electrically contacting and electrically interconnecting the central conductors (28) of the coaxial cables.

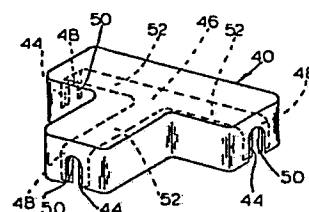


FIG. 4

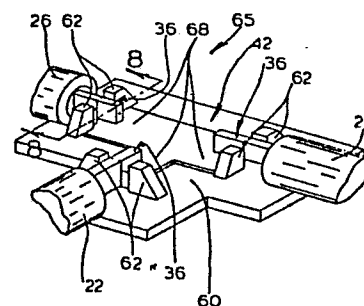


FIG. 7

ELECTRICAL CONNECTOR FOR COAXIAL CABLES

The device of the present invention generally relates to electrical connectors and, more particularly, although not exclusively, to electrical connectors for electrically interconnecting or splicing a
5 plurality of low voltage coaxial cables.

Electrical connectors and, more particularly, electrical connectors for electrically interconnecting or splicing a plurality of single or multiple conductor cables are old and well known in the art.
10 Examples of such connectors are disclosed in United States Letters Patents Nos. 4,284,316; 4,324,450; 4,325,598; 4,346,958; 4,360,244; 4,365,859; and 4,391,484. In general, prior art electrical connectors for electrically interconnecting or splicing
15 a plurality of coaxial cables have exhibited one or more design deficiencies. For example, many prior art electrical connectors have been either overly large, cumbersome, unreliable, expensive, or difficult or time consuming to assemble, or have
20 required one or more soldering operations. A need exists in the art for a relatively small, effective, reliable and inexpensive electrical connector for electrically interconnecting or splicing a plurality of coaxial cables quickly and easily without any

soldering operations.

To this end the present invention provides an electrical connector for electrically interconnecting a plurality of coaxial cables characterized by first means for electrically interconnecting the outer conductors of said plurality of coaxial cables through a short circuit electrical path, said first means comprising a first plurality of electrically interconnected insulation piercing contacts extending in a first direction and adapted to physically and electrically contact the outer conductors of said plurality of coaxial cables through the outer dielectric insulating layers of said plurality of coaxial cables, and second means for electrically interconnecting the inner conductors of said plurality of coaxial cables through a short circuit electrical path, said second means comprising a second plurality of electrically interconnected insulation piercing contacts extending in a second direction opposite to said first direction and adapted to physically and electrically contact the inner conductors of said plurality of coaxial cables through the inner dielectric insulating layers of said plurality of coaxial cables.

The present invention also provides an electrical connector for electrically interconnecting a coaxial cable with an electrical device characterized

by first means for electrically interconnecting the inner conductor of said coaxial cable through an electrical path with the device, said first means comprising a first insulation piercing contact extending
5 in a first direction and adapted to physically and electrically contact the inner conductor of said coaxial cable through the inner dielectric insulating layer of said cable and second means for electrically interconnecting the outer conductor of said coaxial
10 cable with the device, said second means comprising an insulation piercing contact extending in a second direction opposite to said first direction and adapted to physically and electrically contact the outer conductor of said coaxial cable through the outer
15 dielectric insulating layer of said cable.

Some ways of carrying out the invention are described in detail below, by way of example and not by way of limitation, with reference to the accompanying drawings wherein:

20 .FIG. 1 is a perspective view of an electrical connector constructed in accordance with the principles of the present invention;

FIG. 2 is an enlarged perspective view of a coaxial cable for use with the device of Fig. 1;

25 FIG. 3 is an enlarged perspective view of a coaxial cable prepared for use in the device of

Fig. 1;

FIG. 4 is a perspective view of the cover of the device of Fig. 1;

FIG. 5 is an enlarged, cross sectional view of the device of Fig. 1 taken along line 5-5 of Fig. 1;

FIG. 6 is an enlarged, fragmentary, elevational view of the insulation piercing contacts of the device of Fig. 1;

FIG. 7 is a perspective view of the base of the device of Fig. 1; and

FIG. 8 is an enlarged, cross sectional view of the device of Fig. 1 taken along line 8-8 of Fig. 7.

Referring to the drawings and initially to Figs. 1 to 3, an electrical connector 20, which may be referred to as a mass termination, electrically interconnects or splices a plurality of three low voltage coaxial cables 22, 24 and 26 capable of transmitting high frequency, low power energy. Each coaxial cable 22, 24 and 26 (Fig. 2) includes a central or current carrying conductor 28; an inner dielectric insulating layer 30; an outer conductor or metallic shield 32, typically formed as metallic braiding; and an outer dielectric insulating layer, jacket or sheath 34. Each coaxial cable 22, 24 and

and 26 may be prepared for interconnection by the electrical connector 20 by baring and shaping an elongated portion 36 (Fig. 3) of the inner insulating layer 30.

5 The electrical connector 20 includes a generally T-shaped, molded, electrically insulating cover 40 (Fig. 4) formed from a suitable dielectric material that circumscribes or defines the interior of the electrical connector 20 when disposed over a base
10 42 of the electrical connector 20. The cover 40 includes a plurality of three, elongated, generally U-shaped slots or openings 44 for the receipt of the cables 22, 24 and 26. An electrically conductive metallic shield connector 46 is fixedly secured
15 in the cover 40 and includes a plurality of three, downwardly extending, insulation piercing contacts 48 for physically and electrically contacting and for electrically interconnecting the metallic shields 32 of the cables 22, 24 and 26. Each of the contacts
20 48 includes a plurality of laterally spaced apart, exposed knife edges 50 (Fig. 5) extending inwardly into the slots 44. When the cover 40 is disposed over the base 42 (Fig. 1) such that the cables 22, 24 and 26 are fully received in the slots 44, the
25 knife edges 50 cut through the outer insulating jackets 34 and physically and electrically contact

the metallic shields 32 of the cables 22, 24 and 26 en masse (Figs. 5 and 6).

The shield connector 46 also includes a plurality of three, elongated, interconnected, metallic leads 52 (Figs. 1 and 4) for electrically interconnecting the three spaced apart contacts 48 and thus the three metallic shields 32 of the cables 22, 24 and 26. The contacts 48 and the leads 52 may, in a specific embodiment, comprise integrally formed portions of a unitary metallic strip. The metallic shield connector 46 may be formed in a desired configuration and then placed, prior to a molding operation, in a mold used to form the cover 40. In this manner, the cover 40 and the shield connector 46 may be formed as a single component part of the electrical connector 20.

The base 42 of the electrical connector 20 includes a generally T-shaped, electrically insulating substrate 60 (Fig. 7). The substrate 60 includes a plurality of three, integrally formed, pairs of spaced apart protuberances or pedestal portions 62 extending upwardly from the inner surface of the substrate 60. One of a plurality of three, upwardly extending, insulation piercing contacts 64 of an electrically conductive central conductor connector 65 is supported by and mounted between each pair

of pedestal portions 62. Each contact 64 includes a pair of laterally spaced apart, converging knife edges 66 for cutting through the elongated portion 36 of the inner insulating layer 30 and for physically and electrically contacting the central conductor 28 of the cable 22, 24 or 26 (Figs. 6 and 8). The central conductor connector 65 also includes a plurality of elongated, interconnected, metallic leads or strips 68, secured to the substrate 60 by any suitable means, for electrically interconnecting the three contacts 64 and thus the central conductors 28 of the cables 22, 24 and 26 through a short circuit electrical path.

A plurality of two or more of the cables 22, 24 and 26 may be electrically interconnected by means of the electrical connector 20 in accordance with the following method. Initially, each cable 22, 24 and 26 is prepared as depicted in Fig. 3. Specifically, the elongated portion 36 of the inner insulating layer 30 is bared by removing an elongated portion of the outer jacket 34 and a corresponding elongated portion of the metallic shield 32. Subsequently, the elongated portion 36 of the inner insulating layer 30 may be shaped, if desired, to facilitate its receipt on the contact 64 between the pair of pedestal portions 62 (Fig. 7 and 8) and

to reduce the amount of effort required to cut through the inner insulating layer 30 in order to physically contact the central conductor 28. For example, the inner insulating layer 30 may be cut to form a plurality of two, generally parallel, spaced apart, flat or planar surfaces 70 (Fig. 3).

Subsequently, each elongated portion 36 of the cables 22, 24 and 26 (if all three cables 22, 24 and 26 are to be interconnected) is disposed fully in contact with the insulation piercing contact 64 (Fig. 8) such that the center conductor 28 is in physical and electrical contact with the converging knife edges 66. The cover 40 may then be placed over the substrate 60 so that the cables 22, 24 and 26 are received in the slots 44. The cover 40 is pressed downwardly as a mass termination until the cables 22, 24 and 26 are fully received within the slots 44, in which condition the knife edges 50 will have cut through the outer jackets 34 to physically and electrically contact the metallic shields 32 of the cables 22, 24 and 26. If desired, the cover 40 and the base 42 may be configured to interlock, for example, by a snap fit between the cover 40 and the substrate 60, to maintain the cover 40 in secure engagement with the base 42. In this manner and by means of the electrical connector 20, the coaxial

cables 22, 24 and 26 may be easily, quickly and reliably electrically interconnected.

5 A single insulation piercing contact 64 and a single, associated, preferably oppositely extending, insulation piercing contact 48 both electrically interconnected with an electrical device may be used physically and electrically to contact the central conductor 28 and the metallic shield 32, respectively, of a single coaxial cable 22 to electrically inter-
10 connect the coaxial cable 22 and the electrical device.

CLAIMS:

1. An electrical connector for electrically interconnecting a plurality of coaxial cables (22, 24, 26) characterized by

- 5 first means (46) for electrically inter-
connecting the outer conductors of said plurality
of coaxial cables through a short circuit electrical
path, said first means comprising a first plurality
of electrically interconnected insulation piercing
10 contacts (48) extending in a first direction and
adapted to physically and electrically contact the
outer conductors (32) of said plurality of coaxial
cables through the outer dielectric insulating
layers (34) of said plurality of coaxial cables and
15 second means (65) for electrically inter-
connecting the inner conductors of said plurality
of coaxial cables through a short circuit electrical
path, said second means comprising a second plurality
of electrically interconnected insulation piercing
20 contacts (64) extending in a second direction opposite
to said first direction and adapted to physically and
electrically contact the inner conductors (28) of
said plurality of coaxial cables through the inner
dielectric insulating layers (30) of said plurality
25 of coaxial cables.

2. An electrical connector as claimed in claim 1 further comprising an electrically insulating substrate (60), said second plurality of contacts being disposed on and extending upwardly from said substrate.

3. An electrical connector as claimed in claim 2 wherein said substrate comprises a generally T-shaped substrate.

4. An electrical connector as claimed in claim 1, 2 or 3 including an electrically insulating cover (40), an electrically insulating base (42), said cover being physically configured for disposition above said base thereby circumscribing an interior portion of said electrical connector between said cover and said base,

said first and second electrically inter-connecting means being at least partially interiorly disposed in said electrical connector, and

means (44) for providing access for said plurality of coaxial cables to said interior portion of said electrical connector.

5. An electrical connector as claimed in claims 2 and 4 or claims 3 and 4 in which said insulating cover is adapted to be placed over and in contact with said substrate which forms part of said

base, said first plurality of contacts being disposed in and extending downwardly from said cover.

6. An electrical connector as claimed in any preceding claim wherein said plurality of coaxial
5 cables comprises three coaxial cables, said first plurality of contacts comprises three contacts and said second plurality of contacts comprises three contacts.

7. An electrical connector as claimed in
10 any preceding claim in which each contact of said first plurality of contacts comprises a pair of spaced apart knife edges (50) for cutting through an outer dielectric insulating layer of one of said plurality of coaxial cables and for physically and
15 electrically contacting an outer conductor of one of said plurality of coaxial cables.

8. An electrical connector as claimed in any preceding claim wherein each contact of said second plurality of contacts comprises a pair of
20 spaced apart converging knife edges (66) for cutting through an inner dielectric insulating layer of one of said plurality of coaxial cables and for physically and electrically contacting a central conductor of one of said plurality of coaxial cables.

25 9. An electrical connector for electrically interconnecting a coaxial cable with an electrical

- 13 -

device characterized by first means (64) for electrically
interconnecting the inner conductor (28) of said
coaxial cable through an electrical path with the
device, said first means comprising a first insulation
5 piercing contact (64) extending in a first direction
and adapted to physically and electrically contact
the inner conductor (28) of said coaxial cable
through the inner dielectric insulating layer (30)
of said cable and second means (48) for electrically
10 interconnecting the outer conductor (32) of said
coaxial cable with the device, said second means
comprising an insulation piercing contact (48)
extending in a second direction opposite to said
first direction and adapted to physically and
15 electrically contact the outer conductor (32) of
said coaxial cable through the outer dielectric
insulating layer of said cable.

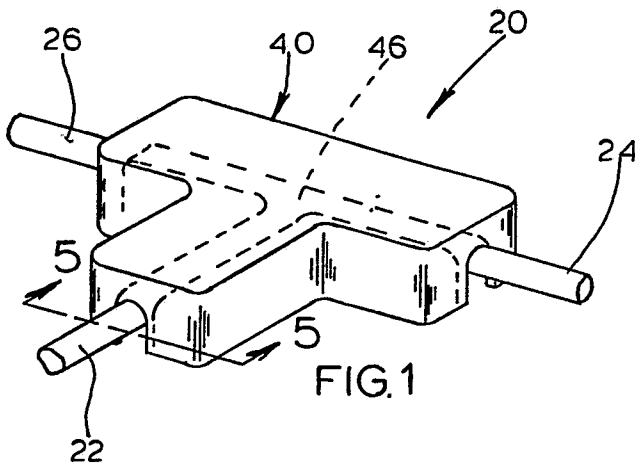


FIG. 1

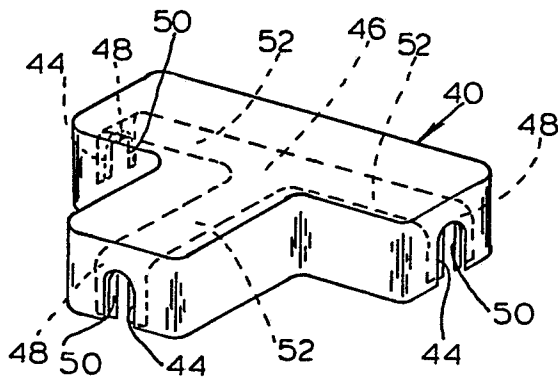


FIG. 4

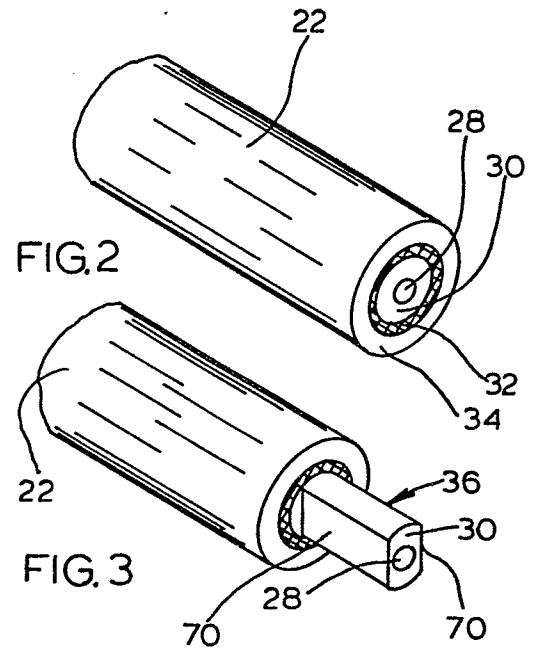


FIG. 2

FIG. 3

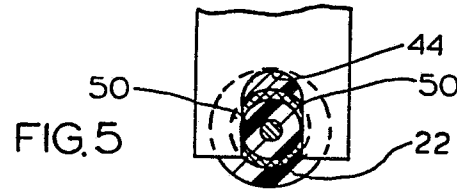


FIG. 5

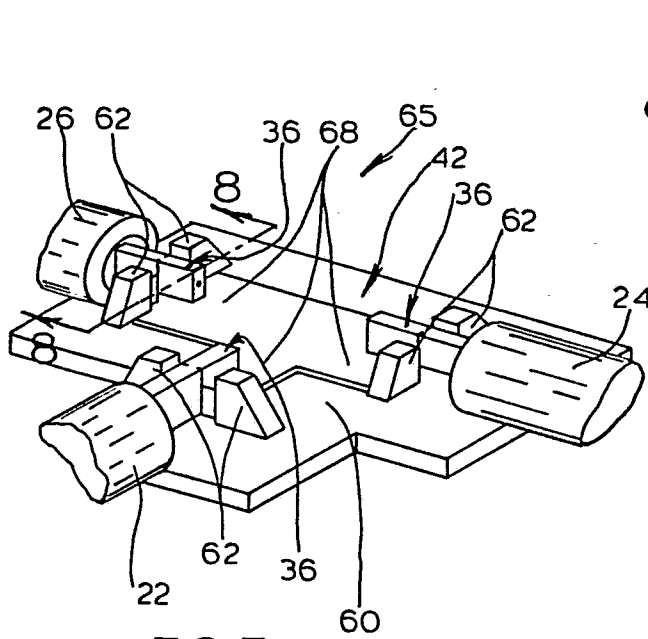


FIG. 7

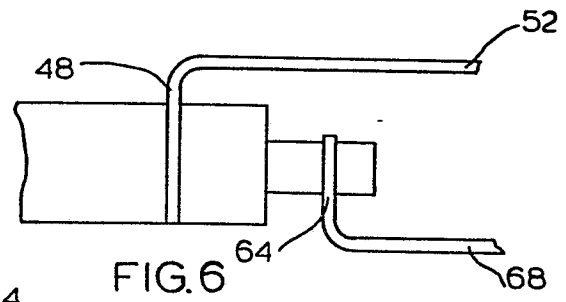


FIG. 6

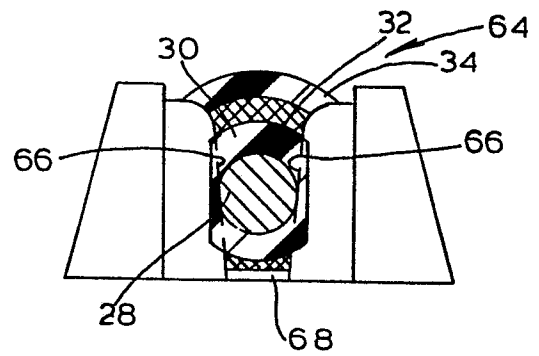


FIG. 8



European Patent
Office

EUROPEAN SEARCH REPORT

0163361

Application number

EP 85 30 1008

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. 4)
Y	GB-A-1 013 499 (SPERRY) * Figures 1-11; page 1, line 78 - page 3, line 69 *	1-9	H 01 R 9/05 H 01 R 17/12
Y	--- US-A-3 543 222 (RHEINFELDER) * Figures 1-4; column 3, line 68 - column 4, line 30 *	1-9	
A	--- GB-A-2 082 850 (BUNKER RAMO) * Figures 1,4,7; page 2, line 129 - page 3, line 32 *	1-5,7, 8	
A,D	--- US-A-4 284 316 (DEBAIGT) * Figures 1-4; column 2, line 10 - column 3, line 29 *		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			H 01 R 4/24 H 01 R 9/05 H 01 R 17/12
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 03-07-1985	HAHN G Examiner
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	