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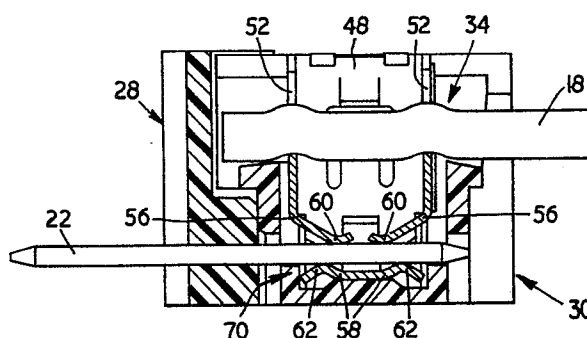
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Bulletin 84/21(72) Inventor: **Dechelette, Helen, 219 Earl's Court Road, London, S.W.5 (GB)**(84) Designated Contracting States: **DE FR IT**(74) Representative: **Slight, Geoffrey Charles et al, Graham Watt & Co. Riverhead, Sevenoaks Kent TN13 2BN (GB)**(54) **Improvements in electrical contact members and electrical connector assemblies.**

(57) An electrical connector assembly comprises a dielectric housing (30) fitted with unitary electrical contact members (32) each for terminating an insulated conductor (18). Each contact member (32) includes a body member (48) supporting a pair of parallel spaced apart plate portions (50), each having an insulation displacement slot (52) which establishes contact with a conductor (18) such that the longitudinal axis of the conductor is orientated normally of the plate portions. First contact fingers (58) extending from the body member (48) co-operate with second contact fingers (56) depending from the plate portions (50) to form a receptacle (70) for establishing a biased connection with a pin terminal (22). The configuration of the contact fingers (56, 58) is such that the pin terminal (22) has its longitudinal axis orientated parallel to the conductor (18) resulting in a highly compact arrangement suitable for miniature electrical contact members and electrical connector assemblies.



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IMPROVEMENTS IN ELECTRICAL CONTACT MEMBERS
AND ELECTRICAL CONNECTOR ASSEMBLIES

This invention relates generally to electrical contact members and electrical connector assemblies for terminating electrical conductors and, more specifically, to an electrical contact member and a connector assembly having the capability of being highly miniaturized as a result of its contact configuration and contact mounting structure.

Connector assemblies for terminating insulated electrical conductors have become increasingly relied upon in the manufacture of complex electronic and electro-mechanical equipment. In the manufacture of video cameras, for example, wherein a plurality of electrical components must be arranged in a preferably compact overall structure, miniature connectors are often a preferred means for interconnecting printed circuit board assemblies with discrete wiring leading from other components.

To provide for such interconnection, the printed circuit boards are often adapted with generally elongated pin terminals which have been electrically connected to conductive circuit paths defined on the boards. The pin terminals may either be free standing or part of a preassembled unit, customarily called a

wafer.

Connectors of a type suitable for terminating discrete insulated conductors to elongated pin terminals typically comprise a dielectric housing fitted with a plurality of metallic contact members. Each contact member has a portion such as a receptacle for selectively receiving or mating with one of the pins.

Connection of the conductor to the contact may be made by one of several methods. One method is known as insulation displacement. Insulation displacement comprehends forcing a conductor into a slot formed in a contact such that the conductor insulation is severed and displaced from the region of the electrical interface between the edges of the slot and the conductor core.

Known connectors for terminating discrete wire to pin terminals have inherent disadvantages when used in miniaturized circuitry applications. These disadvantages result principally from the complexity of known contact structures and from the consequent inability to manufacture such structures economically on a miniature scale with assurance of their reliable performance throughout the vagaries of use.

The present invention provides a unitary electrical contact member for terminating an insulated conductor, the contact member comprising a pair of plate portions each with a slot formed therein for severing and displacing the insulation of a conductor disposed within the slot thereby to terminate the conductor to the

contact member, the plate portions extending from a body member formed integrally with the plate portions, and a formation or formations extending from an edge of the body member and being shaped to provide at least part of a female terminal portion for biased contact with a generally elongated male terminal member having its longitudinal axis orientated substantially parallel to the longitudinal axis of an insulated conductor terminated to the contact member.

10 Preferably, said female terminal portion includes a first finger extending from an edge of the body member and a second finger depending from one of the plate portions, the first and second fingers being disposed in opposed, spaced apart relationship and co-operating to provide said biased contact with a generally elongated terminal member having its longitudinal axis orientated substantially parallel to the longitudinal axis of an insulated conductor terminated to the contact member.

20 Conveniently, said female terminal portion comprises a pair of said first fingers cantilevered generally outwardly from one another and a pair of said second fingers depending one from each of the plate portions and cantilevered generally toward one another the pairs of first and second contact fingers co-operating to provide a receptacle for establishing said biased contact with a generally elongated pin terminal having its longitudinal axis orientated substantially parallel to the longitudinal axis of an insulated conductor terminated to the contact member.

The present invention includes a connector assembly comprising a dielectric housing fitted with a plurality of electrical contact members in accordance with the present invention received in
5 respective recesses of the housing.

One way of carrying out the present invention will now be described by way of example and not by way of limitation with reference to the accompanying drawings in which :-

10 FIG. 1 is an exploded perspective view of a circuitry arrangement including a connector assembly of the present invention employing electrical contact members of the present invention;

 FIG. 2 is a plan view of a terminal blank
15 from which a contact member shown in Fig. 1 may be formed;

 FIG. 3 is a front elevational view of the contact member in its fully formed state;

 FIG. 4 is a cross-sectional view of the
20 contact member taken generally along the line 4-4 of Fig. 3; and

 FIG. 5 is a cross-sectional view of the connector assembly taken generally along the line 5-5 of Fig. 1.

25 Referring now to the accompanying drawings, in Fig. 1 there is shown a circuitry arrangement of

the type suitable for use in electro-mechanical or electronic applications. The arrangement generally comprises a printed circuit board 12 on which a plurality of semi-conductor or other electronic devices (not shown) are mounted. For selective connection to the printed circuit board 12, the circuitry arrangement 10 further includes a wafer assembly, generally designated 14, and a connector assembly in accordance with the present invention generally designated 16, for terminating a plurality of insulated electrical conductors 18.

In order to provide for the mechanically stable coupling of the connector assembly 16 to the printed circuit board 12, the wafer assembly 14 includes a relatively rigid base member 20 through which a plurality of elongated conductive pin terminals 22 have been inserted. The printed circuit board 12 is adapted with apertures 24 for receiving the pin terminals 22 such that the pin terminals 22 may be electrically connected by soldering to a plurality of corresponding circuit paths 26 defined on the printed circuit board 12. The wafer assembly 14 is also adapted with latching arms 28 for latching with a cover member 21 (see Fig. 5) disposed at the other side of the connector assembly 16 for the purpose of holding the connector assembly 16 in fixed disposition

with respect to the printed circuit board 12.

The connector assembly 16 comprises a dielectric housing 30 fitted with a plurality of metallic contact members 32 received in respective recesses 34 of the housing 30 opening at apertures 35 communicating with the recesses along an opposite pair of top edges 33 of the housing permitting connection of insulated conductors 18 to the contact members 32. A plurality of apertures 36 communicate with the recesses 34 along a bottom edge 38 of the housing, permitting connection of the pin terminals 22 to the contact members 32.

Turning to Fig. 2, the contact member 32 is illustrated as it would appear in the form of a flat stamped blank, designated generally by the reference numeral 40. To facilitate the manufacture and handling of the contact 32, the blank 40 includes a continuous carrier 42 having indexing apertures 44 which may be used to advance the blank 40 in the stamping and forming process. The contact 32, which extends from the carrier 42 by a break-away tang 46, has a central body portion 48 with a pair of substantially identical plate portions 50 extending from each side thereof. Each plate portion 50 has a slot 52 with a chamfered opening 54 for receiving an insulated conductor 18 and establishing electrical

contact with the conductor 18 by severing and displacing the conductor's insulative coating. Each plate portion 50 is further adapted with a contact finger 56 cantilevered downwardly from a bottom edge thereof. The body portion 48 of the contact member 32 also has a pair of contact fingers 58 cantilevered outwardly in opposite directions so as to form a T-shape configuration at its bottom edge.

In Figs. 3 and 4, the contact member 32 is illustrated in its fully formed state, wherein the plate portions 50 have been bent at substantially 90 degrees to the body portion 48 and thus are positioned in parallel spaced apart relationship one to another. The contact fingers 56 are also formed inwardly of the plate portions 50 with a slight radius 60 in each of their ends. The contact fingers 58 are bent at substantially 90 degrees to the body portion 48 to lie beneath the contact fingers 56 and each finger 58 is formed with a crown 62. For retention of the contact member 32 in the housing 30, a locking lance 64 is struck outwardly of the body portion 48. An inwardly directed tang 66 is provided for strain relief of the insulated conductor 18 once the conductor 18 has been inserted into the slots 52. A stop 68 not shown in Fig. 2 is struck from the body member 48 and is bent inwardly to limit excessive

movement of the contact fingers 60 upon insertion of a pin terminal 22 into the contact member 32.

Turning now to Fig. 5, the contact member 22 is seen inserted in a recess 34 of the housing 30. An insulated conductor 18 having its longitudinal axis disposed substantially normally of the plate portions 50 is terminated to the contact member 32 by means of the insulation displacement slots 52.

The configuration of the contact fingers 56 and 58 defines, essentially, a receptacle, designated generally by the reference numeral 70, into which the pin terminal 22 is slidably receivable in parallel relation to the conductor 18. Multiple points of contact are established with the pin terminal 22 by the radiused portions 60 and crowns 62 of the contact fingers 56 and 58, respectively.

With reference particularly to Fig. 2, it can be appreciated that the instant contact 32 is manufacturable with very little waste of material because of the efficient orientation of the pairs of contact fingers 56 and 58 in the blank 40. Moreover, since relatively few steps are required to form the contact blank 40 into a completed member, the contact 32 may be highly miniaturized without the requirement of intricate and expensive tooling or fixtures. For example, a connector assembly according to the invention

can be readily formed to have a contact pitch or center spacing as small as two millimeters. It can be further appreciated from the cross-sectional view of Fig. 5 that close spacing of the conductor 18 and pin terminal 22 centerlines is likewise possible, facilitating a highly compact overall assembly.

The receptacle or female terminal portion 70 may alternatively be formed entirely from a lower extension of the body portion 48 by means of a progressive bending operation so as to have a generally triangular configuration in transverse section with outwardly flared ends to receive and guide the pin terminal 22. An elastic lance is sheared from the lower extension of the body portion and folded into the interior of the female portion to enhance flexibility and ensure a good biased contact. The female terminal portion as just described can be located very close to the insulation displacement part of the contact for optimum miniaturization, and may be supported fully within the respective cavity of its connector housing by means of the insulation displacement part ideally without any part of the female terminal portion in physical contact with any part of the connector housing.

CLAIMS:

1. A unitary electrical contact member (32) for terminating an insulated conductor, the contact member comprising a pair of plate portions (50) each with a slot (52) formed therein for severing and displacing the insulation of a conductor (18) disposed within the slot thereby to terminate the conductor to the contact member, the plate portions extending from a body member (48) formed integrally with the plate portions (50) characterized by a formation or formations (56, 58) extending from an edge of the body member (48) and being shaped to provide at least part of a female terminal portion (70) for biased contact with a generally elongated male terminal member (22) having its longitudinal axis orientated substantially parallel to the longitudinal axis of an insulated conductor (18) terminated to the contact member (32).

2. The electrical contact member of claim 1 wherein said female terminal portion includes a first finger (58) extending from an edge of the body member (48) and a second finger (56) depending from one of the plate portions (50), the first and second fingers (58, 56) being disposed in opposed, spaced apart relationship and co-operating to provide said biased contact with a generally elongated terminal member (22) having its longitudinal axis orientated substantially

parallel to the longitudinal axis of an insulated conductor (18) terminated to the contact member (32).

3. The electrical contact member of claim 2 wherein the second finger (56) is cantilevered in a
5 direction generally inwardly of the space between the plate portions (50).

4. The electrical contact member of claim 2 or 3 wherein the first finger (58) is adapted with a crown (62) for establishing a point of contact with a
10 generally elongated terminal member (22).

5. The electrical contact member of claim 2,3 or 4 wherein said female terminal portion (70) comprises a pair of said first fingers (58) cantilevered generally outwardly from one another and a pair of said second
15 fingers (56) depending one from each of the plate portions (50) and cantilevered generally toward one another, the pairs of first and second contact fingers (58, 56) co-operating to provide a receptacle (70) for establishing said biased contact with a generally
20 elongated pin terminal (22) having its longitudinal axis orientated substantially parallel to the longitudinal axis of an insulated conductor (18) terminated to the contact member (32).

6. A connector assembly comprising a dielectric
25 housing (30) fitted with a plurality of electrical contact members (32) as claimed in claim 1 received in

respective recesses (34) of the housing.

7. A connector assembly as claimed in claim 6
wherein the housing has a plurality of apertures (36)
communicating with the recesses along a bottom edge
5 (38) of the housing, permitting connection of pin
terminal (22) to the contact members and a plurality
of apertures (35) along a top edge (33) of the housing
permitting connection of conductors (18) to the
contact members (32).

10 8. A connector assembly as claimed in claim 7
or 8 wherein the pitch or center spacing of the
contact members (32) is about two millimeters.

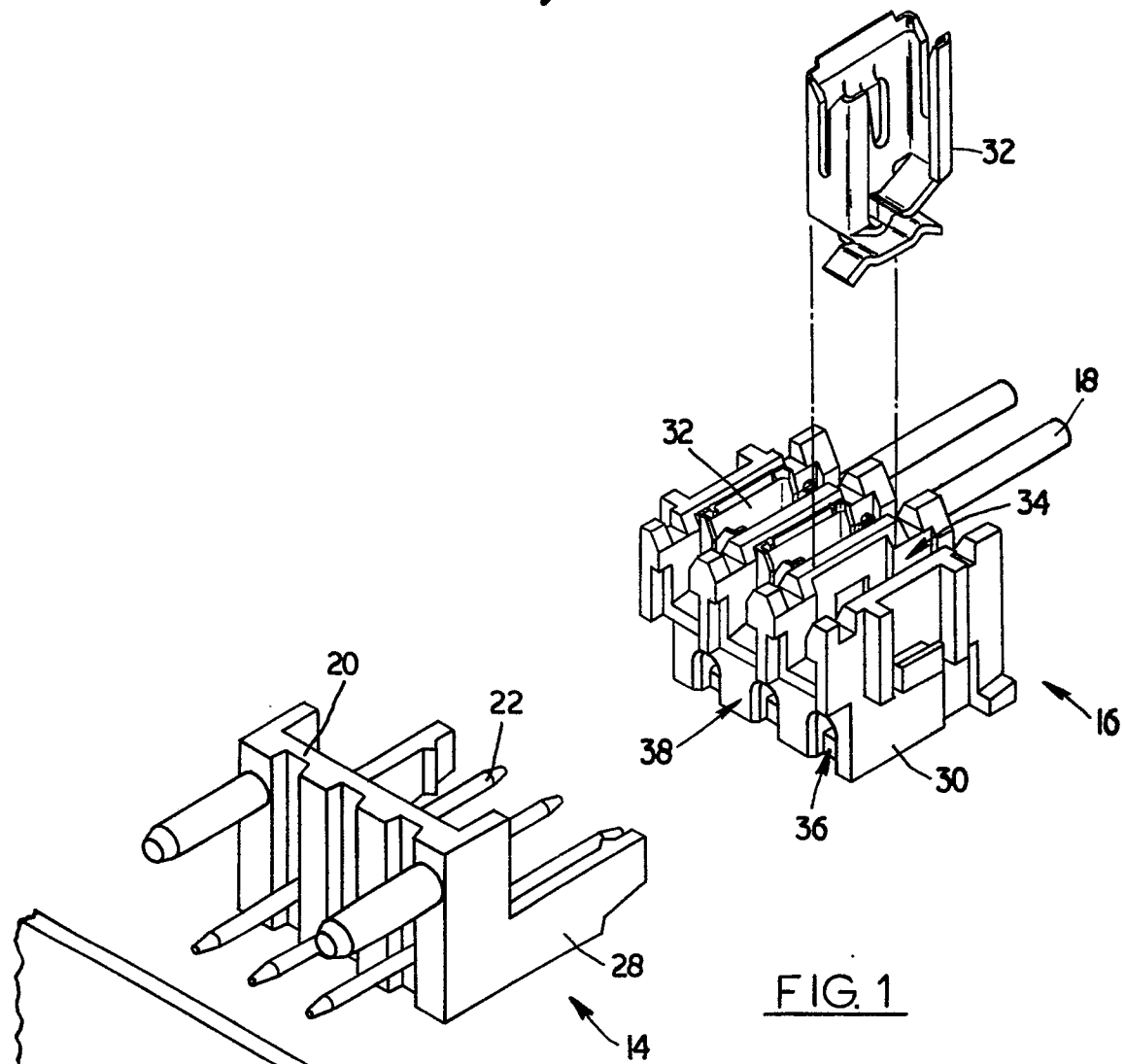


FIG. 1

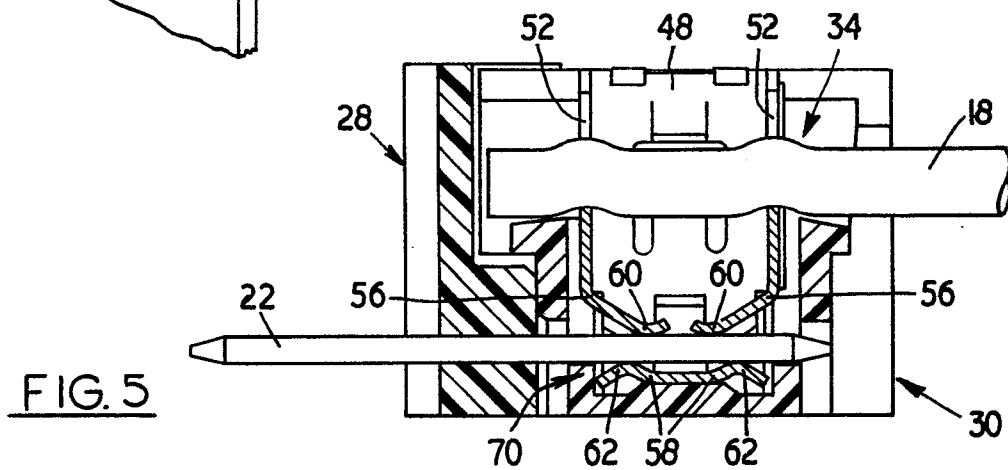
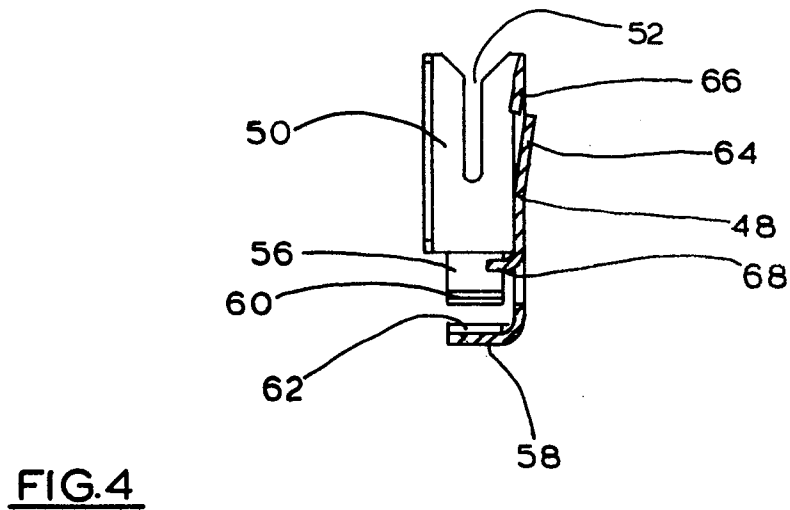
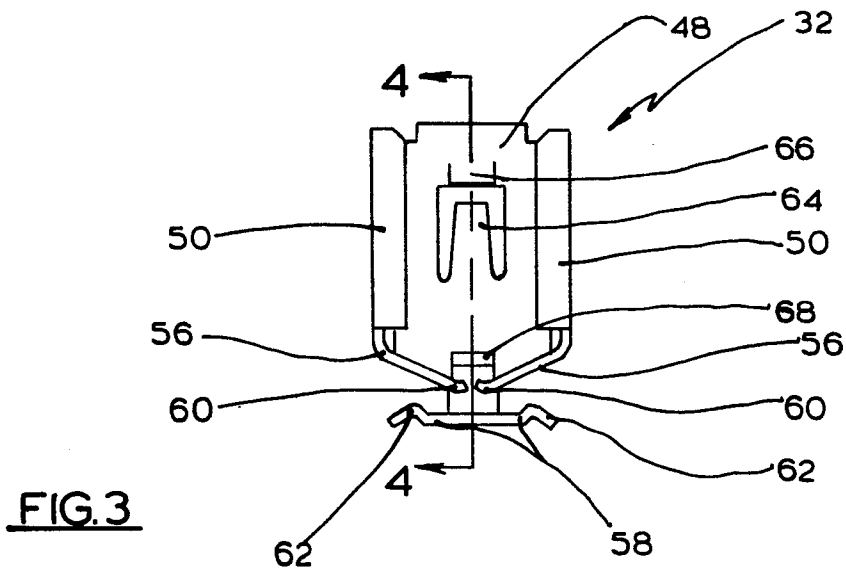
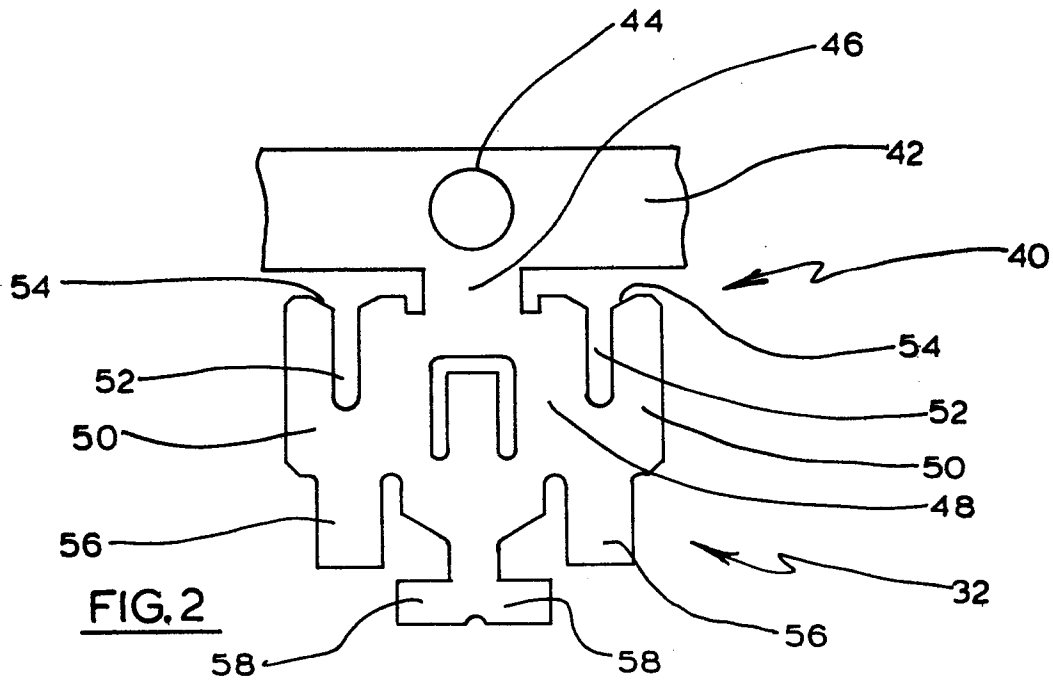
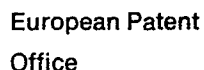


FIG. 5





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Application number

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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)
X	US-A-4 255 009 (AMP) * Figures 1,3,4; column 2, lines 45-63; column 3, line 65 - column 4, line 28 *	1,6,7	H 01 R 4/24
X	--- US-A-4 296 988 (AMP) * Figures 1-3; column 2, lines 4-68 *	1,6,7	
X	--- DE-A-2 621 502 (DU PONT) * Figures 1,5; page 4, lines 5-26; page 5, lines 22-25 *	1,6,7	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			H 01 R 4/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23-02-1984	Examiner WAERN G.M.
CATEGORY OF CITED DOCUMENTS		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	
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			