

Description

The invention relates to a sealing device according to the preamble of claim 1.

In a sealing device of said kind (EP-A 0 084 282), a moisture seal is provided for an electrical connector which includes a receptacle member and a plug member. The receptacle member is fixed within the opening of a panel, and the plug member has an outer sleeve with a moisture seal which engages the panel when the plug member is inserted into the receptacle member. The moisture seal has a radially inwardly directed annular shoulder, which is disposed within an annular cavity of the sleeve. Whereas the panel opening may be protected against the entry of moisture, the connector itself is not protected.

A housing for an electrical connector having means for being fixed within the opening of a panel is known from DE-A 27 00 198. The fixing means include pivotably mounted latching arms with hooks at the ends, which when depressed may grip the rim of an opening. The latching arms extend in antiparallel fashion along one side of the connector housing and cover this side nearly totally.

There are a wide variety of electrical connectors which are mounted through an opening in a panel and for coupling to a mating connector on a side of the panel opposite the direction of insertion of the connector. In some applications, it is desirable to close and seal the opening in the panel to isolate the inner side of the panel from the outside environment, such as for moisture proofing the arrangement. This often is accomplished simply by grommets which surround the connector and provide a seal between the connector and the edge of the opening in the panel. The grommets may include body portions which surround and also provide protection for the connector itself, such as in the form of a boot.

Some panel mounted connectors also have latch means in the form of latch fingers for retaining the connector at a particular position relative to the opening in the panel. Usually, the latch fingers on the connector engage the panel within the opening there-through. A sealing device, therefore, must accommodate these latch fingers and, consequently, a grommet extending through the opening is impractical. In such applications, a sealing boot may surround the connector on the outside of the panel, with a peripheral sealing flange engaging the outside panel surface about the opening in the panel and surrounding the connector and its latching fingers. The peripheral flange usually is flexible, and one of the problems in using such boots is to provide pressure which will maintain the flexible flange in sealing engagement with the panel surface. This may be accomplished by outside clamps, tape or the like, but such devices may become loosened and slippage occurs resulting in loss of the seal.

This invention is directed to solving the above problems of providing an adequate seal for a panel mounted connector, with new and improved seal-facilitating features.

The above problem is solved by the teaching of claim 1.

Summary of Invention:

An object, therefore, of the invention is to provide a new and improved sealing device for closing an opening in a panel which accommodates an electrical connector.

Generally, the sealing device includes a generally hollow body positionable about the connector, with a peripheral sealing flange on the body for sealing engagement with the panel about the opening. Complementary interengaging means are provided between the body and the connector to provide a positive lock therebetween for holding the sealing device in position with the flange in sealing engagement with the panel.

The sealing device is particularly applicable for use with a connector which includes latch means for engaging the panel at the opening therein. The body of the sealing device is of a size sufficient to accommodate the latch means. Therefore, as the connector is latched to the panel, the positive lock between the sealing device and the connector, in turn, maintains the peripheral sealing flange of the sealing device in good engagement with the panel surface.

Another feature of the sealing device is the provision of a tubular portion for surrounding a cable interconnected with the connector, and including clamp means about the tubular portion for tightening the tubular portion sealingly about the cable.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is an elevational view of the sealing device of the invention positively locked to an electrical connector prior to insertion of the connector through an opening in a panel;

FIGURES 2 is a sectional view through the sealing and a panel, showing the electrical connector in elevation inserted through the panel opening;

and

FIGURES 3 is a sectional view through the sealing device, with the connector in elevation, and taken at a right-angle to the view of Figure 2.

Detailed Description of the Preferred Embodiment

Referring to the drawings in greater detail, a sealing device or boot, generally designated 10, is contemplated by the invention for closing an opening 12 in a panel 14 which accommodates an electrical connector, generally designated 16.

As best seen in Figure 2, electrical connector 16 includes a generally rectangular body 18 having a pair of latching fingers, generally designated 20, for latching the connector to panel 14 within opening 12. Each latching finger has a hinge portion 22 about which the latching finger can pivot. A cam boss 23 projects outwardly from the finger spaced from a latch arm 24, the spacing therebetween being sufficient to receive panel 14, at opening 12, as shown in Figure 2. When mounting electrical connector 16 through opening 12 in panel 14, the connector is inserted in the direction of arrow "A" (Fig. 2) whereupon cam boss 23 engages the panel at the edge of opening 12 and pivots the latch finger about hinge 22 in the direction of arrow "B" to allow the cam boss to pass through the opening. As the cam boss reaches the opposite side of the opening, the latch finger pivots outwardly, opposite the direction of arrow "B", and arm 24 engages the outside of the panel to prevent further insertion movement. The connector now is securely latched within the opening in the panel.

Sealing boot 10 includes a body portion 30 positionable about and surrounding body 18 of the connector. The sealing boot is unitarily fabricated or molded of flexible material, such as plastic or rubber, and includes an outwardly directed flexible, peripheral sealing flange 32 for engaging the outside surface 34 of panel 14 about opening 12. The body is generally rectangularly shaped and has generally straight side walls on two sides thereof, as shown in Figure 2. The stepped side walls provide sufficient space 36 (Fig. 2) to accommodate latching fingers 20 of connector 16. It can be seen in Figures 1 and 3 that peripheral sealing flange 32, in its free state, is at an angle relative to panel 14 greater than its angle represented in Figure 2. This illustrates that the sealing flange is "compressed" against surface 34 (Fig. 2) of the panel to provide a very good seal.

The invention contemplates providing a positive lock between sealing boot 10 and connector 16 in order to maintain the above-described sealing engagement between flexible peripheral flange 32 of the boot and surface 34 of panel 14. This positive lock is particularly useful with connectors having latching means between the connector and the panel, such as latching fingers 20 described above. In other words,

with the connector positionally secured relative to the panel, the positive lock between the sealing boot and the connector can maintain the seal between the boot and the panel.

More particularly, connector 18 has a pair of outwardly projecting flanges 40 (Figs. 2 and 3) on each of two opposite sides thereof. As seen in Figure 3, sealing boot 10 has flanges 42 which are provided with flat surfaces 44 and angled cam surfaces 46. In assembling boot 10 to connector 18, the boot is moved in the direction of arrow "C" (Fig. 3) whereupon angled cam surfaces 46 engage the edge of connector flanges 40 and bias the walls of the boot outwardly in the direction of arrow "D" due to the flexibility of the boot. Further movement of the boot relative to the connector in the direction of arrow "C" causes flanges 42 on the boot to snap behind flanges 40 on the outside of the connector. Flat surfaces 44 of the boot flanges engage behind the flat surfaces of the connector flanges to provide a positive lock with flat surfaces 48 on the boot engaging a flat end 50 of the connector. Therefore, with the boot locked to the connector, upon insertion of the connector through opening 12 in panel 14 as described in relation to Figure 2, peripheral sealing flange 32 of the boot is compressed against surface 34 of the panel to maintain a tight seal therebetween.

Sealing boot 10 also has a tubular portion 52 on the end thereof opposite sealing flange 32 for surrounding a cable, generally designated 54 (Figs. 1 and 2) interconnected with connector 16. Clamp means in the form of a cable tie 58 (Figs. 1 and 2) is used for positioning about tubular portion 52 for tightening the tubular portion sealingly about the cable. The cable tie may be in the form of a strap having internal ratchets, with an opening 60 in the strap at one end to receive the opposite end of the strap, the opposite end being pulled through the opening to tighten the strap about the cable.

Claims

1. A sealing device (10) for closing an opening (12) in a panel (14) which accommodates an electrical connector (16), comprising a body (30) positionable about the connector (16), a sealing flange (32) on the body (30) for sealing engagement with the panel (14) about the opening (12), and complementary interengaging means between the body (30) and the connector (16) for holding the sealing device (10) in position with the sealing flange (32) in sealing engagement with the panel (14), wherein said complementary interengaging means includes a body flange means (42) for engaging surface means (40) of said connector, characterized in that said body flange means (42)

and

FIGURES 3 is a sectional view through the sealing device, with the connector in elevation, and taken at a right-angle to the view of Figure 2.

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Sealing boot 10 includes a body portion 30 positionable about and surrounding body 18 of the connector. The sealing boot is unitarily fabricated or molded of flexible material, such as plastic or rubber, and includes an outwardly directed flexible, peripheral sealing flange 32 for engaging the outside surface 34 of panel 14 about opening 12. The body is generally rectangularly shaped and has generally straight side walls on two sides thereof, as shown in Figure 2. The stepped side walls provide sufficient space 36 (Fig. 2) to accommodate latching fingers 20 of connector 16. It can be seen in Figures 1 and 3 that peripheral sealing flange 32, in its free state, is at an angle relative to panel 14 greater than its angle represented in Figure 2. This illustrates that the sealing flange is "compressed" against surface 34 (Fig. 2) of the panel to provide a very good seal.

The invention contemplates providing a positive lock between sealing boot 10 and connector 16 in order to maintain the above-described sealing engagement between flexible peripheral flange 32 of the boot and surface 34 of panel 14. This positive lock is particularly useful with connectors having latching means between the connector and the panel, such as latching fingers 20 described above. In other words,

with the connector positionally secured relative to the panel, the positive lock between the sealing boot and the connector can maintain the seal between the boot and the panel.

More particularly, connector 16 has a pair of outwardly projecting flanges 40 (Figs. 2 and 3) on each of two opposite sides thereof. As seen in Figure 3, sealing boot 10 has flanges 42 which are provided with flat surfaces 44 and angled cam surfaces 46. In assembling boot 10 to connector 16, the boot is moved in the direction of arrow "C" (Fig. 3) whereupon angled cam surfaces 46 engage the edge of connector flanges 40 and bias the walls of the boot outwardly in the direction of arrow "D" due to the flexibility of the boot. Further movement of the boot relative to the connector in the direction of arrow "C" causes flanges 42 on the boot to snap behind flanges 40 on the outside of the connector. Flat surfaces 44 of the boot flanges engage behind the flat surfaces of the connector flanges to provide a positive lock with flat surfaces 48 on the boot engaging a flat end 50 of the connector. Therefore, with the boot locked to the connector, upon insertion of the connector through opening 12 in panel 14 as described in relation to Figure 2, peripheral sealing flange 32 of the boot is compressed against surface 34 of the panel to maintain a tight seal therebetween.

Sealing boot 10 also has a tubular portion 52 on the end thereof opposite sealing flange 32 for surrounding a cable, generally designated 54 (Figs. 1 and 2) interconnected with connector 16. Clamp means in the form of a cable tie 58 (Figs. 1 and 2) is used for positioning about tubular portion 52 for tightening the tubular portion sealingly about the cable. The cable tie may be in the form of a strap having internal ratchets, with an opening 60 in the strap at one end to receive the opposite end of the strap, the opposite end being pulled through the opening to tighten the strap about the cable.

Claims

1. A sealing device (10) for closing an opening (12) in a panel (14) which accommodates an electrical connector (16), comprising a body (30) positionable about the connector (16); a sealing flange (32) on the body (30) for sealing engagement with the panel (14) about the opening (12), and complementary interengaging means between the body (30) and the connector (16) for holding the sealing device (10) in position with the sealing flange (32) in sealing engagement with the panel (14), wherein said complementary interengaging means includes a body flange means (42) for engaging surface means (40) of said connector, characterized in that said body flange means (42)



is formed on the inside of the body (30) and said connector surface means (40) and said body flange means (42) are adapted and arranged so as to provide a snap-fit of the body (30) on the connector (16), while covering the connector (16) completely at the panel side from which the connector is inserted,

that said complementary interengaging means also includes a connector latch means (20) for engaging the panel (14) at the opening (12) therein, that said body (30) is of a size sufficient to accommodate the latch means (20) therein, that the latch means (20) includes at least two latching arms (24), each pivotably mounted on a respective hinge (22) and each including a camming surface for engaging the panel (14) and pivoting the arms (24) towards the connector (16), and in that said panel (14) is captured between the arms (24) and cam bosses (23).

2. The sealing device (10) of claim 1 wherein said body (30) with sealing flange (32) and body flange means (42) is an integrally molded flexible member and has a substantially rectangular shape with generally straight side walls on two sides thereof and stepped side walls on the other two sides to accommodate said latching means (20).
3. The sealing device (10) of claim 2 wherein said body (30) has a tubular portion (52) adapted for surrounding the cable (54) which is interconnected with the connector, and wherein said sealing device (10) also includes clamp means (58) for tightening the tubular portion (52) sealingly about the cable (54).
4. The sealing device (10) of claim 3, wherein said body (30), said sealing flange (32) and said tubular portion (52) are an integrally molded flexible member having walls of substantially uniform thickness.
5. The sealing device (10) of any of claims 1 to 4 wherein said surface means (40) of said connector (16) and said flange means (42) of said body (30) form positive lock means between the body (30) and the connector (16) for holding the sealing device (10) in position with the sealing flange (32) in sealing engagement with the panel (14).
6. The sealing device (10) of claim 5 wherein said body flange means (42) includes at least a substantially flat surface (44) which is formed on the inside of the body (30) for snapping behind said surface means (40) which also includes at least a substantially flat surface formed on the outside of the connector (16), the two flat

surfaces being forced into a parallel, abutting relationship, when the body flange means (42) snaps past the surface means (40).

- 5 7. The sealing device (10) of claim 2 wherein said body (30) and said sealing flange (32) have substantially rectangular outlines, seen in direction of said opening (12) in said panel (14).

10 Patentansprüche

1. Abdichtung (10) zum Verschließen einer Öffnung (12) in einer Schalttafel (14), die einen elektrischen Steckverbinder (16) aufnimmt, mit einem um den Steckverbinder (16) anordenbaren Gehäuse (30), mit einem Abdichtflansch (32) am Gehäuse (30) zur abdichtenden Anlage an der Schalttafel (14) um die Öffnung (12) und mit komplementär ineinandergreifenden Einrichtungen zwischen dem Gehäuse (30) und dem Steckverbinder (16) zum Halten der Abdichtung (10) in einer Stellung mit dem Abdichtflansch (32) in Abdichtanlage an der Schalttafel (14), worin die komplementäre, ineinandergreifende Einrichtung eine Gehäuseflanscheinrichtung (42) zur Anlage an einer Oberflächeneinrichtung (40) des Steckverbinders aufweist, dadurch gekennzeichnet, daß die Gehäuseflanscheinrichtung (42) auf der Innenseite des Gehäuses (30) ausgebildet ist und daß die Steckverbinder-Oberflächeneinrichtung (40) und die Gehäuseflanscheinrichtung (42) so ausgebildet und angeordnet sind, daß eine Rastpassung des Gehäuses (30) am Steckverbinder (16) geschaffen wird, während der Steckverbinder (16) vollständig an der Schalttafel abgedeckt ist, von der aus der Steckverbinder eingeführt wird, daß die komplementäre, ineinandergreifende Einrichtung eine Steckverbinder-Riegeleinrichtung (20) zur Anlage an der Schalttafel (14) an deren Öffnung (12) aufweist, daß das Gehäuse (30) genügend groß ist, die Riegeleinrichtung (20) aufzunehmen, daß die Riegeleinrichtung (20) mindestens zwei Riegelarme (24) umfaßt, die jeweils um ein entsprechendes Scharnier (22) schwenkbar angebracht sind und jeweils eine Nockenfläche zur Anlage an der Schalttafel (14) und zum Verschwenken der Arme (24) zum Steckverbinder (16) hin umfassen und daß die Schalttafel (14) zwischen den Armen (24) und Nockenvorsprüngen (23) gefangen wird.
2. Abdichtung (10) nach Anspruch 1, dadurch gekennzeichnet, daß das Gehäuse (30)



mit dem Abdichtflansch (32) und die Gehäuseflanscheinrichtung (42) ein integral geformtes, biegsames Teil darstellt und im wesentlichen rechteckförmige Gestalt mit im großen und ganzen geraden Seitenwänden auf beiden Seiten und stufenförmigen Seitenwänden an den anderen beiden Seiten aufweist, um die Riegeleinrichtung (20) aufzunehmen.

3. Abdichtung (10) nach Anspruch 2, dadurch gekennzeichnet, daß das Gehäuse (30) einen rohrförmigen Abschnitt (52) aufweist, der zum Umfassen des Kabels (54) ausgebildet ist, welches mit dem Steckverbinder verbunden ist, und daß die Abdichtung (10) noch eine Klemmeinrichtung (58) umfaßt, um die rohrförmigen Abschnitt (52) abdichtend um das Kabel (54) zu befestigen.
4. Abdichtung (10) nach Anspruch 3, dadurch gekennzeichnet, daß das Gehäuse (30), der Abdichtflansch (32) und der rohrförmige Abschnitt (52) ein integral geformtes, flexibles Teil mit Wänden von im wesentlichen gleichförmiger Dicke darstellen.
5. Abdichtung (10) nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Oberflächeneinrichtung (40) des Steckverbinders (16) und die Flanscheinrichtung (42) des Gehäuses eine zwangswise Verriegelung zwischen dem Gehäuse (30) und dem Steckverbinder (16) bilden, um die Abdichtung (10) in richtiger Stellung mit dem Abdichtflansch (32) in Abdichteingriff an der Schalttafel (14) zu halten.
6. Abdichtung (10) nach Anspruch 5, dadurch gekennzeichnet, daß die Gehäuseflanscheinrichtung (42) mindestens eine im wesentlichen ebene Oberfläche (44) umfaßt, die auf der Innenseite des Gehäuses (30) ausgebildet ist, um hinter die Oberflächeneinrichtung (40) einzufallen, welche mindestens eine im wesentlichen ebene Oberfläche umfaßt, die auf der Außenseite des Steckverbinders (16) angeformt ist, und daß die beiden ebenen Oberflächen in paralleler Stellung und in Anlage zueinander gezwungen werden, wenn die Gehäuseflanscheinrichtung (42) hinter die Oberflächeneinrichtung (40) einfällt.
7. Abdichtung (10) nach Anspruch 2, dadurch gekennzeichnet, daß das Gehäuse (30) und der Abdichtflansch (32) im wesentlichen rechteckförmige Umrisse besitzen, gesehen in Richtung der Öffnung (12) in der Schalttafel (14).

Revendications

1. Dispositif d'étanchéité (10) pour obturer une ouverture (12) d'un panneau (14) qui reçoit un connecteur électrique (16), comprenant un corps (30) pouvant être placé autour du connecteur (16), une collerette d'étanchéité (32) sur le corps (30) pour un contact d'étanchéité avec le panneau (14) autour de l'ouverture (12), et un moyen d'enclenchement réciproque complémentaire entre le corps (30) et le connecteur (16) pour maintenir le dispositif d'étanchéité (10) en position, la collerette d'étanchéité (32) étant en contact étanche avec le panneau (14), dans lequel ledit moyen d'enclenchement réciproque complémentaire comprend un moyen formant collerette de corps (42) pour coopérer avec un moyen formant surface (40) dudit connecteur ;
caractérisé en ce que ledit moyen formant collerette de corps (42) est formé à l'intérieur du corps (30) ; et
en ce que ledit moyen formant surface de connecteur (40) et ledit moyen formant collerette de corps (42) sont conçus et agencés pour réaliser un montage à encliquetage du corps (30) sur le connecteur (16), tout en recouvrant complètement le connecteur (16) du côté du panneau à partir duquel on introduit le connecteur ;
en ce que ledit moyen d'enclenchement réciproque complémentaire comprend également un moyen de verrouillage de connecteur (20) pour coopérer avec le panneau (14) au droit de l'ouverture (12) qui y est pratiquée ;
en ce que ledit corps (30) est d'une taille suffisante pour y loger le moyen de verrouillage (20) ;
en ce que le moyen de verrouillage (20) comprend au moins deux bras de verrouillage (24), chacun monté de façon à pouvoir pivoter sur une articulation (22) et chacun comportant une surface agissant comme une came pour contacter le panneau (14) et pour faire pivoter les bras (24) vers le connecteur (16) ; et
en ce que ledit panneau (14) est emprisonné entre les bras (24) et des bossages de came (23).
2. Dispositif d'étanchéité (10) selon la revendication 1
dans lequel ledit corps (30) avec ladite collerette d'étanchéité (32) et ledit moyen formant collerette de corps (42) est un élément souple moulé d'un seul tenant et a une forme sensiblement rectangulaire avec des parois latérales globalement rectilignes sur deux de ses côtés et des parois latérales à gradin sur les deux autres côtés pour loger ledit moyen de verrouillage (20).



3. Dispositif d'étanchéité (10) selon la revendication 2

dans lequel ledit corps (30) possède une partie tubulaire (52) conçue pour entourer le câble (54) qui est interconnecté avec le connecteur, et dans lequel ledit dispositif d'étanchéité (10) comprend également un moyen de serrage (58) pour serrer la partie tubulaire (52) de manière étanche autour du câble (54).

4. Dispositif d'étanchéité (10) selon la revendication 3

dans lequel ledit corps (30), ladite collerette d'étanchéité (32) et ladite partie tubulaire (52) sont un élément souple moulé d'un seul tenant ayant des parois d'une épaisseur sensiblement uniforme.

5. Dispositif d'étanchéité (10) selon l'une quelconque des revendications 1 à 4

dans lequel ledit moyen formant surface (40) dudit connecteur (16) et ledit moyen formant collerette (42) dudit corps (30) forment un moyen de verrouillage mécanique entre le corps (30) et le connecteur (16) pour maintenir le dispositif d'étanchéité (10) en position, la collerette d'étanchéité (32) étant en contact d'étanchéité avec le panneau (14).

6. Dispositif d'étanchéité (10) selon la revendication 5

dans lequel ledit moyen formant collerette de corps (42) comprend au moins une surface sensiblement plate (44) qui est formée du côté intérieur du corps (30) pour s'encliquer derrière ledit moyen formant surface (40) qui comprend également au moins une surface sensiblement plate formée sur l'extérieur du connecteur (16), les deux surfaces plates étant forcées dans une disposition en butée, parallèle, lorsque le moyen formant collerette de corps (42) s'encliquette au-delà du moyen formant surface (40).

7. Dispositif d'étanchéité (10) selon la revendication 2

dans lequel ledit corps (30) et ladite collerette d'étanchéité (32) ont des profils sensiblement rectangulaires, vus dans la direction de ladite ouverture (12) dudit panneau (14).

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