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⑤④ **Sealed electrical connector and seal ring therefor.**

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Description

The present invention relates to a seal ring and a sealed electrical connector using same.

In a waterproof electrical connector having male and female housings, a seal ring for sealing the male and female housings is generally mounted on the outer surface of the male housing, and the resultant structure is inserted into the female housing.

In such structure, since the seal ring is exposed on the outer surface of the male housing, the seal ring may be susceptible to external influences. For example, the seal ring may be damaged during assembly, thus impairing the waterproof properties. In order to solve this problem, a waterproof connector having a cylindrical outer wall for protecting a seal ring on a male housing is known (Japanese Publication No. 1-51031). In this connector, however, the male housing has a relatively high profile, and the connector is bulky, resulting in inconvenience.

In order to protect the seal ring and provide a compact connector, an assembly obtained by mounting a seal ring on the inner wall surface of a female housing is also known (Japanese Laid-Open Utility Model Application No. 55-31201). In this case, unless the male housing is inserted into the female housing with care, the seal ring may be folded, removed, or deformed, thereby greatly impairing the waterproofing effect.

EP-A-0132099 discloses a connector seal ring comprising an elastomeric ring body, at least one projection formed on an outer peripheral surface of said ring body, and at least one projection formed on an inner peripheral surface of said ring body.

EP-A-0335721 discloses a rubber gasket for a waterproof electric connector, the gasket having recesses in its surface which cooperate with projections on the connector.

It is therefore an object of the present invention to reduce the conventional drawbacks described above, and to implement a new structure of a seal ring and a new structure of a connector housing mounted with the seal ring, to thereby prevent degradation of the sealing effect at the time of assembly of the connector.

According to a first aspect of the invention, there is provided a connector seal ring comprising an elastomeric ring body, at least one projection formed on an outer peripheral surface of said ring body, at least one projection formed on an inner peripheral surface of said ring body, and a locking groove extending into said ring and between said projections, said locking groove having a groove communicating therewith and formed in a direction generally perpendicular to the direction of depth of said locking groove.

The invention further provides a sealed connector comprising a male housing, a female housing having a cavity receiving said male housing, and a seal

ring according to the invention, wherein said seal ring is disposed in said cavity and interposed between an outer wall surface of said male housing and an inner wall surface of said female housing when said male and female housings are joined with each other.

By way of example, one embodiment of a seal ring according to the invention and a connector including a seal ring according to the invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a plan view showing an arrangement of a seal ring according to the present invention.

Figure 2 is a sectional view of the seal ring of Figure 1, as seen along viewing lines II-II.

Figure 3 is a sectional view showing an arrangement of an electrical connector according to the present invention, using the seal ring of Figure 1.

A seal ring according to the present invention is shown in Figures 1 and 2.

Referring to Figures 1 and 2, the seal ring comprises a rubber ring body 1, projections, such as ribs 2, formed on the outer peripheral surface of the ring body, and projections, such as ribs 3, formed on the inner peripheral surface of the ring body. A locking groove 4 is formed into the ring body and between the projections 2 and 3. In the illustrated embodiment, a total of six locking grooves are formed along the circumference of the seal ring.

Since these locking grooves 4 are to be respectively engaged with latch projections 12 (see Figure 3) formed in a cavity of a female housing 11 for receiving a male housing 10, the locking grooves 4 are formed at positions respectively corresponding to the latch projections, as will be indicated hereinbelow.

The locking groove 4 has a groove 4A extending in a direction perpendicular to the direction of depth of the locking groove 4. The groove 4A corresponds to a projection 12A (see Figure 3) extending from the corresponding latch projection 12 formed in the cavity of the female housing 11.

In the illustrated embodiment, the projections 2 and 3 are formed at substantially corresponding, opposite positions.

Figure 3 shows a sealed connector including the seal ring described above.

The connector comprises a male housing 10, a female housing 11 having a cavity for receiving the male housing 10, and the seal ring.

The grooves 4 on the seal ring are engaged with the latch projections 12 extending from the bottom surface of the cavity of the female housing 11. As shown in Figure 3, the seal ring is interposed between an outer wall surface of the male housing and an inner wall surface of the female housing to seal the male and female housings when the male and female housings are joined with each other.

Referring still to Figure 3, reference numeral 13 denotes wires each having a distal end terminating at

a corresponding receptacle contact 14. A ferrule 14A (crown-shaped cap) is mounted on the distal end of the receptacle contact. A pin contact 15 is received into the corresponding receptacle contact through the corresponding ferrule.

Each pin contact extends through the bottom portion of the cavity of the female housing 11. In the illustrated structure, the pin contact extending through the housing is inserted into and fixed on a printed circuit board 20 through an alignment plate 16.

Reference numeral 17 denotes a bushing having a plurality of holes for receiving the wires 13. The bushing 17 serves to seal the wires 13 and the male housing 10. Reference numeral 18 denotes a packing rubber member and reference numeral 19, a unit case.

Since the seal ring according to the present invention has the locking grooves which are respectively engaged with the latch projections formed on the bottom of the cavity of the female housing, the seal ring is not inadvertently folded or the like when the male housing is fitted in the cavity of the female housing. Therefore, the sealing effect is not impaired.

Since the seal ring is fixed in the cavity of the female housing, the seal ring tends not to be adversely affected externally. A special structure for protecting the seal ring (e.g., a cylindrical outer wall for protecting the seal ring in a known connector) is not required, thereby providing a compact structure.

Since each locking groove of the seal ring of the present device has a groove extending in a direction perpendicular to the direction of depth of the locking groove, the seal ring is not easily removed from the latch projections.

Having described the preferred embodiment of the present invention herein, it should be understood that variations may be made thereto without departing from the contemplated scope. Accordingly, the description of the preferred embodiment is intended to be illustrative rather than limiting. The true scope of the invention is set forth in the claims appended hereto.

Claims

1. A connector seal ring comprising an elastomeric ring body (1), at least one projection (2) formed on an outer peripheral surface of said ring body, at least one projection (3) formed on an inner peripheral surface of said ring body, and a locking groove (4) extending into said ring and between said projections (2, 3), said locking groove (4) having a groove (4A) communicating therewith and formed in a direction generally perpendicular to the direction of depth of said locking groove (4).
2. A connector seal ring according to Claim 1,

wherein said projections (2, 3) extend in substantially opposite directions and wherein said locking groove (4) extends into said ring body (1) in a direction generally perpendicular to the direction of the projections (2, 3).

3. A seal ring according to Claim 1 or Claim 2, wherein said projections (2, 3) are formed at substantially corresponding opposite positions.
4. A sealed connector comprising a male housing (10), a female housing (11) having a cavity receiving said male housing, and a seal ring according to any one of Claims 1 to 3, wherein said seal ring is disposed in said cavity and interposed between an outer wall surface of said male housing and an inner wall surface of said female housing when said male and female housings are joined with each other.
5. A sealed connector according to Claim 4, wherein said locking groove (4) is formed to correspond to a latch projection (12) on said female housing (11) and projecting into said cavity such that said locking groove (4) engages with said latch projection (12).
6. A sealed connector according to Claim 4 or Claim 5, wherein said seal ring (1) is disposed on a surface of said female housing, said projection (2) being in interference fit with said female housing surface for holding said ring thereon.

Patentansprüche

1. Verbinderdichtring umfassend einen elastomeren Ringkörper (1), zumindest einen Vorsprung (2) gebildet an einer äußeren peripheren Oberfläche des Ringkörpers, zumindest einen Vorsprung (3), gebildet an einer inneren peripheren Oberfläche des Ringkörpers, und eine Verschlusrrille bzw. -nut (4), welche sich in den Ring und zwischen den Vorsprüngen (2, 3) erstreckt, wobei die Verschlusrrille (4) eine mit ihr verbundene Rille (4a) hat, welche im wesentlichen in einer Richtung senkrecht zu der Richtung der Tiefe der Verschlusrrille (4) gebildet ist.
2. Verbinderdichtring gemäß Anspruch 1, wobei die Vorsprünge (2, 3) sich im wesentlichen in entgegengesetzten Richtungen erstrecken und wobei die Verschlusrrille (4) sich in dem Ringkörper (1) in einer im wesentlichen senkrechten Richtung zu der Richtung der Vorsprünge (2, 3) erstreckt.
3. Verbinderdichtring gemäß Anspruch 1 oder 2, wobei die Vorsprünge (2, 3) in gegenüberliegen-

den Positionen ausgebildet sind, die sich im wesentlichen entsprechen.

4. Gedichteter Verbinder, umfassend ein männliches Gehäuse (10), ein weibliches Gehäuse (11), welches eine Aushöhlung hat zum Aufnehmen des männlichen Gehäuses, und einen Dichtring gemäß einem der Ansprüche 1 bis 3, wobei der Dichtring in der Aushöhlung und zwischen einer äußeren Wand- bzw. Wandungsoberfläche des männlichen Gehäuses und einer inneren Wandungsoberfläche des weiblichen Gehäuses angeordnet ist, wenn das männliche mit dem weiblichen Gehäuse zusammengeführt wird. 5 10
5. Gedichteter Verbinder gemäß Anspruch 4, wobei die Verschlusrrille (4) entsprechend einem Klinkenvorsprung (12) an dem weiblichen Gehäuse (11) gebildet ist, welcher in die Aushöhlung vorspringt, so daß die Verschlusrrille (4) mit dem Klinkenvorsprung (12) eingreift. 15 20
6. Gedichteter Verbinder gemäß Anspruch 4 oder 5, wobei der Dichtring (1) an einer Oberfläche des weiblichen Gehäuses angeordnet ist, wobei der Vorsprung (2) in passendem Eingriff, zum Halten des Ringes daran mit der weiblichen Gehäuseoberfläche ist. 25

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Revendications

1. Bague d'étanchéité pour connecteur, comprenant un corps annulaire en élastomère (1), au moins une saillie (2) formée sur une surface périphérique extérieure dudit corps annulaire, au moins une saillie (3) formée sur une surface périphérique intérieure dudit corps annulaire, et une gorge de blocage (4) s'étendant dans ledit corps annulaire entre lesdites saillies (2, 3), ladite gorge de blocage (4) ayant une rainure (4A) qui communique avec elle et qui est ménagée dans une direction globalement perpendiculaire à la direction de la profondeur de ladite gorge de blocage (4). 35 40 45
2. Bague d'étanchéité pour connecteur selon la revendication 1, dans laquelle lesdites saillies (2, 3) s'étendent dans des directions sensiblement opposées et dans laquelle ladite gorge de blocage (4) s'avance à l'intérieur dudit corps annulaire (1) dans une direction globalement perpendiculaire à la direction des saillies (2, 3). 50
3. Bague d'étanchéité selon la revendication 1 ou la revendication 2, dans laquelle lesdites saillies (2,3) sont formées dans des positions sensiblement opposées correspondantes. 55

4. Connecteur étanche comprenant un boîtier mâle (10), un boîtier femelle (11) qui présente une cavité recevant ledit boîtier mâle, et une bague d'étanchéité conforme à l'une quelconque des revendications 1 à 3, dans lequel ladite bague d'étanchéité est disposée dans ladite cavité et est interposée entre une surface de paroi extérieure dudit boîtier mâle et une surface de paroi intérieure dudit boîtier femelle quand lesdits boîtiers mâle et femelle sont réunis l'un à l'autre.
5. Connecteur étanche selon la revendication 4, dans lequel ladite gorge de blocage (4) est ménagée dans une position correspondant à celle d'une saillie de verrouillage (12) présente sur ledit boîtier femelle (11) et saillant à l'intérieur de ladite cavité d'une façon telle que ladite gorge de blocage (4) vienne en prise avec ladite saillie de verrouillage (12).
6. Connecteur étanche selon la revendication 4 ou la revendication 5, dans lequel ladite bague d'étanchéité (1) est disposée sur une surface dudit boîtier femelle, ladite saillie (2) étant en contact à ajustement serré avec ladite surface du boîtier femelle pour retenir ladite bague sur cette dernière.

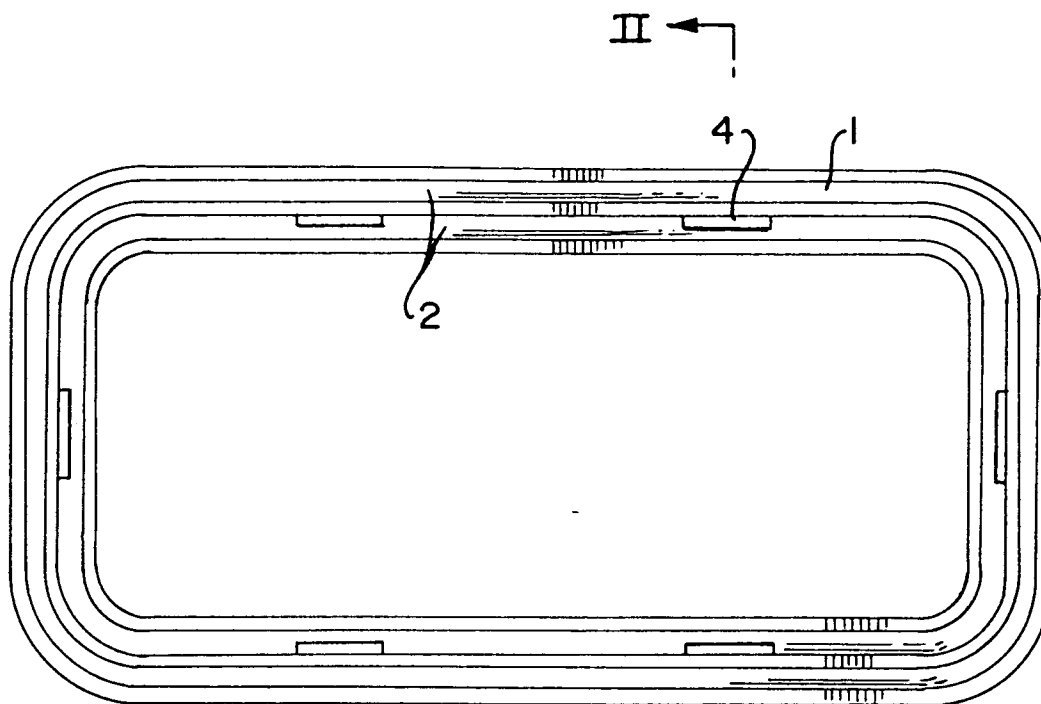


FIG. 1

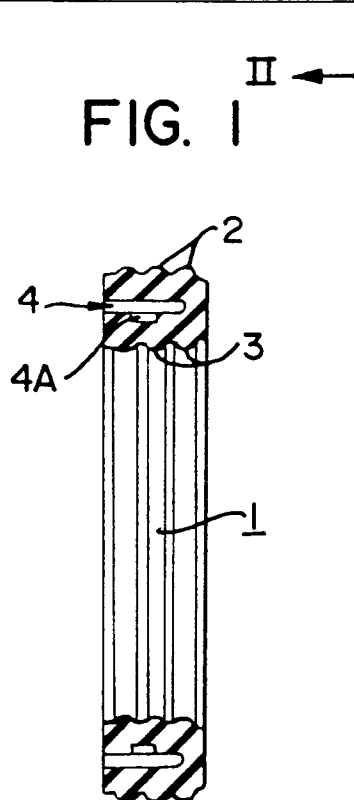


FIG. 2

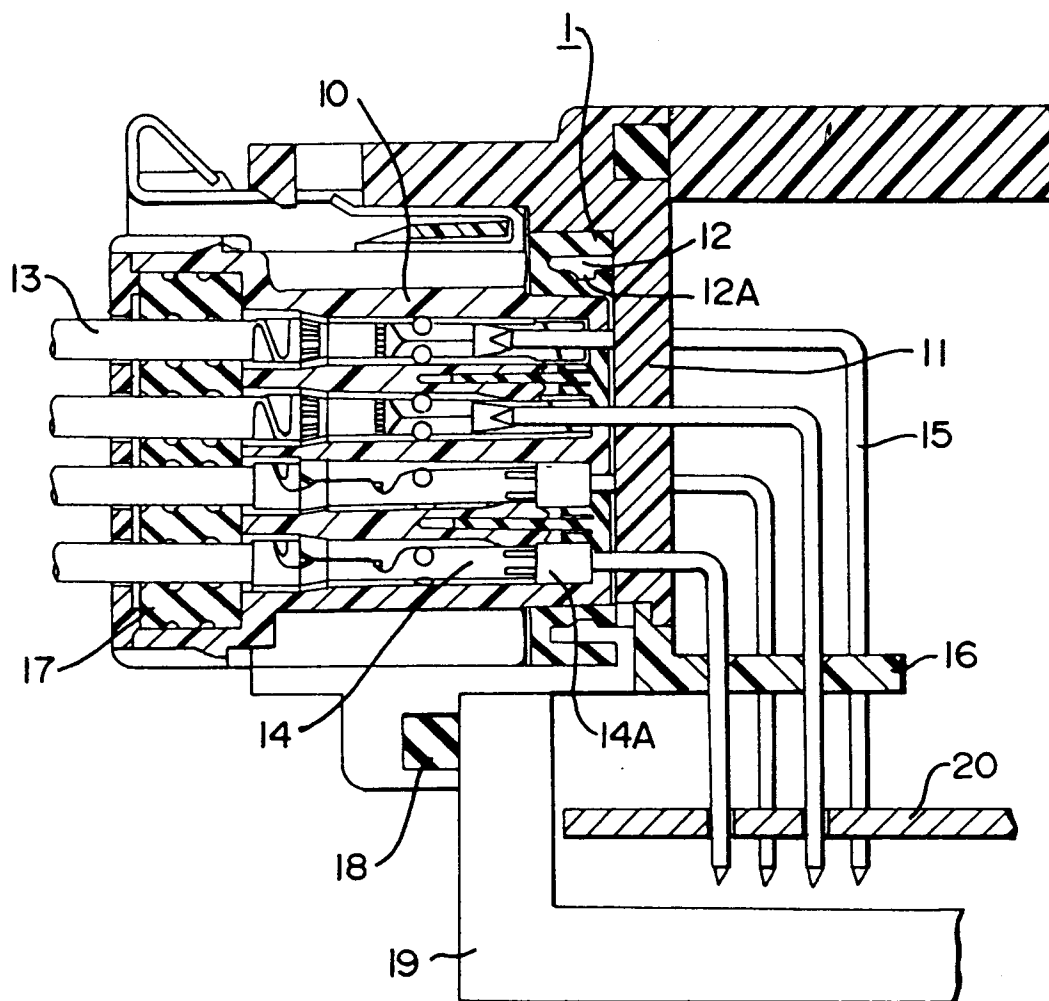


FIG. 3