Sept. 3, 1963 G. T. SCHWAMB 3,102,768

ELECTRICAL CONNECTOR

Original Filed Oct. 21, 1953

FIG. 1.

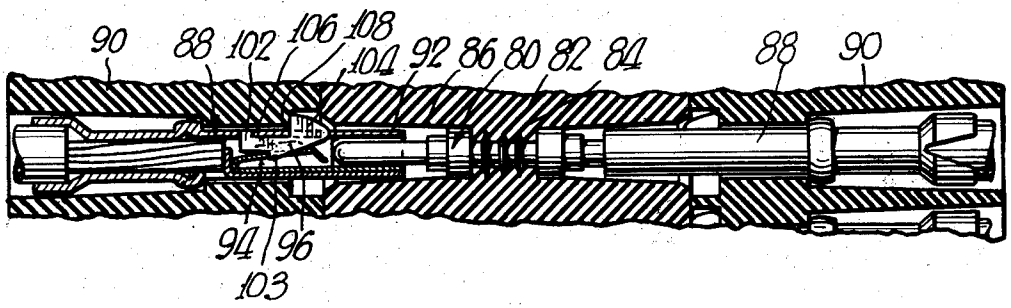


FIG. 2.

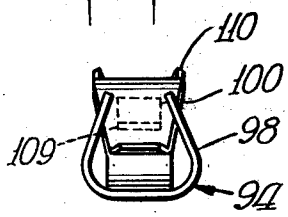


FIG. 3.

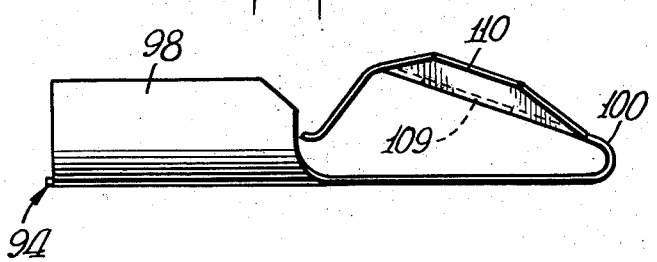
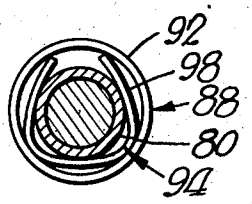


FIG. 4.



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ELECTRICAL CONNECTOR

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Continuation of application Ser. No. 387,405, Oct. 21, 1953. This application Dec. 6, 1961, Ser. No. 160,686
1 Claim. (Cl. 339—217)

This invention relates to electrical connectors and, more particularly, to multi-contact connectors incorporating separable contacts.

This application is a continuation of my prior application, Serial No. 387,405, filed October 21, 1953, now abandoned.

The common type of multi-contact plug and receptacle connection extensively utilized in electronic equipment requires that a plurality of mating electrical contacts each be mounted within insulating housings to form plug and receptacle portions of the connector. Each of the mating contacts must be connected to an electrical conductor. It is, of course, necessary that the connection between the contact and conductor be mechanically and electrically sound and preferably of a permanent nature. In the past the connector parts have been manufactured as integral components of the plug and receptacle housings and thus required the user to connect the conductor to the contact while the mating parts were mounted within the housing. An example of this type of connector is shown in the Borchert patent, U.S. 2,265,341. Since many contacts are contained in a single plug or receptacle, this requires the user to make a plurality of connections in an extremely small space, often resulting in improper connections.

Moreover, since it is preferable to make the connection between the conductor and contact permanent in nature, and since the contact is an integral portion of the plug or receptacle housing, a change in circuitry results in the necessity of replacing the entire plug or receptacle. In other words, former circuits cannot be disconnected nor can any circuits be added or circuit changes made without a great deal of difficulty and expense.

Much effort has been expended by the industry in attempts to overcome the shortcomings of these most common forms of connectors. Such attempts include many designs which permit the contact parts to be removed from the housings. However, in general, such removal has been accomplished by designing the housing in such a manner that it can be divided into a plurality of parts, exposing the contacts and thereby permitting them to be released. Obviously, such a design entails a great deal of expense in the manufacture of the housing and often results in the release of all the contacts simultaneously rather than the individual contacts as desired.

Simultaneously, in the art of switchboards, plug contacts have been designed in a manner which exposes the means which retains the contacts within the switchboard housing. By proper manipulation of these exposed parts or by pulling, tugging or twisting the conductors the contacts can be released. Obviously, if a mere pull, tug or twist can release the contact from the housing, inadvertent disconnections can most certainly occur. In general, the industry has felt that all the difficulties inherent in the integral contact-housing connector were preferable to the type of connector which could inadvertently be disconnected.

One other problem which has constantly arisen to plague the person who would improve upon the prior art multi-contact connectors is the requirement that when disconnected, the connection present a "dead face" to reduce the risk and hazard of short circuiting. Such a "dead face" requirement necessitates that the contacts be completely contained within the insulator housing.

Thus to summarize the prior art, it can be seen that the contacts were not individually removable from the housing or the housing was composed of a plurality of parts which had to be disassembled to release the contacts or that the contacts, while releasable from the housing, could inadvertently be disconnected or the connectors when disconnected did not present the desired "dead face."

An object of this invention is to provide a connector having contacts which may be individually inserted and removed from the connector, together with their attached conductors.

Another object of this invention is to provide a connector which is particularly adapted to permit changeable connections through a bulkhead which is pressurized.

Still another object of this invention is to provide a dual function spring for a socket type contact which serves to lock the contact in the connector and to retain the pin contact in the socket contact.

A feature of this invention is a socket type contact assembly comprising a tubular body portion having a first axial opening at one end, adapted to receive therethrough a mating pin contact, and having a second radial opening in its wall; and a spring assembly disposed within said body portion, adapted to resiliently engage a pin contact inserted through said first hole, and having a portion passing through said second hole to provide a resilient, outwardly biased projection on the outer surface of said contact.

These and other objects are accomplished and my new results obtained as will be apparent from the device described in the following specification, particularly pointed out in the claim, and illustrated in the accompanying drawing, in which:

FIG. 1 is a fragmentary view in partial cross section through an assembled connector or disconnect panel embodying this invention;

FIG. 2 is an end view of the socket contact spring of FIG. 1;

FIG. 3 is a side view of the socket contact spring of FIG. 1; and

FIG. 4 is a fragmentary end view of the socket contact showing the spring and a pin contact inserted therein.

The invention comprises a connector part or contact having a tubular body which is connected to a conductor at one end and has its other end adapted to make contact with a mating contact. The contact of the invention is disposed within a bore of an insulating housing which contains internal shoulders. Locking means project from the tubular body and engage from the housing. Moreover, since all the locking functions are accomplished within the bore, there is no necessity for portions of the connector to be exposed, thus the invention permits the presentation of a "dead face" in the nonoperative position.

The invention is provided with a locking device which is adaptable to both the pin or male and the socket or female contacts. When used in the socket contact, the locking means perform additional functions. Normally, when a pin contact is inserted in a socket contact, means must be provided which will ensure electrical connection between the cooperating contact parts and, in addition, will apply a mechanical force to retain the pin within the socket. In the invention, the spring portion of the locking means, when incorporated in a socket contact, not only retains the socket within the housing and the pin within the socket, but also applies a force to the pin ensuring intimate electrical connection between the contacts.

A preferred embodiment of the invention, which is suitable for connections through a presurized bulkhead, is shown in the figures.

An intermediate retainer or insulated housing **82** is secured by suitable means, such as a flange, not shown, to a bulkhead, not shown. A pair of end retainers, or insulated housings **90**, are secured, one to each end of the intermediate housing, by suitable means, such as a sleeve which is internally threaded to engage external threads on the intermediate housing and has an internal shoulder to engage an external shoulder on the end housing, all not shown. A plurality of double ended pin contacts **80** are molded into the housing **82** and each has a plurality of annular ridges **84** to provide a sealed and secure anchorage to the housing. Each pin end is disposed in a recess **86** of sufficient depth and diameter such that the end of the pin does not extend beyond the face of the housing **82** and such that a mating socket contact end **88** can be received therein. Each of the end housings **90** has a plurality of bores therethrough which are coaxial with the pin contacts **80** of the intermediate housing **82**. Each bore has a constriction therein providing a pair of spaced apart shoulders. A socket contact **88** is disposed in each bore. Each socket contact is provided with a spring assembly comprising a spring **94** and a locking tab **96**, which is disposed within the body of the contact. The spring **94** may consist of a single stamping spring metal formed to provide a spring socket **98** and a tab supporting spring element **100**. The locking tab **96** is a flat stamping provided with an aligning ear **102** and a tab or detent portion **104** which respectively extend through cut-outs or openings **106** and **108** in the wall of the socket contact **88**. The locking tab **96** is supported in a cut-out **109** in a grooved section **110** of spring element **100** by a projection **103**.

The rear or spring remote end of the socket contact is provided with a conductor receiving portion, an insulation shroud portion, and a peripherally formed hollow bead. The bead provides a stop which engages the rear shoulder of the bore constriction and serves as an over-insertion prevention device.

The locking tab has a front camming surface which is depressed when the socket contact is inserted into the housing bore past the bore constriction. When the tab passes the bore constriction, the spring biases the tab outwardly to engage the front shoulder of the bore constriction and serve as a withdrawal prevention device.

Thus upon complete insertion of the socket contact into the bore, the contact is automatically locked therein, until and unless it is manually unlocked and removed. When the end housing is separated from the intermediate housing, the camming surface may be engaged by a suitable tool, such as a penknife or probe, depressing the locking tab and permitting the withdrawal of the socket contact from the end housing.

The front end **92** of the socket contact is open to receive a pin contact **80**. The socket portion **98** of the spring **94** is disposed adjacent the opening and resiliently engages the pin contact as shown in FIGURE 4. It will thus be seen that the spring assembly **94** serves the dual function of resiliently engaging a mating pin contact, and locking the socket contact in its housing bore.

In the foregoing there has been provided a disconnect panel having a plurality of housings, one of which contains contacts sealed to the housing to maintain the integrity of the pressurized bulkhead. Such connectors

are preferably pin connectors of the rigid type to which are mounted the socket contacts which are detachably secured to the housing which may be locked to the intermediate housing fastened to the bulkhead. In this embodiment the circuit connections may be easily changed by changing the socket contacts and attached conductors, while the pin contact remains undisturbed through the bulkhead.

The 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 and, therefore, the right is broadly claimed to employ all equivalent instrumentalities coming within the scope of the appendent claim, 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:

A removable contact assembly, for use in a dielectric housing including at least one bore extending therethrough and having a constriction forming a pair of spaced apart axially opposed shoulders therein, comprising: a substantially tubular socket contact body member adapted to be inserted into said bore and having a surface discontinuity on the outer surface thereof forming a shoulder for engaging one of said pair of opposed bore shoulders, said body member being further adapted to be mechanically and electrically secured to a conductor at one end thereof and to axially receive a mating contact at the other end thereof; a resilient spring member disposed in substantially coaxial relationship to said body member, including means for electrically and mechanically contacting said mating contact; means interlocking said spring to said body member for preventing axial relative motion therebetween; and radially projecting means coupled to said spring member and resiliently biased outwardly thereby for engaging the other of said pair of bore shoulders to prevent axial movement of said spring within said bore, said projecting means including a cam surface thereon for deflecting said spring inwardly to disengage said means from said bore shoulder in response to a force applied substantially axially thereto.

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