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[54] **SEALED CONNECTOR FOR INSULATED CONDUCTORS**

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[51] **Int. Cl.** **H01r 11/20**

[58] **Field of Search** 339/75, 94, 96–99

[56] **References Cited**

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Primary Examiner—Joseph H. McGlynn

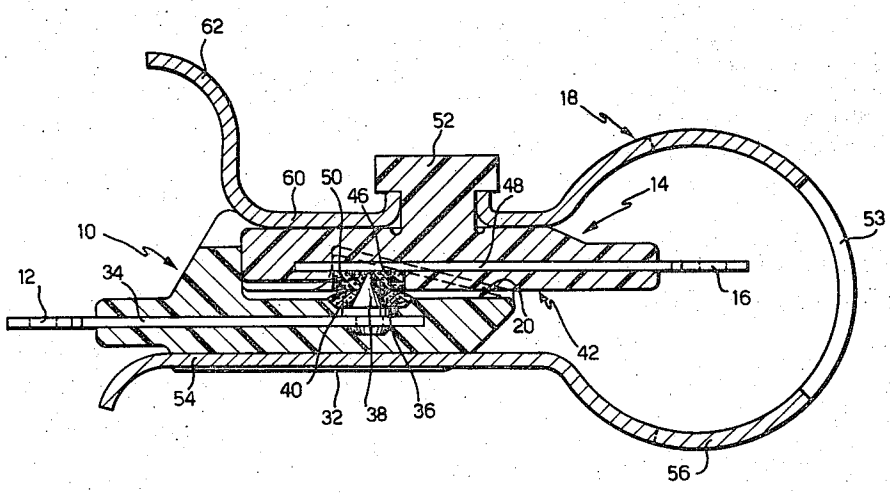
Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

A sealed electrical connector comprises two interengageable insulating bodies provided with embedded terminal plates for connection to respective cable conductors to be connected, each body having a respective depression filled with a gelatinous resin through which a contact pin connected to one terminal plate penetrates to make contact with the other terminal plate when the connector is assembled by clipping the two bodies together.

Upon dismantling of the connector the gelatinous resin flows to reclose the holes made therein by the pin, thereby ensuring sealing of the terminal plates.

7 Claims, 3 Drawing Figures



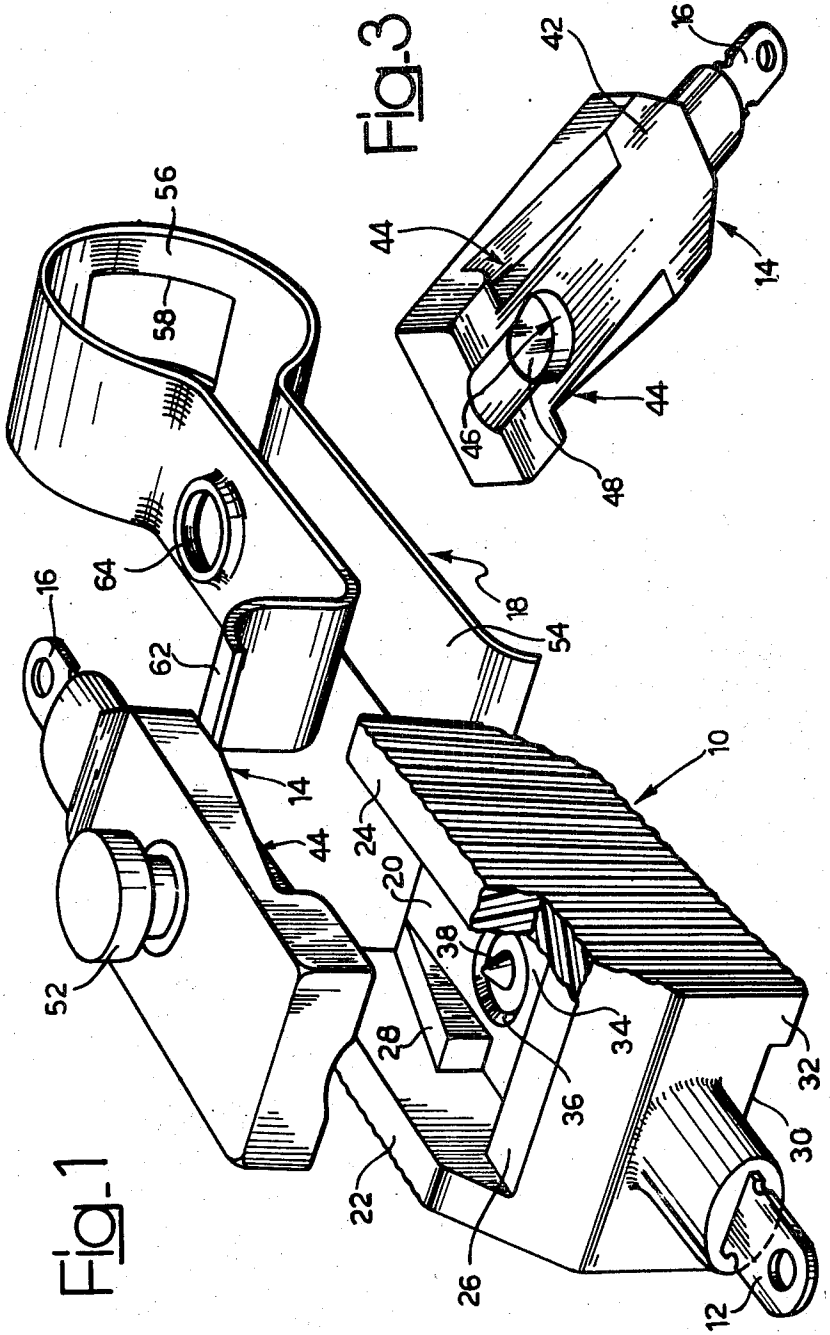
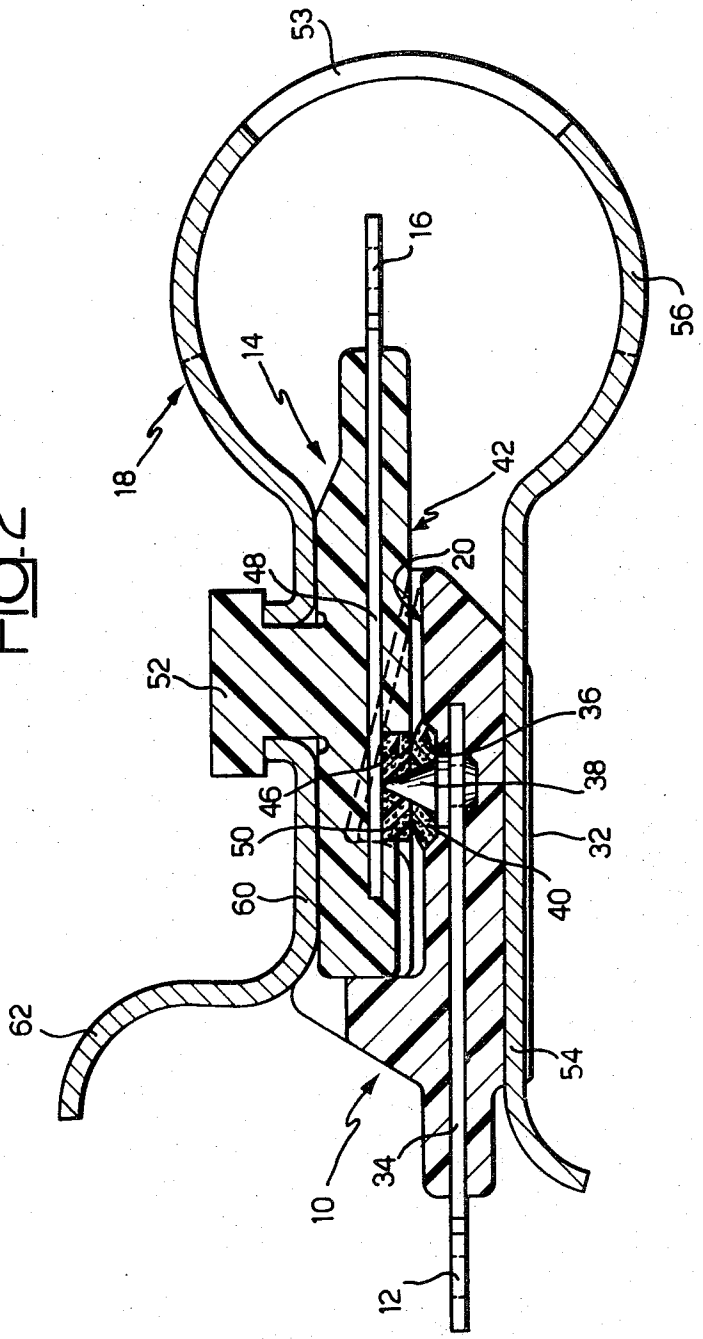

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Fig-1

Fig-3

Fig.2



SEALED CONNECTOR FOR INSULATED CONDUCTORS

This invention relates to a connector for connecting insulated conductors in a manner providing a sealed and detachable connection for use in equipment destined to operate in damp surroundings or even immersed in water.

When electronic equipment is intended to operate in damp surroundings, its components or component systems are rendered impermeable, for example, by enclosing them in insulating resin, so as to avoid the creation of conductive leakage paths, or even complete short-circuits, as a result of damp operating conditions. Such sealing has not, however, been applied to detachable connections which may be associated with the equipment, and consequently each such connection has to be rendered impermeable by such methods as embedding it in a block of thermosetting resin. A sealed connection of this type is necessarily inaccessible and is thus unsuitable for equipment in which frequent revision and checking or occasional replacement of component parts is necessary.

It has not hitherto been possible to provide detachable sealed connectors capable of establishing simultaneously one or more connections between the conductors of cables having impermeable insulating sheaths by a simple and speedy method.

An object of this invention, therefore, is to overcome this shortcoming by providing a sealed detachable connector having the advantages described above, which is of particulary simple construction, such as to require a minimal force to effect sealing between two parts to be connected.

According to the invention there is provided a connector adapted to effect a sealed and releasable connection between insulated conductors, characterised in that the connector comprises, in combination:

a. a first rigid insulating impermeable body having a working face formed with a depression and having an embedded metal plate extending from the depression through the first body to a first external terminal on the outside of the first body;

b. a contact pin housed in the depression of the first body and electrically connected to the plate, said pin projecting beyond the plane of the said working face;

c. a layer of gelatinous resin, which fills the depression in the working face of the first body, entirely covering the contact pin;

d. a second rigid insulating impermeable body having a working face formed with a depression and having an embedded metal plate extending from the depression and through the second body to a second external terminal on the outside of the second body;

e. a layer of gelatinous resin filling the depression in the second body; and

f. pressure means for pressing the two bodies against each other with their working faces facing each other, so that the contact pin carried by the first body perforates the layers of gelatinous resin in the two depressions to make contact with the plate in the depression of the second body.

The gelatinous resin has the property of reclosing after it has been pierced with capillary holes, thereby forming a sealing and insulating layer between the parts to be connected.

The invention will now be described, by way of example, with reference to the attached drawings, in which:

FIG. 1 is an exploded perspective view of a connector according to one embodiment of the invention;

FIG. 2 is a longitudinal sectional view of the connector shown in FIG. 1; and

FIG. 3 is a perspective view from below of part of the connector shown in FIG. 1.

Referring to the drawings, a sealed connector according to the invention consists essentially of a lower insulating body **10** provided with a metal connector terminal **12,** for connection to an insulated conductor of a first cable (not shown) to which connection is to be made, an upper insulating body **14** provided with a metal terminal **16** for connection to an insulated conductor of a second cable (not shown) to be connected to the first, and a spring clip **18** serving the purpose of holding the two bodies **10, 14** assembled together in their working position. The connections (not shown) of the terminals **12** and **16** to their respective cable conductors (not illustrated) are irremovable and destined to be covered by an insulating impermeable resin.

The lower body **10** consists of a block of rigid insulating material such as that known under the trade mark "Noril" made by the firm of Silicon of Milan, having a substantially rectangular plan form, and having a working face **20** bounded by two lateral walls **22, 24** and by an end wall **26.** Adjacent the inner surfaces of the walls **22, 24** which face each other, the face **20** of the lower body **10** is formed with two ramp projections **28,** one only of which is visible in FIG. **1.** On its outer face, that is, the face opposite the working face **20,** the lower body **10** is formed with a longitudinally extending channel **30** defined between two longitudinal ribs **32.**

The terminal **12** of the lower body **10** is part of a metal plate **34** embedded within the body **10,** and terminating below a depression **36** in the working face **20** of the lower body. At the region of the depression **36** a metal contact pin **38,** electrically connected, for example soldered, to the plate **34,** projects into the depression **36** and extends beyond the plane defined by the working face **20.** The depression **36** is filled by a convex pad **40** (not shown in FIG. **1**) which is such to surround the contact pin **38.** The pad **40** is formed of a gelatinous and elastic resin which is such that it recloses if pierced by capillary holes, thereby establishing sealing conditions. It is possible to make a pad of gelatinous resin having this property from various materials.

A preferred example of this gelatinous resin is a fluorosilicon marketed by the firm of Vagnone and Boeri, of 18 Corso Re Umberto 18, Turin, under the Trade Mark 3C401 and having the following characteristics:

Hardness: 40 Shore
Dielectric strength 13,500 V/m
Specific gravity: 1.35 + 1.65 Kg/m^3
Working temperature - 60°C to 75°C.

The resin is applied to the contact pin **38** by known methods and is subsequently polymerized at ambient temperature.

The upper body **14** also consists of a block of rigid insulating material such as that known under the trade mark Noril, with a rectangular shape in plan, having a lower working face **42** adapted to co-operate with the working face **20** of the lower body **10.** The width of the

upper body **14** is such that it can be located between the lateral walls **22, 24** abutting at one end against the end wall **26** of the lower body **10.** The working face **42** of the upper body has two lateral wedge-shaped recesses **44** of such dimensions and slope as to match the ramp projections **28** of the lower body **10** when the upper body **14** is introduced between the walls **22, 24** and abutted against the wall **26** of the lower body **10.**

The working face **42** of the upper body **14** is formed with a depression **46** which comes into register with the depression **36** of the lower body **10** when the two bodies **10, 14** are assembled. The connector terminal **16** of the upper body **14** is part of a metal plate **48** embedded in and extending longitudinally within the body **14** as far as the depression **46** and in such manner that one face of the metal plate **48** is exposed in the depression **46** prior to the insertion in the depression **46** of a pad **50** of a gelatinous resin similar to that of the pad **40** of the lower body **10.**

The outer face of the upper body **14,** that is, the face which is opposite to its working face **42,** is formed with a flanged boss **52,** made in one piece with the upper body **14** and adapted to co-operate with the spring clip **18,** as will now be described.

The clip spring **18** consists of a length of harmonic steel strip, folded and curved so as to have a flat rectilinear section **54** adapted to engage in the channel **30** into the lower body **10,** a wide circular arched section **56** provided with an opening **58** through which a cable passes, and a flat rectilinear section **60** terminating in an arched cut end **62.** The opening **58** forms a zone of weakened resistance in the arched section **56** of the clip **18,** in which zone the flexion of the spring clip **18** predominantly occurs. The rectilinear section **60** has a flared hole **64** which fits around the flanged boss **52** so as to attach the upper body **14** to the spring clip **18.** During manufacture of the connector the boss **52** is initially purely cylindrical and while hot is then snap-rivetted or flanged after insertion in the hole **64** of the spring clip **18** to secure the body **14** to the spring clip **18.**

The terminal **16** of the upper body **14** is also destined, like the terminal **12** of the lower body **10,** to be permanently connected to a conductor of a cable end, the connection with the conductor being rendered impermeable by a covering of varnish or resin.

The connector herein described and illustrated functions as follows. With the spring clip **18** held open the lower body **10** is slid below the upper body **14,** up to the point where the pressure of the spring clip **18,** which acts on the outer surfaces of the bodies **10** and **14** by means of the rectilinear sections **60** and **54** respectively, causes the upper body **14** to engage in the recess defined between the lateral walls **22** and **24** of the lower body **10,** bringing the depression **46** of the upper body **14** into register with the depression **36** of the lower body **10.** The recesses **44** in the upper body **14** engage the ramp projections **28** of the lower body **10.**

Upon such interengagement of the bodies **10** and **14** the pin **38** perforates both its own covering pad **40** and the pad **50** of the upper body **14,** making electrical contact with the metal plate **48** which is integral with the terminal **16.** Thus electrical contact is established which is sealed by the pressing of the perforated pads **40** and **50** against the other, sealing the perforations through which the pin **38** passes, and the zone of contact of the pin with the plate **48.** When the connector is disassembled and the two bodies **10** and **14** are separated, the respective pads **40** and **50** of gelatinous resin recover or spread out again, as stated above, until they close up and seal the punctiform openings previously made by the pin **38,** thereby preventing the access of damp both to the pin **38** and to the zone of contact of the pin **38** with the metal plate **48.** The operations of connecting and disconnecting the connector can therefore be carried out safely even under water.

Several variants and modifications are possible in the specific embodiment herein described and illustrated without nevertheless going beyond the scope of the invention as defined by the attached claims.

We claim:

1. A connector adapted to effect a sealed and releasable connection between insulated conductors, said connector comprising, in combination:

a. a first rigid insulating impermeable body having a working face formed with a depresssion;

b. a first metal plate embedded in said first body and extending from the depression through the first body, said plate having a first external terminal on the outside of the first body;

c. a contact pin electrically connected to said first plate and housed in the depression of the first body, said pin projecting beyond the plane of the said working face;

d. a layer of gelatinous resin filling the depression in the working face of the first body and entirely covering the contact pin;

e. a second rigid insulating impermeable body having a working face formed with a depression;

f. a second metal plate extending from the depression and through said second body, said second plate having a second external terminal on the outside of the second body;

g. a layer of gelatinous resin filling the depression in the second body; and

h. pressure means for pressing the two bodies against each other with their working faces facing each other, so that the contact pin carried by the first body perforates the layers of gelatinous resin in the two depressions to make contact with the plate in the depression of the second body.

2. The connector defined in claim **1,** wherein the pressure means comprise a spring clip.

3. The connector defined in claim **2,** wherein the spring clip has two rectilinear sections which press against the respective outer surfaces of the two bodies opposite their respective working faces, and an arched section which interconnects the two rectilinear sections.

4. The connector defined in claim **3** wherein the second body has a boss to which the spring clip is fixed.

5. The connector defined in claim **4,** wherein one of the two rectilinear sections of the spring clip has means defining an opening which fits over the boss of the second body, said boss having a flanged head by which the spring clip is secured to the second body.

6. The connector defined in claim **1** wherein the first body has two lateral walls bounding the working face of said body and constituting a lateral guide for the second body.

7. The connector defined in claim **6,** wherein the first body further has an end wall which constitutes an abutment engaged by the second body upon assembly of the connector.

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