Nov. 12, 1968 D. N. BUSHEY 3,411,130

ELECTRICAL CONNECTOR

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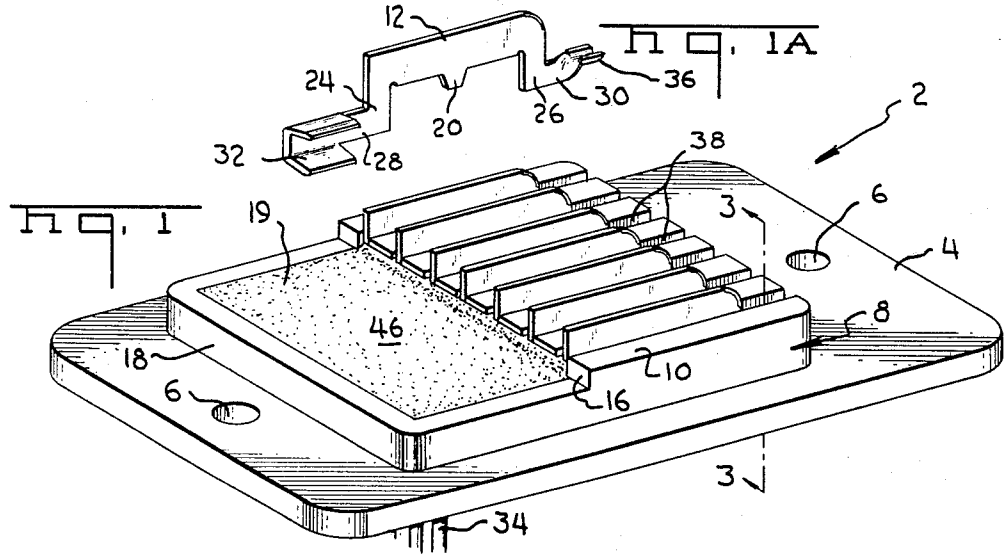


FIG. 1A

FIG. 1

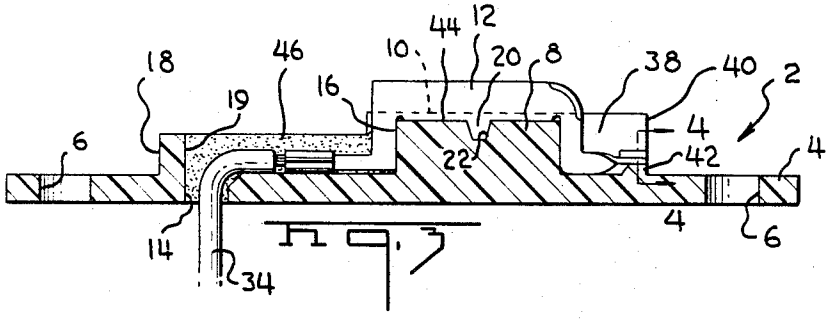


FIG. 3

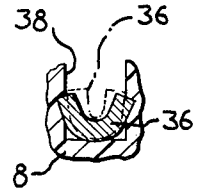
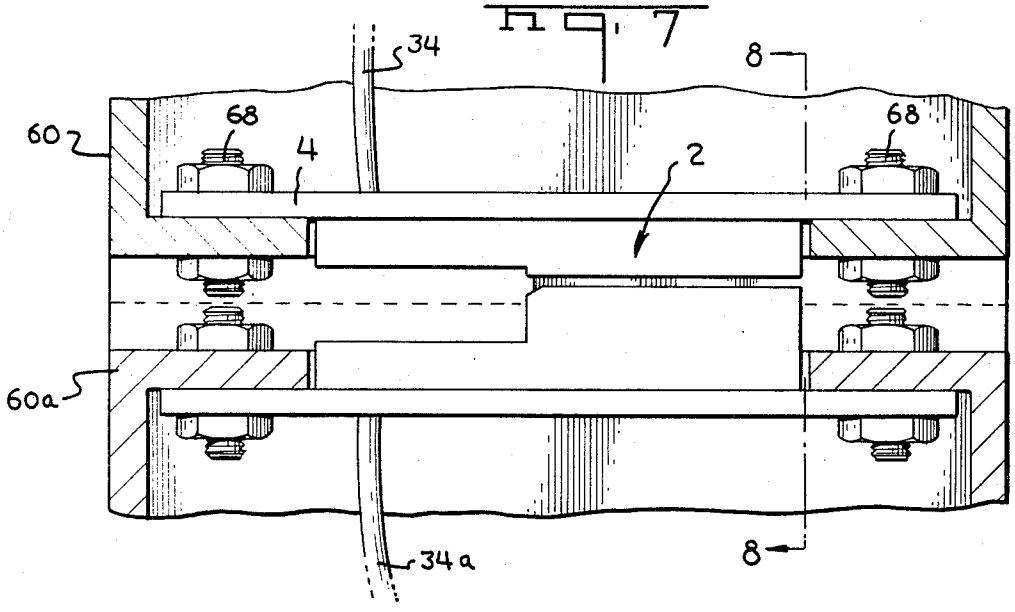


FIG. 4

FIG. 7



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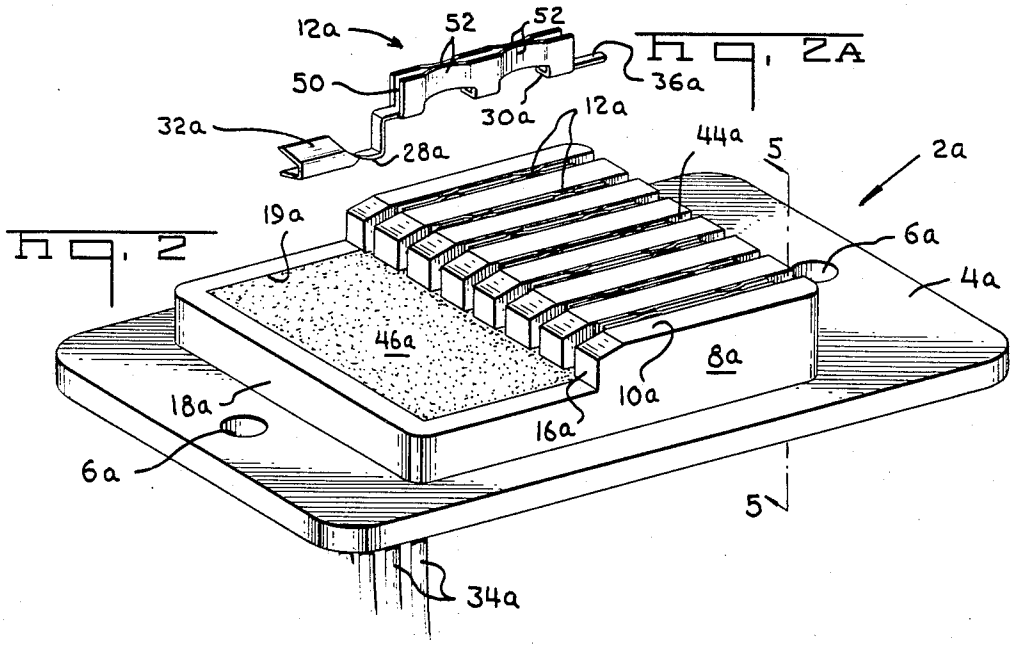


Fig. 2A

Fig. 2

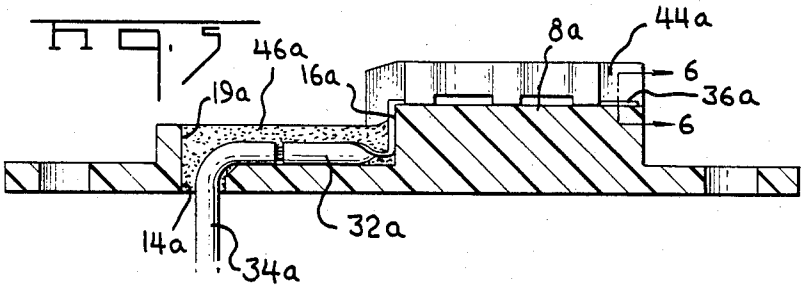


Fig. 5

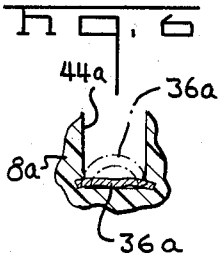


Fig. 6

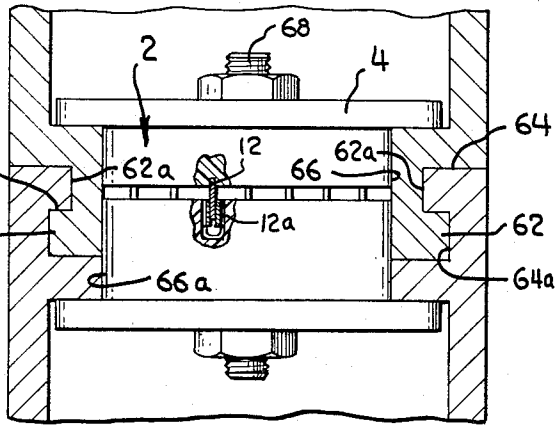


Fig. 8

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3,411,130

ELECTRICAL CONNECTOR

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8 Claims. (Cl. 339—176)

ABSTRACT OF THE DISCLOSURE

A separable electrical connector comprised of a pair of housing assemblies are arranged to be mounted in the sides of hermetically sealed cans containing electronic modules. The housing assemblies include a series of telescopically interengageable contacts with each contact being connected to a lead wire which passes from the obverse face of the housing to the reverse face through a slot in the bottom of a well into which a potting compound is put for preserving the hermetic seal.

Background of the invention

This invention relates in general to electrical connectors, and more particularly to separable connectors for encased, sealed electronic modules.

In some modular electronic systems, the modules are separably connected and contained in their own casings, and may, in the case of a transceiver, for example, be independently active units. Frequently, such casings will be well sealed to meet rugged environmental specifications. Under these circumstances the connector, especially where the contacts are exposed when the modules are disconnected, must attain to unusually high standards.

Summary of the invention

Accordingly the present invention has as objectives to provide a system for connecting sealed modular electrical units wherein the contact elements may be exposed to the weather, are self-cleansing under rugged conditions of use, and interconnect with internal wiring of the units to preserve the integrity of the seal of units.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings.

Brief description of the drawings

FIGURE 1 is a perspective view of one part of a bipartite connector constructed and arranged in accordance with the present invention;

FIGURE 1*a* is a perspective view of an electrical contact of the connector part of FIGURE 1;

FIGURE 2 is a perspective view of the other part of the bipartite connector with its contact being shown in perspective in FIGURE 2*a*;

FIGURE 3 is a sectional view taken along lines 3—3 of FIGURE 1, except that the contact and lead wire are shown in full side elevation;

FIGURE 4 is a fragmentary sectional view taken along lines 4—4 of FIGURE 3;

FIGURE 5 is a sectional view taken along lines 5—5 of FIGURE 2, except that the contact and lead wire are shown in full side elevation;

FIGURE 6 is a fragmentary sectional view taken along lines 6—6 of FIGURE 5;

FIGURE 7 is a fragmentary side view of a pair of modular units in connected relation to illustrate the manner of mounting the connector of FIGURES 1 and 2; and

FIGURE 8 is a sectional view taken along lines 8—8 of FIGURE 7.

Description of the preferred embodiment

In the embodiment of the invention shown in the drawings, the separable connector is comprised of a blade contact housing assembly and a receptacle contact housing assembly, as shown in FIGURES 1 and 2 respectively. Each assembly includes an insulating housing and an appropriate number of metallic electrical contacts to the end of interconnecting a pair of electrical units to be described in connection with FIGURES 7 and 8.

As shown in FIGURES 1, 3 and 4 the blade contact housing assembly includes a generally rectangular insulating housing **2** preferably of a moldable synthetic plastic material such as a glass filled polycarbonate which is fairly hard, yet not brittle. A plate **4** forms the base of housing **2** and provides the means by which it is mounted on the associated electronic unit, apertures **6** being bolt holes suitably arranged for the mounting purpose. Centrally located on the obverse face of mounting plate **4** is a block **8** supporting on and along its raised surface **10** a series of blade contacts **12**. An elongated slot **14** extends adjacent and generally parallel to the rear or trailing side **16** of block **8** to serve as the means for communicating between the obverse and reverse faces of mounting plate **4**. Wall portions **18** upstand from plate **4** to about two-thirds the height of block **8**, and continuously extend from one end of block side **16** to the other and around slot **14** to provide a well **19** to contain a potting and sealing compound as will be explained. Wall portions **18** smoothly merge with block **8** to present, in plan, a generally rectangular perimeter.

Advantageously the contacts of the present invention are stamped and formed from sheet metal and have a wire attaching means of a form suitable for use of the crimping technique disclosed, for example, in Macy Patent No. 2,600,012. The contacts may terminate otherwise, of course, such as by a solder tag, depending upon the conditions of use. Contact **12**, as particularly shown in FIGURE 1*a*, is thus a flat elongated blade arranged to be set edgewise across surface **10**, the blade having a central depending locating and stabilizing tab **20** projecting into recess **22** of block **8** and two depending end legs **24** and **26** which connect with outwardly extending shanks **28** and **30** respectively. In the illustrative embodiment, at the end of shank **28** is a wire attaching ferrule **32** having upstanding ears arranged to be wrapped and compressed onto the bared end of lead wires **34** as shown in FIGURES 1 and 3. Intermediate its length shank **30** is twisted so that the side edges of a concavely bowed locking tab **36** are symmetrically disposed laterally of the longitudinal axis of the contact blade. A series of channels **38** extend inwardly of the leading side **40** and have a width snugly to receive locking tab **36**, thereby lightly to hold the contacts in place initially. An anvil like projection **42** on the bottom of the channel is disposed so that tab **36** initially rests upon it, and against which tab **36** can be partially straightened by any suitable tool, thereupon the side edges of the tab dig into the side walls of the channel, as best shown in FIGURE 4, to anchor one end of contact **12** to the housing.

Further to stabilize contacts **12** on the housing a series of slots **44** preferably traverse raised surface **10** whereby snugly to receive the lower edge of blade **12** and leg **24**.

As thus constructed, contact blades **12** are crimped to lead wires **34**, passed through slot **14**, and securely set edgewise in a parallel array across the face of block **8** with depending legs **24** and **26** disposing ferrule **32** and locking tab **36** in the bottom of well **19** and channel **38** respectively. Any suitable potting compound **46**, FIG-

URE 3, preferably of an epoxy nature, then may be put into well **19** to cover ferrules **32**, the ends of lead wires **34**, and to close slot **14** in a fluid-tight seal.

The receptacle contact housing assembly as shown in FIGURES 2, 2*a*, 5 and 6 is generally similar to the blade contact housing assembly, and thus includes housing **2***a* comprised of a mounting plate **4***a* with bolt holes **6***a*. Centrally located block **8***a* has surface **10***a* raised from the obverse side of the mounting plate to support a series of contacts **12***a* in a parallel array and recessed in channels **44***a*. Slot **14***a* running parallel to the rear side **16***a* of block **8***a* is of sufficient width to pass contacts **12***a* and the ends of lead wires **34***a* from the reverse side to the obverse face of mounting plate **4***a*. Wall portions **18***a* likewise serve to define a well **19***a* into which potting compound **46***a* may be put thereby sealing slot **14***a* and covering the ends of the lead wires and contacts.

Contacts **12***a*, being the receptacle part of the contact assembly, as especially seen in FIGURE 2*a*, comprise a central channel **50** open at its ends and arranged to receive blade **12** in endwise telescopic relation. At a plurality of intermediate positions along the length of the channel, the base and portions of the side walls are removed to define opposed pairs of sidewall portions which are curved or bowed inwardly toward each other to form contact nodes **52**, the opposed nodes being spaced less than the thickness of blade **12**. Preferably contacts **12***a* are formed by stamping techniques from thin and resilient sheet metal, such as phosphorous-bronze, whereby after telescoping the contacts the pairs of contact nodes **52** firmly press against opposite sides of the blade positioned therebetween to insure multiple points of good electrical engagement. In this connection contacts **12** and **12***a* preferably will be plated with a non-corroding metal since they are external contacts exposed to adverse weather conditions.

Shank **30***a* at the leading end of contact **12***a* terminates in a convexly bowed tab **36***a* which, when undeformed, is easily received in channel **44***a*. Tab **36***a*, being relatively thin, is more easily deformed towards a straightened condition, by any suitable forming tool applied to the tab whereby to force its edges into the sidewalls of the channel, as best shown in FIGURE 6, locking the end of the contact securely in position. Wire attaching ferrule **32***a*, after being crimped onto the end of wire **34***a*, normally is wider than it is high in the direction of crimping. To obtain maximum electrical spacing between adjacent contacts preferably the ferrule is laid in well **19***a* on its side. Thus shank **28***a* is twisted in the forming operation of contact **12***a*.

With contacts **12***a* snugly received and recessed in channels **44***a*, and contacts **12** standing edgewise along surface **10** in grooves **44**, it can be appreciated that movement of housings **2** and **2***a* along one another in a manner to slide surface **10** across and along surface **10***a*, the leading end of contact blade **12** is caused to enter into channel **50** of contact **12***a* and further to move in telescoping relation until the ultimate position of contact with blade **12** is reached, which is when blade **12** is substantially centrally disposed along contact **12***a*. To constrain the housings to such movement, the cans **60** and **60***a* fragmentarily shown in FIGURES 7 and 8 are provided with double tongue and groove elements **62–64** and **62***a*–**64***a* on either side of mounting openings **66** and **66***a* respectively. Opening **66** is of a size snugly to receive block **8** as extended by wall portions **18** when plate **4** is abutted at its margins against the inside of can **60** and secured thereto as by bolts **68**. Plate **4***a* is similarly mounted adjacent opening **66***a*, but in both cases for protection of the contact elements the sidewalls of the mounting openings, as extended by the interlocking tongue and groove elements **62–64** and **62***a*–**64***a*, are at least as high as blocks **8** and **8***a* including the projection of contacts **12**, see FIGURE 8. As thus constructed and

arranged, the obverse face of each connector housing is recessed in a well in the side of a can which houses the associated electrical gear, and the reverse face of the connector housing is directed interiorly of the can whereby the lead wires **34**–**34***a* may interconnect with the electrical components of the electrical gear. The hermetic nature of the cans is thus preserved, and to this end, where necessary, a waterproofing grease of suitable composition may be applied to the margins of plates **4**–**4***a*.

What is claimed is:

1. In an electrical connector for coupling two sets of leads, an insulating member having a raised surface on an obverse face, a well adjacent said surface having an opening through to the reverse face, a set of contacts on said surface, each contact having a shank portion extending within said well and a connecting portion adjacent said opening for attachment to a lead directed to said opening, said well having sidewalls arranged to confine a sealing compound introduced therein for closing the opening.

2. A connector according to claim **1** wherein said connecting portion lies along the bottom of said well for attachment to a lead extending through said opening and into said well.

3. A connector according to claim **1** wherein said contact has a shank terminating in a bowed tab force-fitted between opposed walls of said member to anchor the contact at one end.

4. A connector according to claim **3** wherein said tab is upwardly bowed, and partially flattened to drive its side edges into said walls.

5. A connector according to claim **3** wherein said tab is downwardly bowed, and substantially flattened to drive its side edges into said walls.

6. A connector according to claim **2** wherein said well is defined by an upstanding wall continuous with the sides of said raised surface to define therewith a block-like portion for fitting within an opening in a casing.

7. A connector according to claim **6** wherein said wall has a height substantially less than said raised surface.

8. An electrical connector for coupling the two sets of leads of electrical modules contained in casings having sidewall mounting openings, comprising a pair of insulating members each having a mounting plate, a central block portion on said plate providing a raised surface, wall portions upstanding on said plate and connecting with said block portion, margins of said plate being arranged to engage the respective casing upon fitting said block portion in a mounting opening to present the raised surface of one member externally of the casing for sliding along the raised surface of the other member, a slot in the bottom of said well opening through the member to the interior of the casing, a set of elongated parallel contacts arrayed across said raised surface, each contact having a shank at each end of a contact section, one shank terminting in a bowed tab force-fitted between the walls of a channel in said member to anchor the contact at one end, the other shank extending into said well and terminating in a connecting portion adjacent said slot for attachment to a lead extending through said slot and into said well whereby a sealing compound filling said well closes the slot around a set of leads terminated by said set of contacts.

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