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(54) Connector pin and socket saver.

(57) A connector is designed with sockets in both mating housing parts (82,102) which define a cavity (86,106) and accept an intermediate dielectric disc 130 containing conductive pins (132) which protrude from both sides. The pins can be short and stiff enhancing their resistance to bending. The disc can be mounted in one member (82) of the connector and is secured by a device such as a threaded fastener (134) or a snap ring. In the event the pins (132) become damaged, the disc (130) is removed and replaced with another. The disc is, by comparison to a new connector, much easier to replace and less costly. Since both housing members (82,102) of the connector (80) contain sockets (90,110) they are relatively immune to damage. This is because the sockets are usually completely constrained by an insulator body (88,108), and are, therefore, protected from physical damage.

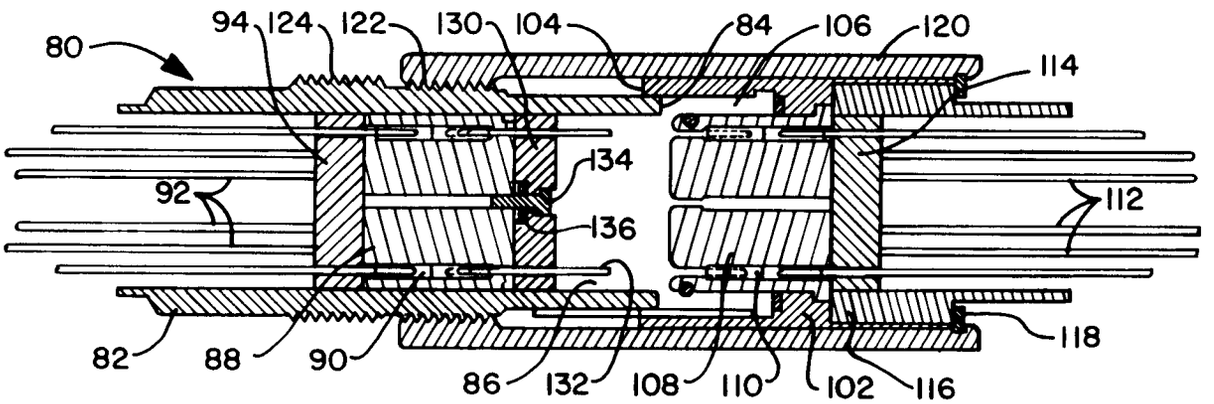

Fig. 3

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BACKGROUND OF THE INVENTION

Conventional electrical connectors use pins and sockets housed in connector shells. It is desirable to provide connectors with the number of pins maximized and shell size minimized.

In some applications it is necessary to use connectors which have the pins hermetically sealed to the shell by means of a glass fired seal. These glass seals are state of the art and are used routinely by connector manufacturers. Each pin is usually sealed to the shell by an individual glass bead. As the shell is fired, the glass melts. As it cools, it forms a bond with the shell and the pin. In order to maximize the pins for a given size at least one manufacturer (Electronic Resources Division of Whittaker) has developed a new glass seal technology in which all the pins of a connector are simultaneously fired into a single large glass bead. By carefully controlling the shell thickness and firing cycle, a good airtight and structurally sound connection is developed between the OD of the glass and the ID of the shell, as well as around the pins. The advantage of the single bead is that the spacing between pins can be reduced to a smaller value than can be obtained with the individual glass beads. The objective of miniaturizing the connector is thus satisfied.

As connectors become smaller, so do the problems with pin and socket reliability, i.e., it becomes easier to bend or distort the pins when handling the connectors or when mating or demating the connectors. Also, it is not often possible to easily replace a connector with damaged pins. This is especially true, (a) if the number of circuits passing through the connector is large, and (b) if the shell is hermetically sealed to the interfacing instrument or cable. In these cases, damaged connector pins can result in significant down time and repair costs.

Accordingly, a method for facilitating connector repair by means of a unique design feature has been developed.

SUMMARY OF THE INVENTION

The bending or breaking of connector pins can lead to costly repairs. This can be avoided if the connector is designed with sockets in both mating housing members which accept an intermediate disc shaped piece containing pins which protrude from both sides. The pins can be short and stiff, enhancing their resistance to bending. The disc can be mounted in one half of the connector and secured by a removable fastening device such as a threaded fastener or a snap ring. In the event the pins become damaged, the disc is removed and replaced with another. The disc is, by comparison to a new connector, much easier to replace and less costly. Since both mating housing parts of the connector contain sockets, they are relatively immune to damage. This is so because the sockets are usually completely constrained by an insulator, and are, therefore, protected from physical damage.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side elevational view partially broken away of a plug or male portion of a prior art electrical pin and socket type of connector;

Fig. 1a is an end elevation of the mating end of the prior art plug of Fig. 1;

Fig. 2 is a side elevation view partially broken away of a socket or female portion of the prior art electrical pin and socket connector of Figs. 1 and 1a;

Fig. 2a is an end elevation of the mating end of the prior art socket of Fig. 2.

Fig. 3 is a schematic cross-sectional side elevational view of the electrical connector of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The numeral 10 generally designates the prior art electrical connector plug of Figs. 1 and 1a. The plug 10 includes a substantially cylindrical hollow housing member or shell 12 having an open end 14. The end 14 is adjacent to an outwardly opened cavity portion 16 which includes an inwardly directed shoulder 18 and is defined by an end of housing member 12.

At the opposite end of the housing member 12 is a hollow backshell portion 20 which is a portion mounted within, and fastened to, the shell 12. A multi-conductor cable 22 extends through the backshell 20 such that its individual conductors may be connected to individual conductive pins 30 mounted by means of a fused dielectric material such as glass, in the shell 12. The pins 30 are held in place by a dielectric glass seal and support disc 32 suitably secured in the hollow shell 12. Conductive pins 30 extend outwardly in a backward direction for connection to the individual cable conductor strands and forwardly into cavity portion 16 for mating with a socket. An O-ring seal 34 is provided for the prevention of moisture or dirt from interfering with the electrical connection.

The numeral 40 generally designates the prior art electrical connector socket of Figs 2 and 2a. The socket 40 includes a substantially cylindrical hollow housing member or shell 42 having an open end 44. The end 44 is adjacent to an outwardly opened cavity portion 46 which includes an annular

body 48 having a plurality of conductively lined socket holes 50 corresponding in pattern and shape to the pattern and shape of pins 30 of plug 10.

The body 48 has adjacent thereto and within cavity 46, a second body 52 which also has passageways which are extensions 54 of socket holes 50. Conductive pins 56 are mounted in a dielectric glass seal 58 of disc shape mounted behind bodies 48 and 52 in cavity portion 46 such that they are in conductive relation to the conductively lined passageways of socket holes 50 and extensions 54 thereof. At the opposite end of the pins 56 are connections to a cable 60, within a backshell 62.

When the plug 10's pins 30 are inserted into the conductive holes 60 of socket 40 with the housing members or shells 12 and 42 mated, the prior art electrical connection is made. A coupling nut 70 retained on the shell 42 by means of a retaining ring 72, moves axially forward by means of its threads 74 being fastened to threads 76 and shell 12. Nut 70 is turned by means of spanner wrench holes 78. This firmly fastens the prior art plug 10 to the socket 40.

The use of these prior art pin and socket type of electrical connectors has presented problems because their construction has made the repair or replacement of bent or broken conductive pins 30 very difficult. In Fig. 3, the inventive solution to this problem is illustrated.

The number 80 generally designates the electrical connector of the invention in its essential parts. The plug housing member or shell 82 is a cylindrical housing member having an open end 84 and an outwardly opened end cavity portion 86 which has a body 88 mounted therein. The body 88 has a plurality of conductively lined socket holes 90 therein.

Conductive pins 92 are mounted and sealed in a disc 94 of glass or other dielectric material such that one end extends away from cavity portion 86 for connection to the individual conductive strands of a cable and the opposite end extends into conductive socket holes 90.

The electrical connector 80 has a socket housing member 102 which has an open end 104 and an open end cavity portion 106. The cavity portion has an annular body 108 mounted therein. The body 108 has a plurality of conductively lined socket holes 110 therein.

Conductive pins 112 are mounted and sealed in a disc 114 of glass or other dielectric material such that one end extends away from cavity portion 106 for connection to the individual conductive strands of a cable and the opposite end extends into conductive socket holes 110. An intermediate shell or housing portion 116 is mounted in shell portion 102 and held by retainer ring 118. A coupling nut 120 with threaded portion 122 coacts with threaded portion 124 on shell 82 to mate the plug and the socket housing portions and, by means of cavity portion 86 of shell 82 and cavity portion 106 of shell 102, defines a cavity within the housing.

An intermediate body member 130 of dielectric material such as glass or an elastomeric, is provided such that it is mountable in the housing cavity formed by cavity portions 86 and 106 of the mated plug and socket members. The body 130 has conductive pins 132 projecting from opposite sides thereof into the pin receiving sockets 90 and 110, respectively, of the mating housing members. The dimension of the cavity portion 86 is such that when the shells 82 and 102 are disassembled, the body 130 stays with the body 82 to thus define the "plug" member of the connector.

As shown in Fig. 3, a threaded fastener 134 retains the body 130 against the body 88. If any of the pins 132 are damaged, the intermediate body 130 may be removed from the cavity portion 86 and a new intermediate body member with new pins 132 may be mounted in the cavity to effect repair of the connector. A disc 136 fixedly mounted in body 130 permits the fastener 132 to rotate relative to it but not to move axially with respect to it. Accordingly, unthreading the fastener 134 from the body 88 will facilitate removal of the body 130 from the cavity portion 86 adjacent body 88.

The illustrated embodiment is the best mode contemplated by the inventor at this time but clearly other electrical connector structures which utilize an intermediate body 130 with conductive pins 132 therein for easy replacement of bent or broken pins are contemplated, thus permitting the provision of several sizes and styles of bodies 130 with pins 132.

Claims

1. An electrical pin and socket type of connector having a housing which includes a cavity defined by a pair of mating housing members, each of which housing member contains pin-receiving sockets, an intermediate member mounted within said cavity, said intermediate member including a body of dielectric material with conductive pins projecting from opposite sides thereof into the pin receiving sockets of said mating housing members, whereby if any of said pins are damaged said intermediate member may be removed from said cavity and a new intermediate member with pins may be mounted in said cavity to effect a repair of the connector.

2. The connector of claim 1 in which the mating housing members have detachable means fastening them together.

3. A replaceable intermediate member for mounting in a cavity portion of a mating housing member of an electrical connector,

said member including a dielectric body with conductive pins extending through and in opposite directions from said dielectric body, said body including means for releasably fastening said body to the mating housing member.

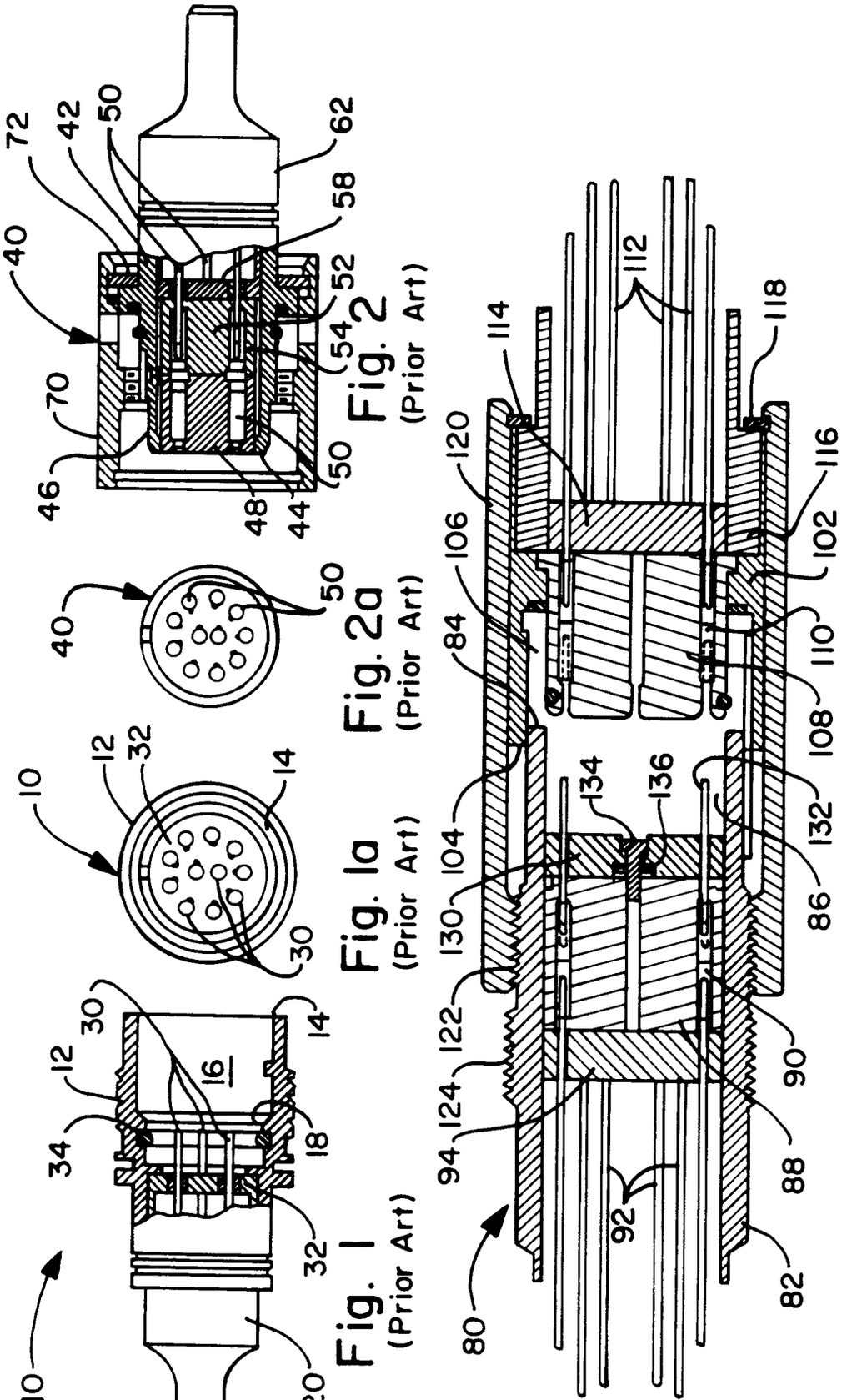

Fig. 1 (Prior Art)

Fig. 1a (Prior Art)

Fig. 2a (Prior Art)

Fig. 2 (Prior Art)

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number

EP 91 11 0988

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.5)
X	EP-A-0 128 472 (LITTON SYSTEMS) * page 2, lines 1-32; page 3, line 23 - page 5, line 1; figures 1,2 *	1-3	H 01 R 13/52 H 01 R 31/06
A	ENGINEERING MATERIALS & DESIGN no. 12, December 1988, pages 18,19, Sutton, Surrey, GB; T. WEARDON: Hermetically sealed connectors for tomorrow's industries" * page 18, left-hand column, last paragraph - middle column, paragraph 1; figures 1-5 *	1,3	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H 01 R 9/00
H 01 R 13/00
H 01 R 31/00
H 01 R 33/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	17-02-1992	ALEXATOS G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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