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3,456,232

SELF-SEALING CONNECTOR

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Fig. 1.

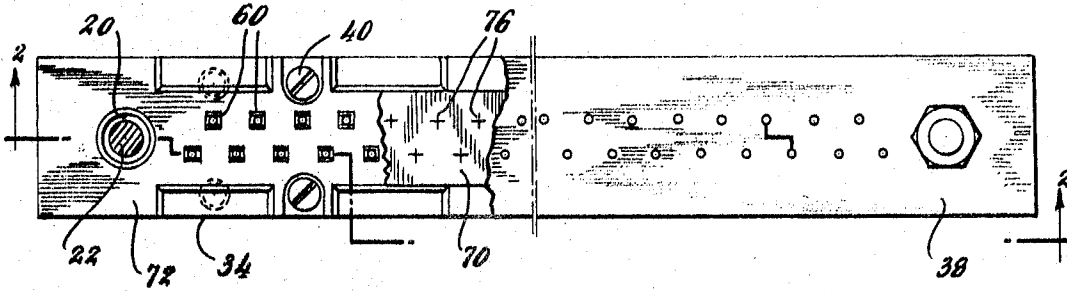


Fig. 2.

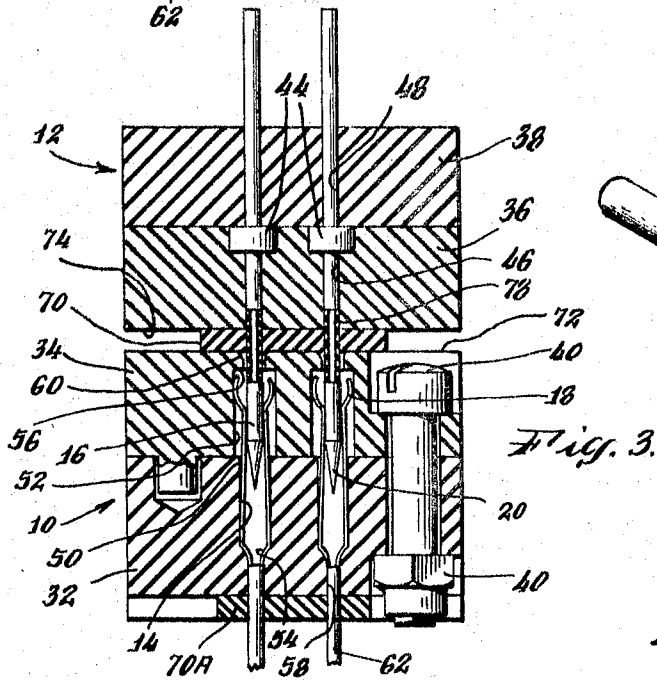
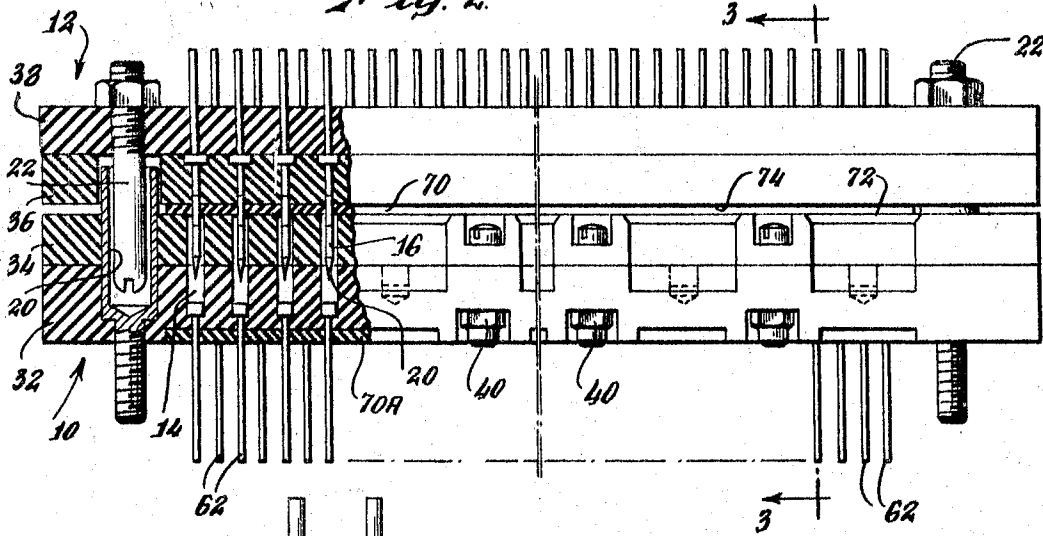
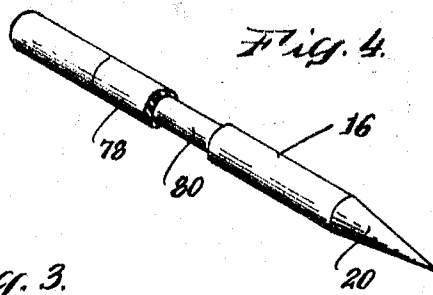


Fig. 4.



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SELF-SEALING CONNECTOR

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2 Claims

ABSTRACT OF THE DISCLOSURE

A separable electrical connector having rupturable gasket at interface between the two connector halves. Weakened sections of gasket formed in alignment with mating contact elements permit multiple contacts to pass through with ease, maintaining moisture-proof seal before and after mating. Contacts are insulated at pass-through to inhibit leakage through gasket.

This invention relates to separable electrical connectors in general, and more specifically to separable connectors which provide for sealing against moisture penetration.

Separable electrical connectors are currently being used in various applications in which it is necessary to establish connections through a barrier wall having a sealed, controlled environment on one side and an undesirably moist atmosphere on the other. In such applications it is desirable and often necessary to prevent the electrical connector from operating as a means for transmitting moisture from one environment to the other. Accordingly, it is an object of this invention to provide a separable electrical connector which is sealed against moisture penetration whether the halves thereof are separated or joined together.

Another object of this invention is to provide a self-sealing plug and receptacle connector which can be easily connected and separated without loss of the self-sealing function.

Still another object is to provide a plug connector and self-sealing means which are readily adaptable for use with a conventional socket connector.

Other objects are to provide a self-sealing separable connector which is inexpensive to manufacture and install, which is simple to use, and which avoids the need for a plurality of complex sealing parts.

These and other objects, features, and advantages of this invention will be made more apparent by reference to the following specification, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a partially cut-away front-face plan view of socket connector-half constructed in accordance with this invention;

FIG. 2 is a partially cut-away side elevation view of the connector-half of FIG. 1 shown with a mating connector-half coupled thereto; FIG. 2 being taken along the section line 2—2 of FIG. 1;

FIG. 3 is a transverse section view of the mated connectors of FIG. 2 taken in plane 3—3 of FIG. 2; and,

FIG. 4 is a partial pictorial representation of a contact element constructed in accordance with this invention, showing a partially cut-away detail thereof.

Referring now to the drawings in more detail, it may be seen that the assembled connector shown in FIG. 2 comprises a socket connector-half 10, and a receptacle connector-half 12. Socket connector-half 10 may be seen to include a plurality of socket contacts 14, while plug connector-half 12 may be seen to include a plurality of plug contact elements 16. The connector-halves are designed to be mated in opposed relationship so that the resilient arms 18 of socket contacts 14 receive and engage the

pointed projecting ends 20 of plug contacts 16. The connector-halves 10 and 12 are provided with alignment socket 20 and mating alignment pin 22 to position and guide the two halves relative to one another during the coupling process.

Each connector-half section 10, 12 is formed of a pair of dielectric housing elements 32, 34 and 36, 38 respectively. The housing elements of each connector-half are separated from one another during assembly so as to permit insertion and capturing of the appropriate contact elements between them. A plurality of fastening bolts 40 are shown holding the assembled housing elements together; but it should be understood that other suitable and appropriate fastening matings may be used in lieu of the illustrated bolts.

The housing sections and respective contact elements are particularly shaped to permit convenient assembly of the connector-halves. Thus, housing element 36 includes a recess 42 which is adapted to receive an enlarged shoulder portion 44 on contact element 16. Bores 46 and 48 are formed in housing elements 36 and 38, respectively, to accommodate the extending portions of contact elements 16 when the housing sections are assembled. Enlarged shoulder portion 44, which is disposed within recess 42, becomes captured between housing element 36 and housing element 38 when the two are fastened together, thus serving to retain contact elements 16 within connector-half 12. Similarly, housing elements 32 and 34 are provided with enlarged bores 50 and 52 for receiving the contact elements 14 in connector-half 10. Bores 50 and 52 each include inwardly extending end walls 54, 56, respectively which reduce the effective diameter of the bores so as to capture contact elements 14 therebetween. End walls 54 and 56 in turn include through-bores 58 and 60, respectively, which accommodate the extending tail portion 62 of contact elements 14, and permit entrance of the pointed end portion 18 of contact elements 16.

A self-sealing gasket 70 is interposed between the opposed front faces 72 and 74 of connector-halves 10 and 12, respectively, to provide moisture sealing for socket connector-half 10. The gasket is secured to surface 72 of housing section 34 by cementing or by any other suitable sealing and attaching technique, and is positioned so that it fully covers each of thru bores 60 in housing section 34. To assure proper sealing, the gasket 70 is formed preferably as a continuous web, and is secured to connector-half 10 in that condition. However, to allow for convenient mating of the two connector-halves, the gasket 70 may be provided with a plurality of weakened sections 76 which may be in the form of partial cross-cut slits as shown, or may be bevelled "blind-holes" or other rupturable reduced thickness portions, positioned in alignment with the underlying bores 60 in housing section 34.

Upon mating of the two connector-halves the pointed end portions 20 of plug contact elements 16 penetrate through the weakened portion 76 and engage the underlying socket contact elements 14. The resilient elastic character of gasket 70 causes it to conform to the outer surface of the penetrating plug contacts 16, forming a resilient abutting seal therewith. A similar gasket 70A may be provided on the rear of connector-half 10 so as to form a seal against moisture penetration into the connector-half along tail pieces 62 of contact elements 14.

Connectors of this type might be expected to encounter, in use, environments in which a moisture-bearing or other conductive film might form upon the surface of gasket 70 prior to mating of the two connector-halves. Since each of plug contact elements 16 must pass through the gasket when the halves are coupled together, it might be possible for a conductive film on the surface of the gasket to form a short-circuit or leakage path between contact elements

16. To guard against this possibility, each of contact elements 16 may be insulated along an axially extending portion of the length thereof by means of a collar or surrounding sleeve of dielectric material 78. As shown in detail in FIG. 4 the sleeve 78 may be formed to have an outer diameter equal to the outer diameter of the plug contact 16 so as to permit smooth passage of the contact element through the insulating gasket 70. To achieve this configuration, the sleeve 78 may be set into an annular recess 80 formed in contact 16. In use, the sleeves 78 will extend from one side of gasket 70 to the other, and therefore will be the only part of contacts 16 in engagement with gasket 70 when the connector-halves 10 and 12 are fully mated; electrical contact between any conductive film on the surface of gasket 70 with the conductive metal parts of contact elements 16 will thus be prevented.

This invention has thus been described but it is desired to be understood that it is not confined to the particular forms or usages shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of the invention; therefore, the right is broadly claimed to employ all equivalent instrumentalities, and by means of which objects of this invention are attained and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some of the many that can be employed to obtain these objects and accomplish these results.

I claim:

1. A sealed, separable electrical connector comprising:
 - a socket connector-half having: a housing, a front face on said housing, a plurality of socket openings in said front face, and a plurality of socket contact elements disposed within said housing in position to be engaged through said socket openings;
 - a plug connector-half having a housing, a front face on said housing, and a plurality of projecting plug contact elements mounted to said housing so as to extend substantially normally from the front face thereof; and,
 - a sealing gasket of resilient elastic material sealed to the front face of said housing of said socket connector-half circumjacent said socket openings in said housing, forming a seal against moisture penetration into said openings;
 wherein said projecting plug contact elements are of

sufficient length to penetrate through said gasket and through the underlying openings in said housing of said socket connector-half into engagement with said socket contact elements when the connector-halves are coupled together;

wherein each projecting plug element includes an axially extending portion of insulating material positioned to extend from one side of said sealing gasket to the other when the connector-halves are coupled together, isolating the conductive surfaces of said plug contact elements from electrical engagement with said sealing gasket;

wherein the axially extending portion of insulating material on said projecting plug contact elements comprises an insulating sleeve, said plug contact elements being provided with recess portions for anchoring said sleeves thereto; and

wherein said sealing gasket includes a plurality of weakened sections positioned in alignment with the socket openings in said socket connector-half, and the material of said gasket is rupturable at said weakened sections so that said projecting plug contact elements can be inserted through said sealing gasket as the connector-halves are brought together.

2. The separable electrical connector of claim 1 wherein said weakened sections are precut slits in said sealing gasket.

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