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(71) Applicant: **ALLIED CORPORATION**
**Columbia Road and Park Avenue P.O. Box 2245R (Law Dept.)**
**Morristown New Jersey 07960(US)**

(72) Inventor: **Herdeg, Peter C.**
**443 Ferdinand Avenue**
**Forest Park Illinois 60130(US)**

(72) Inventor: **Mathe, Istvan**
**1938 South 48th Court**
**Cicero Illinois 60650(US)**

(72) Inventor: **Pelczarski, Walter J.**
**801 Claremont**
**Downers Grove Illinois 60516(US)**

(74) Representative: **Wagner, Karl H.**
**P.O. Box 246 Gewürzmühlstrasse 5**
**D-8000 Munich 22(DE)**

(54) **Modular electrical connector.**

(57) A modular molded plastic electrical connector construction is disclosed allowing a family or series of connectors of the same general type but made up of different subsets of different connectors within the series to be economically produced. All of the different connectors in a given subset may have intermateable plug and receptacle type outer housings with either having male or female contacts supported within these housings with all connectors within a given subset have the same number of contacts. A molded plastic outer housing is produced for each outer housing type desired, i.e., a plug for male contacts, a plug for female contacts, a receptable for female contacts and a receptacle for male contacts. A single set of contact supporting modules is provided for the entire subset. Each module defines one of several different conductive termination configurations for connectors in the subset. Each module is mountable to one or more of the housings with the contact termination ends of the contacts supported by the module being accessible from outside the module and conforming to the termination configuration defined by the housing.

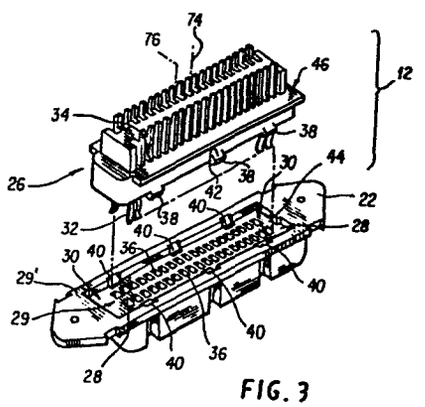


FIG. 3

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DESCRIPTION

# MODULAR ELECTRICAL CONNECTOR

## Background of the Invention

### FIELD OF THE INVENTION

This invention relates to electrical connector structures which are comprised of an assemblage of selected preexisting interfitting modules.

### DESCRIPTION OF THE PRIOR ACT

It is well known that certain types of all plastic molded connectors, and more particularly, all plastic telecommunications typeconnectors, have front or mating ends which are configured in accordance with international standards adopted by many countries throughout the world. Any standardized plug connector manufactured primarily for sale in one country can therefore mate with a standardized receptacle connector of the same type and size manufactured primarily for sale in any other country.

It is also well known, however, that very few countries have adopted international standards specifying the configuration of the rear or termination ends of such connectors. Although the front or mating end of a connector meets an international specification, one country may have a domestic standard calling for a rear or termination end having conductors for terminating within holes in a printed circuit board such that the mating face of the connector when mounted on the board is parallel to the board surface.

Another country may have a standard requiring a termination end be such the mating face is at right angles to a printed circuit board surface. Another country may have a domestic standard calling for the termination of the connector by the conductors of a multiconductor flat cable. Still another country may have a domestic standard specifying that each connector contact be individually terminated by the insulation displacement termination of solid or stranded wire, etc.

Thus a manufacturer in any one country wishing to serve the total world market for such connectors is faced with potentially high tooling costs because one cavity end of the production mold would have to conform to an international standard relating to the mating portion of the connector while the other end cavity of the mold would have to conform to the particular domestic standard specifying the termination portion of the connector adopted by the particular country or countries the manufacture desired to serve.

The problem is aggravated by the fact that, typically, the end cavity of a connector mold which configures the mating portion of a telecommunications connector is far more intricate and costly to make than the end cavity of the mold configuring the less intricate termination portion of the connector.

To alleviate this problem it has been heretofore recognized that a low cost way of meeting at least part of such worldwide market requirements is to provide a modular electrical connector construction which is made up of a molded plastic common housing which defines the mating portion of the connector and which includes a generally open-ended cavity. A plurality of molded plastic insert members are then provided in the form of a set of contact supporting modules each defining a different termination configuration for the connector. Each of the modules is formed so as to interchangeably nest in and substantially fill at least one end of the cavity in the common housing. Each of the contact supporting modules in a given set supports a plurality of contact elements having mating ends which conform to the mating portion of the housing and termination ends which conform to the particular termination portion of the connectors as defined by the specific contact supporting modules within the cavity of the housing.

Thus the higher cost of tooling typically required for molding the common housing portion of a connector meeting international mating standards can be offset to a large extent by mass producing such housings at one or a relatively few strategically located primary locations within one or more countries embraced by the international market area of interest. Such housings may then be shipped to any of a larger number of secondary locations in a greater number of countries embraced by the market area. At these secondary locations the lower cost contact supporting modules meeting specialized domestic standards of a secondary location country can be manufactured and assembled into the common housing for sale in that domestic market.

Such modular connector, its method of manufacture and tooling enabling its manufacture are disclosed and claimed in a copending patent application assigned to the same assignee as the present invention. As disclosed in that patent application a single common housing is provided along with a single set of different snap-in contact supporting modules each one defining a respectively different termination configuration for the housing and each supporting a plurality of contacts. Further, all of the contacts in any module of the set have identical mating ends. However, the termination ends of all of the contacts in each different module conform the particular termination configuration defined by that module. Additionally, the mating face of the common housing with a snap in contact in place is such that it will mate with a non-modular standard connector.

## SUMMARY OF THE INVENTION

The present invention takes advantage of certain features of the aforesaid modular connector structure in combination with certain improved structural features which enable complete subsets of different connector series to be produced in modular form. In each subset complementary plug and receptacle type connectors are mateable with each other as well as with complementary nonmodular standard connectors. The individual male and female contacts supported within selected modular plug and receptacle connectors are field serviceable or replaceable. The attendant increased product versatility which is thereby afforded allows a greater part of the international market to be served with higher cost savings.

In accordance with the present invention an entire series or family of connectors is categorized into subsets with the basic elements of each subset being intermateable plug and receptacle housings for a given connector size. Molded plastic inserts, carrying male or female contacts, are then provided in as many different conductor termination configurations as may be desired.

More specifically, in accordance with the present invention a modular electrical connector may be realized which constitutes one member of a subset of a pluraltiy of different subsets making up a family of intermateable modular electrical connectors. Each connector is distinctly different from any of the others in the subset and each carrying electrical contacts with each one of the connectors in the subset having an outer housing end of either receptacle or plug configuration. Any given member of the subset having an outer housing mating end or face of plug configuration is intermateable with any other given member of the subset having an outer housing mating face of receptacle configuration and vice versa. However, the conductor termination end of any given member of the subset is differently configured from the conductor termination end of any given member of the subset. The modular electrical connector so characterized comprises: an outer housing element corresponding to either a plug configuration or a receptacle configuration, each complementary to the other, said housing element having a mating face defining the front outer face of said modular connector, said mating face having an electrical contact access opening means therein for receiving electrical contacts carried by any other connector member of said subset having a complementary mating face;

contact restraining means supported within the housing and having a plurality of contact receiving openings extending generally between the mating face and the rearward portion of said housing, the rearward tranverse surface of said restraining means being displaced from the rear surface of the housing to form a generally open-ended cavity;

a molded plastic contact supporting module selected from a set of contact supporting modules, each module of the set supporting a plurality of electrical contact elements and defining a different termination configuration for said module electrical connector and being

nestable within said open-ended cavity in close juxtaposition to the rearward transverse surface of said restraining means with each contact thereof being positioned in a respective restraining means contact receiving opening and restrained from rearward motion by the rear tranverse surface of said restraining means when the module is nested in said cavity, and means for mounting said selected contact supporting module in said cavity.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a male connector with a receptacle housing in accordance with the present invention.

Figure 2 is a perspective view of a female connector with a plug housing in accordance with the present invention and adapted for mating with the male connector shown in Figure 1.

Figure 3 is an exploded perspective view of the female connector shown in Figure 2.

Figures 4A and Figure 4B are side views of typical solid conductor insulation displacement type contacts for use in the contact supporting modules of male and female connectors constructed in accordance with the present invention.

Figure 5 shows a planar cross-sectional view taken in the direction of arrows 5-5 of Figure 2 of the female connector shown in Figure 2.

Figure 6 is a planar cross-sectional view taken in the direction of arrows 6-6 of Figure 1 of the male connector shown in Figure 1.

Figure 7 is a cross-sectional view of a contact receiving cavity in either a male or female contact supporting module with an insulation displacement terminatable contact frictionally held therein.

Figure 8 is an exploded perspective view of a contact supporting module in accordance with the present invention for terminating and providing strain relief for a multiconductor flat cable.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in greater detail, and first to Figures 1 and 2, there is illustrated a male connector generally designated 10 and a female connector generally designated 12 which are intermateable with one another and each comprising one member of a subset of a plurality of different subsets making up a complete family or series of modular electrical connectors.

A subset of a connector series or family, as contemplated by the present invention, comprises a plurality of distinctly different connectors having certain common mating features. A connector within any given subset has a mating portion (or face) of either a plug or a receptacle configuration with either configuration being complementary to the other and therefore intermatable with the other. All connectors in any given subset also have the same number of contacts with complementary male and female mating ends, and with all contacts being positioned such that complementary male or female contacts held within complementary plug and receptacle connectors will mate upon the intermating of the connector. As will be seen any member of a given subset, in accordance with the present invention, can be provided with different conductor termination configurations for use with printed circut boards, flat cables, solid or stranded wire insulation displacement, etc.

In Figure 1, a male electrical connector 10 in accordance with this invention is comprised of a receptacle outer housing element 14 having front or mating face configuration 16 with an access opening 18 sized and shaped to received the outer housing element mating face configuration 20 of the female connector 12 shown in Figure 2. When the two connectors are mated the male contacts 17 adjacent the dielectric center wall 17' of male connector 10, are received into contact access opening 19 of female connector 12 to mate with female contacts 32 adjacent the peripheral dielectric wall 21 within the female connector 12.

Therefore, the connector 10 of Figure 1 may be characterized as a male connector with a receptacle housing and the connector 12 of Figure 2 a female connector with a plug housing. As will be better appreciated hereinafter, owing to the modular construction of connectors made in

accordance with the present invention, housings such as 14 and 22 in any given subset may, depending on type of contacts used in the connector and especially where pin and socket type contacts are used, be supplemented by and interchanged with reciprocally sized housing elements. Thus a receptacle housing with male pin contacts is replaceable by a plug housing having male contacts and plug housing with female contacts is replaceable by a receptacle housing having female contacts.

In accordance with the invention, the receptacle outer housing 14, its complementary plug housing element 22 and their reciprocal counterparts are adapted to receive one of a plurality of different molded plastic contact supporting modules, such as 24 and 26, within a cavity formed in the rear of each housing element. This can better be seen by referring to Figure 3.

In Figure 3, (see also Figure 5) the outer housing element 22 of female connector 12 is shown formed with a contact restraining means or web 28 having a transverse rear surface 29 displaced from the rear outer surface 29' of the housing element to form a generally open-ended cavity 30. The molded plastic contact supporting module 26 supporting contacts 32 within recesses 34 therein, (see also Figures 5 and 7) may then be nested in the cavity 30 with contacts 32 passing through contact receiving openings 36 in the contact restraining web 28.

Mounting means in the form of bosses 38 extending forwardly and to the sides of the supporting module 26 engage latch openings 40 so as to lock the module 26 to the housing 22.

The latching action is preferable accomplished by means of the upper surface of the hook portion 42 formed in each boss engaging the forward-most surface of the contact restraining web 28 or a rear surface of a ledge formed in latch openings 40 when the module is nested within the cavity 30.

Still referring to Figure 3, complementary keying means in the form of a transversely extending nib or projection 44 and a registering recess (not shown) in the right hand edge surface 46 of the module 26 ensures that the module 26 can be positioned in the cavity 30 in only one orientation relative to the housing 22. This preserves the integrity of

the contact numbering system used to assign indices to the various contact receiving recesses 34 for proper complementary matching with correspondingly numbered cavities in a mating connector.

As can be seen by reference to Figure 5 taken in combination with Figures 2 and 3, the ends of the contacts 32 when fully positioned into the housing 22 through the contact receiving openings 36 are guided into contact receiving channels 48 formed within the housing 22. These channels in turn help guide the contacts 32 into engagement with contact spring preloading elements 50 also formed within the forward end of the plug housing 22 as seen in Figure 5. The open end 52 of contact receiving channels 48 which form contact preloading means 50 are also depicted in Figure 2. The contacts 32, are formed to maintain a spring bias inwardly against elements 50 and toward each other to enhance electrical contact with complementary male contacts when the plug and receptacle housings are intermated. As will later be seen, the male connector 14 (Figures 1 and 6) have complementary bias means 50' with adjacent channels 48' having open ends 52'.

Referring again to Figure 5, the form of the female contact 32, as also shown in Figure 48, is of an insulation displacement type for use with solid or stranded insulation wire. The mating male and female contacts 32 and 58 (Figure 4) are of a form similar to that shown in U.S.Patent 3,867,005 entitled "Insulation - Piercing Contact Member and Electrical Connector" and assigned to the assignee of the present invention. The mating portions 32' and 58' of these contacts, however, are configured differently from those shown in U.S. Patent 3,867,005 so as to permit assembly of the contacts through the contact receiving openings such as 36 in the contact restraining webs of the housing members 14 and 22 to ultimately engage the contact preloading means 50 and 50' in the plug and receptacle housings. The insulation displacement termination portion 32" and 58" of contacts 32 and 58 are, however, substantially the same as that shown in the aforereferenced patent and includes two pairs of detents such as 56 in contact 32 extending from opposite sidewalls of a U-shaped channel in the contact (see Figure 7), with the space between the detents comprising a notch 56' which will displace the insulation on solid or stranded wire when forced therein to effect an electrical termination of the contact to the conductor of the wire.

As seen in Figure 4A the male contact for use in male connector 10 shown in Figure 1 is reciprocal in form to the female contact 32 shown in Figure 4B, that is to say the mating surface 58' of contact 58 is on the same side of the flat blade as the insulation displacement terminating portion 58" while for the female contact 32 the insulation displacement termination portion 32" is on the opposite of the female contact surface 32'.

In accordance with the present invention each of the contact members shown in Figure 4 are provided with raised portions 60 in the form of dimples or the like. As shown in Figure 7, it is the function of these raised portions 60 in combination with the inner side-walls of the forwardmost portion of cavities 34 within the contacts supporting module 26 to provide means for frictionally maintaining contacts within a contact supporting module prior to the nesting of the module into a housing. In this way molded plastic contact supporting modules in accordance with the present invention can be assembled and put into inventory for later selection and insertion into selected outer housing elements such as 22 shown in Figure 3 without the contacts inadvertently becoming displaced from the module during handling.

Another feature of advantage provided by the present invention can best be understood by referring to Figure 5 taken in combination with Figure 6. Figure 6 illustrates a cross-sectional view of the male modular connector shown in Figure 1 taken on a plane defined by line 6-6 looking in the direction of the arrows, and made up of receptacle outer housing element 14 with a male molded plastic contact supporting module 24 nested within a cavity 62 in the rearward portion of the outer housing element 14. The male contacts 58 supported by module 24 extend through openings 64 in a contact restraining web 68 in a manner comparable to the female connector shown in Figures 2, 3 and 5. However, because of the modular construction of the present invention, which in the embodiment shown permits the use of the same contact supporting module for both plug and receptacle housings (the plug supporting female contacts while the receptacle male contacts) the walls 70 and 72 (in Figures 5 and 6), which separates laterally disposed pairs of female and male contacts, are of the same thickness. This simplifies the insulation displacement termination of individual wires or conductors within contacts in connectors made in

accordance with the present invention inasmuch as the termination tool does not have to be adjusted otherwise compensate for any differences in the thicknesses of theseparating walls 70 and 72 as in prior art connectors. Reference is made to U.S. Patent 3,698,555 entitled "Electrically Operated Programmable insertion Tool With Conductor Guide and Movable Spring Relief Insertion Mechanism" illustrating a differential wall thickness compensation mechanism used in a prior art termination tool. The need for such mechanisms is no longer necessary in termination tools for terminating modular connectors construed in accordance with the present invention.

It will be readily appreciated by reference to Figures 4, 5 and 6, that the termination portions such as 32" and 52" of contacts 32 and 58 may be readily modified to conform to any one or more of a variety of different conductor termination techniques without changing the configuration of the mating portions 32' and 58' of such contacts. This is illustrated by dotted lines 74 and 76 in Figures 3 through 6 inclusive. Dotted line 74 indicates that the insulation displacement portion of the contact termination end may be eliminated and substituted by a straight line extension of the material from which the contacts are made to provide direct printed circuit board mounting on the modular connectors. Similiarly, dotted line 76 illustrates a solid conductor with a right angle bend which may be used in connection with a right angle printed circuit board mounting assembly. Such extensions may also be formed so as to have a rectangular cross-section to permit wrap termination of wire conductors to the contacts and module.

Figure 8, however, illustrates a preferred form of the present invention wherein the contact supporting module termination face is adapted for terminating and providing strain relief to a flat multiconductor cable. As shown in Figure 8, the termination end of each contact 77 held by the molded plastic contact support module 78 is formed to provide a typical insulation displacement type flat cable conductor connection "V" or notch 81. To aid in more clearly illustrating the features of the present invention, only two conductors of a flat multiconductor cable have been indicated at 83. The module 78 may be of either male or female contact configuration for nesting within either a receptacle or plug outer housing element such as 14 or 22 as described

hereinbefore. The flat cable insulation displacement termination ends 81 are formed on the conductor termination portion of contacts such as 32 and 58 respectively in lieu of a singlesolid wire or stranded wire insulation displacement portion as illustrated in Figure 4 at 56.

In accordance with the present invention the plastic insert module 78 is provided with two upright pressure plate and cable strain relief support locking members 82. Cable pressure plate 86 in turn is provided with two downwardly extending latch member 88 carrying latch hooks 91. After the cable has been put into place upon the top surface of the module 78 the pressure plate 86 is forced down over the cable with the latch hooks 91 engaging the lowermost surface 94 of each locking member 82 or the module 78. The pressure plate 86 is preferably made of a material which has sufficient elasticity such that the latch members 88 are forced away from one another out over bosses 96 on the end surfaces of locking members 82 to permit the latch hooks 91 to engage the lower surfaces 94 of the locking members or module.

After the pressure plate 86 has been installed the cable may then be brought up and carried back over the upper surface of the pressure plate (as shown) and the strain relief clamp 100 thereafter snugly fitted against the cable and retained by the engagement of apertures 102 with the bosses 96. Strain relief clamp 100 is preferably made of a spring metal material. As will be readily appreciated, by providing the insert module with such locking members there is no need, in accordance with the present invention, to provide a special housing member having equivalent locking means when terminating flat cable.

It will be understood that the invention described hereinabove may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments therefore are to be considered in all respects as illustrational and not restrictive and the invention is not to be limited to the details given herein, but only in accordance with the appended claims when read in the light of the foregoing specification.

WHAT IS CLAIMED IS:

Claim 1 - A modular electrical connector which constitutes one member of a subset of a plurality of different subsets making up a family of modular electrical connectors, the subset including complementary intermateable plug and receptacle connectors with all connectors in the subset being distinctly different from one another and carrying either male or female electrical contacts, intermateable with one another, each one of the connectors in the subset having an outer housing face of either receptable or plug configuration and a conductor termination face, with any given member of said subset having an outer housing mating face of plug configuration being intermateable with another given member of said subset having outer housing mating face of receptacle configuration and vice versa and with any given member of the subset having a conductor termination face which may be selectively configured in accordance with one of a plurality of a plurality of different specified configurations;

said modular electrical connector comprising:

an outer housing element corresponding to either a plug configuration or a receptacle configuration, each complementary to the other, said housing element having a mating face defining the outer mating face of said modular connector;

said mating face having electrical contact access opening means therein for receiving electrical contacts carried by any other connector member of said subset having a complementary mating face and a complementary dielectric contact support means;

contact restraining means supported within said housing and having a plurality of contact receiving openings extending generally between the mating face and the rearward portion of said housing, the rear transverse surface of said restraining means being displaced from the rear surface of the housing to form a generally open ended cavity;

a molded plastic contact-supporting module selected from a set of contact supporting modules, each module of the set supporting a plurality of electrical contact elements and defining a different one of a plurality of different specified termination configurations for said modular electrical connector and being nestable within said open ended cavity in close juxtaposition to the rearward transverse surface of said restraining means with each contact thereof being positioned in a respective contact receiving opening therein and restrained from forward motion by the rear transverse surface of said restraining means when said module is nested in said cavity;

and means for mounting said selected contact supporting module in said cavity to form a modular electrical connector having a termination configuration corresponding to said selected module.

Claim 2 - A connector according to claim 1 wherein the inner forward inner portion of said housing has recess means for guiding and positioning said contacts during the final assembly phase of said contact supporting module to said housing.

Claim 3 - A connector according to claim 1 wherein the electrical contact elements supported by said module are made of an elastic material and are held within recesses in said outer housing module by spring action betweeen portions of each contact and the walls of said recesses.

Claim 4 - A connector according to claim 2 wherein said electrical contact elements are formed of relatively thin spring metal with each contact having a mating end shaped in the form of a substantially flat blade and a conductor termination end, said contact supporting module holding said termination end such that said mating ending may be displaced against the elastic properties the spring metal, and wherein said housing recess means pre-loads the mating ends of each contact when said contact supporting module is assembled to said housing.

Claim 5 - A connector according to claim 1 wherein said mounting means for mounting said module within said housing cavity comprises a pluraltiy of bosses extending from the forward surface of each module and complementary recesses within said housing into which said bosses snap-fit.

Claim 6 - A connector according to claim 1 wherein said housing element and said contact supporting modules having complementary interfitting keying means to allow a module to be nested within said open ended cavity only when a module and housing member are positioned relative to one another in a predetermined orientation.

Claim 7 - A connector according to claim 1 wherein the termination ends of the contacts supported by said module are configured and positioned for insulation displacement termination with the conductors of a flat multiconductor cable and wherein means are carried by said module for releasably holding the lower surface of a cable pressure plate against the cable and said contact termination ends after a cable has been terminated thereto.

Claim 8 - A connector according to claim 1 wherein each of said contacts has an insulation displacement conductor termination end configured for the terminating an individual solid or stranded wire conductor and wherein a first and a second ones of said contact supporting modules are configured to support male and female contacts respectively, with the contacts positioned by either module falling in one of two rows spaced apart by a dielectric wall of substantially the same thickness whereby termination tooling may terminate the contacts of either module without requiring compensation for differences in contact separation.

Claim 9 - A modular electrical connector which constitutes one member of a subset of a plurality of different subsets making up a family of modular electrical connectors, the subset including complementary intermateable plug and receptacle connectors with all connectors in the subset being distinctly different from one another and carrying either male or female electrical contacts, intermateable with one another, each one of the connectors in the subset having an outer housing face of either receptable or plug configuration and a conductor termination face, with any given member of said subset having an outer housing mating face of plug configuration being intermateable with another given member of said subset having outer housing mating face of receptacle configuration and

vice versa and with any given member of the subset having a conductor termination face which may be selectively configured in accordance with one of a plurality of a plurality of different specified configurations;

said modular electrical connector comprising:

an outer housing element corresponding to either a plug configuration or a receptacle configuration, each complementary to the other, said housing element having a mating face defining the outer mating face of said modular connector;

said mating face having electrical contact access opening means therein for receiving electrical contacts carried by any other connector member of said subset having a complementary mating face and a complementary dielectric contact support means;

contact receiving openings within said housing extending generally between the mating face and the rearward postion of said housing to receive electrical contact for positioning within said housing;

a molded plastic contact - supporting module selected from a set of contact supporting modules, each module of the set defining a different one of a plurality of different specified termination configurations for said modular electrical connector;

a plurality of electrical contacts supported by each module and positioned so as to be receivable within the contact receiving openings of said housing.

means for detachably mounting said module to said housing with the contacts supported by said module being received within the contact receiving openings of said housing;

and means within said housing for restraining motion of said contacts in a direction opposite to the mating direction of said connector.

Claim 10 - A subset of a family of modular electrical connectors of the same general type made up of a plurality of different subsets of respectively different connectors, said subset comprising;

a set of outer housing members including at least one or more pairs of such members having intermateable plug and receptacle mating faces;

a set of different contact supporting modules complementary to at least one housing member each supporting the same number of electrical contacts of either male or female type with the contacts of any given module having identical conductor termination end configurations which are different from the conductor termination end configurations of contacts supported by any other module in the set;

and means affixing any module to a complementary housing member to fabricate said subset of connectors.

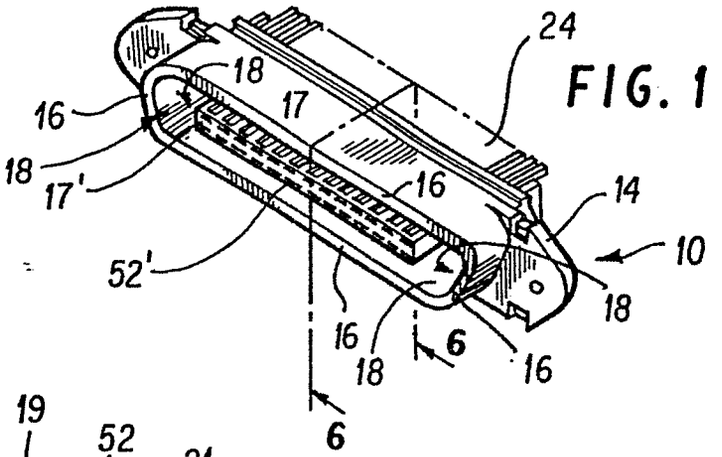


FIG. 1

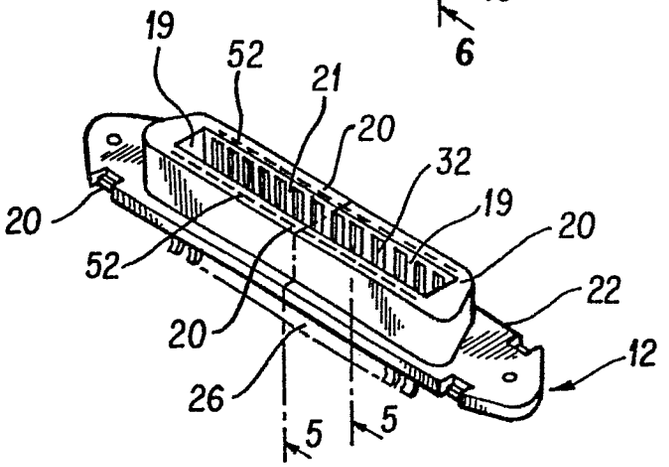


FIG. 2

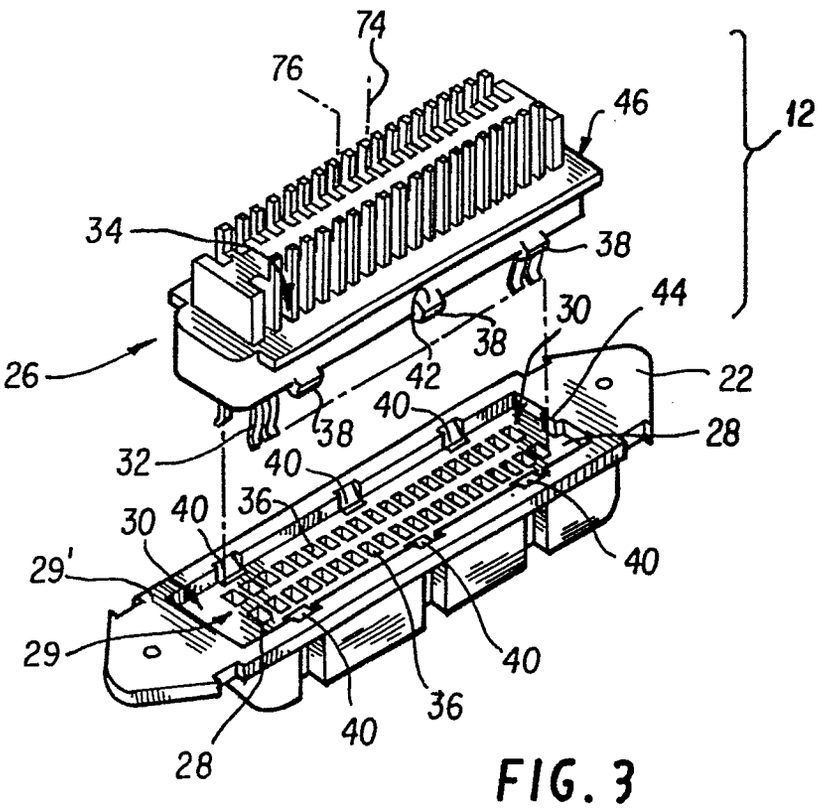


FIG. 3

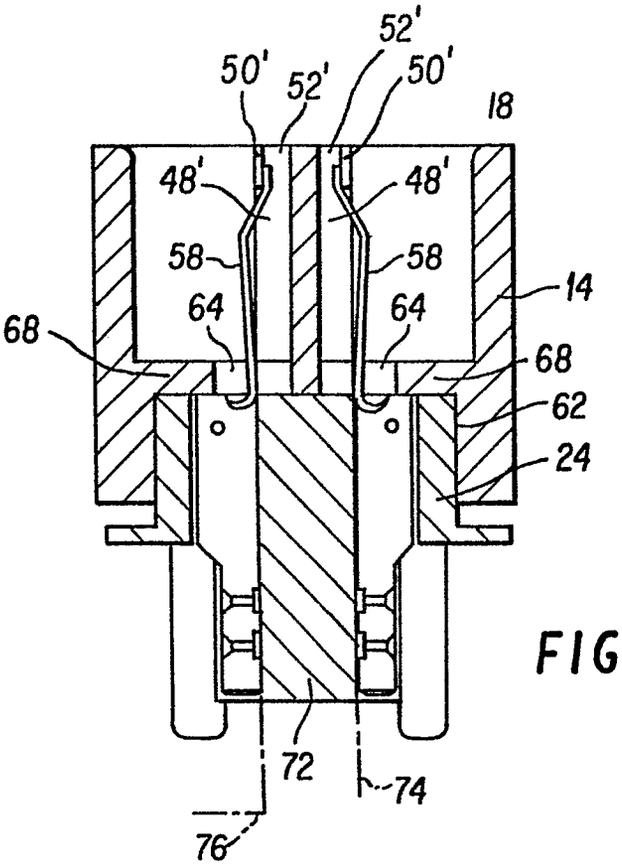


FIG. 6

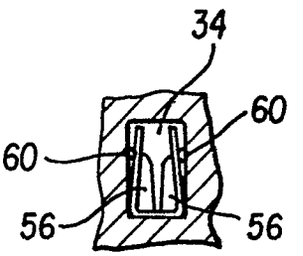


FIG. 7

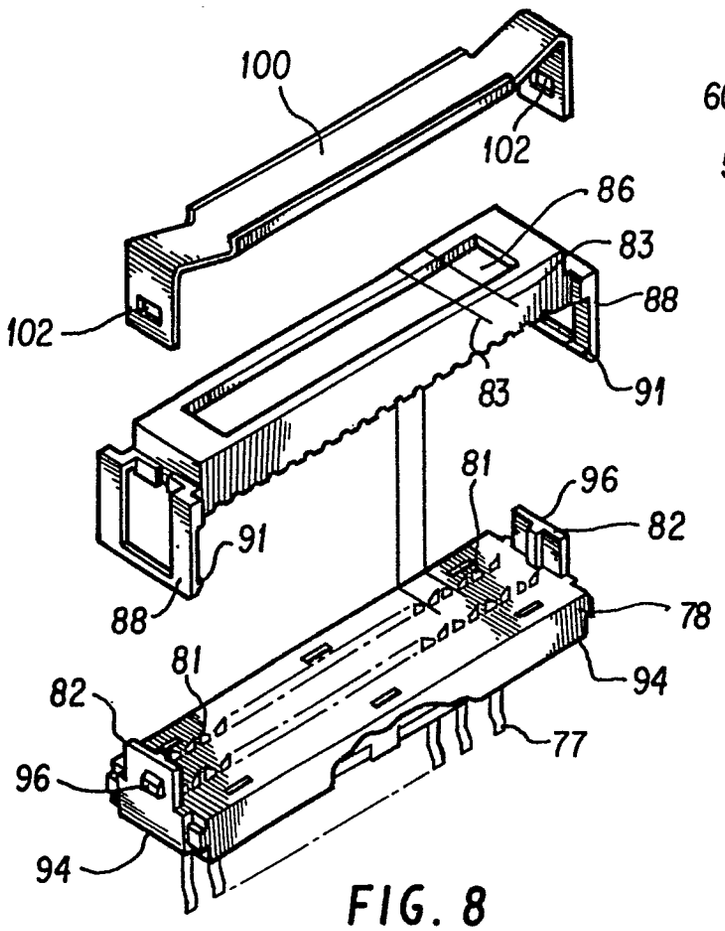


FIG. 8

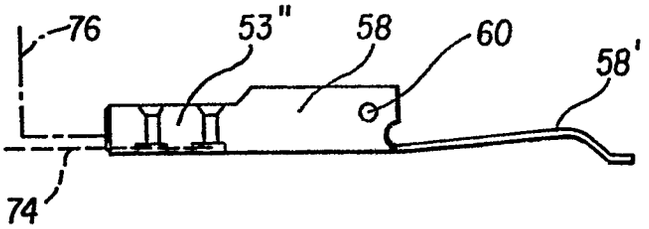


FIG. 4a

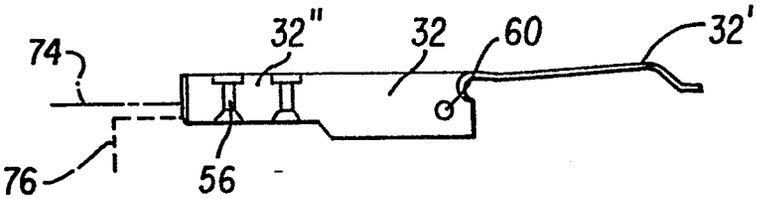


FIG. 4b

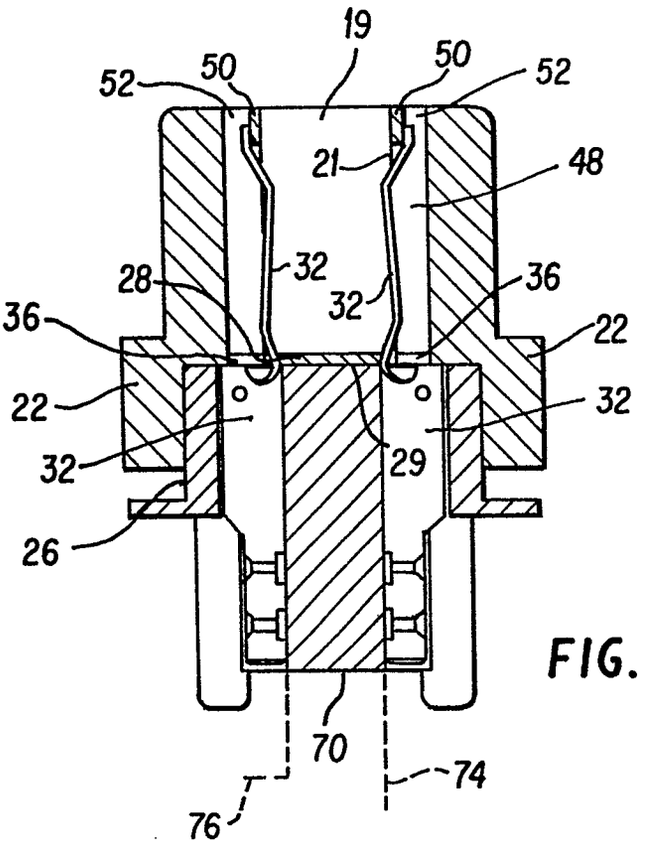


FIG. 5

0104482

European Patent Office

Application number

EP 83 10 8564

# EUROPEAN SEARCH REPORT

## 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 | DE-A-2 230 248 (PANDUIT)<br>* Figures 1,2; page 3, lines 7-32 * | 1,3-5, 9 | H 01 R 13/516 |
| A | US-A-3 824 530 (AMP)<br>* Figures 1,3; column 3, lines 19-27, 53-56 * | 7 | |
| A | FR-A-2 239 777 (ITT)<br>* Figures 1,2; page 3, lines 1-39 * | 1-3,5, 9 | |
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 15-12-1983 | WAERN G.M. |

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