

Description

This invention relates to an electrical connector assembly, and particularly to an electrical connector assembly comprising two mateable housings and means to seal the interface between the two housings when mated against the ingress of moisture.

Such sealed connector assemblies find use in automobiles at positions where the splashing of water onto the assemblies could, if unsealed assemblies were used, result in short circuit problems.

In EP-A-0072104 there is disclosed an electrical connector assembly in which the interface between two mateable housings is sealed by means of a planar sealing gasket which is compressed between opposed surfaces of the two housings when they are mated.

Such a sealing arrangement has the disadvantage that sealing is achieved only in planes normal to the direction of mating of the housings and is thus limited to the available area of the opposed surfaces of the two housings which engage the gasket.

US-A-3 937 545 discloses an electrical connector comprising first and second mateable housings and means to seal the interface between the housings when mated, against the ingress of moisture, the sealing means comprising a resilient gasket 75. The second housing has a projecting shroud receivable in a blind cavity formed by inner and outer walls of the first housing.

FR-A-1 314 138 discloses a resilient gasket mounted in a blind cavity in one member of a multipart housing and a mating housing having a projecting shroud which is received in the cavity between the gasket and an inner wall of the cavity and compresses one portion of the gasket in the mating direction against the blind end wall of the cavity and another portion against an outer wall of the cavity.

It is an object to provide an improved sealed electrical connector assembly.

According to the present invention there is provided an electrical connector assembly comprising first and second mateable housings and means to seal the interface between the housings when mated, against the ingress of moisture, the sealing means comprising a resilient gasket, the second housing having a projecting shroud receivable in a blind cavity formed by inner and outer walls of the first housing with a projecting wall of the shroud received between the outer wall of the cavity and the gasket, characterised in that the gasket is mounted in the blind cavity and a further wall of the shroud serves to compress the gasket in the direction of insertion of the shroud into the cavity such compression serving to urge the gasket into sealing engagement with the inner wall of the cavity and the projecting wall of the shroud.

The assembly of this invention has the advantage that sealing is provided not only at the

opposed surfaces of the housings, which engage the gasket in the direction of mating of the housings, but also over a surface encircling the gasket, the effective sealing surface area thus being relatively large.

An electrical connector assembly according to this invention will now be described by way of example with reference to the drawings, in which:—

Figure 1 is an exploded perspective view of the assembly;

Figure 2 is a longitudinal sectional view of one housing of the assembly in the assembled state;

Figure 3 is a view similar to Figure 2 but of the other housing of the assembly;

Figure 4 is a view of the housings of Figures 2 and 3 in a mated condition; and

Figure 5 is a sectional fragmentary view showing the area of sealing in the assembly.

The assembly shown in Figure 1 comprises first and second housings 1 and 2 each moulded from an electrically insulating plastics material.

The first housing 1 is formed with three pairs of through cavities 3 each to receive and retain a female contact 20 terminating an insulated conductor 21. Each pair of cavities 3 is defined by an individual annular inner wall 4 of the housing 1, the three inner walls 4 being surrounded by a single outer wall 5 which with the inner walls 4 defines a blind cavity 6 which surrounds the inner wall 4 and extends between them.

The second housing member 2 is formed with six through cavities 7 each to receive and retain a male contact 30 terminating an insulated conductor 31. Mating portions of the male contacts 30 project out of the cavities 7, and are surrounded by a shroud 8 having at its free end a projecting wall 9 thinner than the remainder of the wall of the shroud 8, the remainder thus terminating in a wall 10 facing the free end of the shroud 8.

As shown by Figures 4 and 5, the shroud 8 is sized and arranged to be received in the cavity 6 in the housing 1 about the inner walls 4 when the housings 1 and 2 are mated to mate the contacts 20 and 30 carried by the housings 1 and 2.

The assembly also includes a resilient sealing gasket 11 sized and adapted to be received in the cavity 6 in the housing 1, the gasket 11 having three through holes 12 each to receive a respective inner wall 4 of the housing 1.

As best seen in Figure 5, the surfaces of the gasket 11 facing each inner wall 4 of the housing 1 are each formed with an annular groove 18 which receives an annular rib 15 on the opposed inner wall 4 thereby to secure the gasket 11 in the cavity 6 in the housing 1.

The outer surface of the gasket 11 is formed with two initially rounded peripheral ribs 13 while the surfaces of the holes 12, which face the inner walls 4, are each formed with two arcuate cross-section peripheral grooves 14 (Figure 5).

On mating of the housings 1 and 2, with the gasket 11 mounted in the cavity 6 as shown in Figure 2, the wall 10 of the shroud 8 on the



housing 3 engages the gasket 11 and compresses it in the direction of insertion of the shroud 8 into cavity 6. The projecting wall 9 of the shroud 8 is received between the ribs 13 on the gasket 11 and the outer wall 5 of the housing 1, as best seen in Figure 5. The compression of the gasket 11 by the wall 10 of the shroud 8 urges the gasket 11 into sealing engagement with the inner walls 4 of the cavity 6 and the projecting wall 9 of the shroud 8, this causing compression of the ribs 13 as shown in Figure 5.

The gasket 11 thus serves to seal the interface between the housings 1 and 2 when mated as shown in Figure 4, by preventing any moisture which enters between the outer wall 5 of the housing 1 and the shroud 8 of the housing 2 from passing into the contact-containing cavities 3 and 7 of the housings 1 and 2.

As clearly shown in Figure 5 the ribs 15 on the inner walls 4 of the housing 1 have a chamfered corner 16 facing the open end of the cavity 6. This chamfered corner 16 serves to facilitate insertion of the gasket 11 into the cavity 6, the gasket 11 simply being pushed into the cavity 6 with the chamfered corners 16 serving to lift the leading end of the gasket 11 over the ribs 15 until the ribs 15 become received in the grooves 18 in the gasket 11.

The housings 1 and 2 are provided with co-operating latching means which serve to hold the housings 1 and 2 together in the mated condition with the gasket 11 in its compressed, sealing condition. These latching means comprise a pair of ramps 17 on one side of the housing 2 and a co-operating arm arrangement 18 on the housing 1. Such a latching means is described in U.S. Patent Specification No. 4,272,145 and will not therefore be described in detail herein. The essential difference is that in the assembly disclosed in the U.S. patent there is only a single ramp which is used by the arm arrangement as a pivot to effect release of the latching between the housings, whereas in the present assembly the arm arrangement pivots on the housing carrying the arm arrangement to effect release of the latching.

At the conductor-entry end each housing 1 or 2 is sealed by ribbed plug members 19 one of which is crimped into each conductor 21 or 31 together with the associated contact 20 or 30 so as to be received in the cavity 3 or 7 receiving the contact 20 or 30 to seal the conductor-entry end of each cavity 3 or 7 against the ingress of moisture.

Each contact 20 or 30 is secured in its associated cavity 3 or 7 in housing 1 or 2 by means of a resilient latch arm 22 formed in a wall of the cavity 3 or 7, the latch arm 22 having a projection 23 at its free end, which engages in an aperture in the associated contact 20 or 30. A second means of securing the contacts 20 or 30 in their cavities 3 or 7 is provided by a fingered plate 24 which is received and becomes latched in a slot 25 (Figure 1) in one wall of the housing 1 or 2 with the free ends of the fingers 26 of the plate 24 being received in holes 27 in the opposite wall of

the housing 1 or 2. The spacing between the fingers 26 of the plate 24 is just sufficient to pass the conductors 21 or 31 but will not pass the contacts 20 or 30 or the sealing plug members 19 whereby with the plate 24 in place the contacts 20 or 30, and the plug member 19 are secured in their cavities 3 or 7.

Claims

1. An electrical connector assembly comprising first and second mateable housings (1 and 2) and means (11) to seal the interface between the housings (1, 2) when mated, against the ingress of moisture, the sealing means (11) comprising a resilient gasket, the second housing (2) having a projecting shroud (8) receivable in a blind cavity (6) formed by inner and outer walls of the first housing (1) with a projecting wall (9) of the shroud (8) received between the outer wall (5) of the cavity and the gasket (11), characterised in that the gasket is mounted in the blind cavity and a further wall (10) of the shroud (8) serves to compress the gasket (11) in the direction of insertion of the shroud (8) into the cavity (6), such compression serving to urge the gasket (11) into sealing engagement with the inner wall (4) of the cavity (6) and the projecting wall (9) of the shroud (8).

2. An assembly as claimed in claim 1, characterised in that the surface of the gasket (11) facing the inner wall (4) of the first housing (1) is formed with an annular groove (18) to receive a rib (15) on the inner wall (4) thereby to secure the gasket (11) in the cavity (6).

3. An assembly as claimed in claim 1 or claim 2, characterised in that the outer surface of the gasket (11) is formed with one or more peripheral ribs (13) which is or are urged into contact with the projecting wall (9) of the shroud (8) on the second housing (2) when the gasket (11) is compressed.

4. An assembly as claimed in claim 1, claim 2 or claim 3, characterised in that the surface of the gasket (11) facing the inner wall (4) of the first housing (1) is formed with one or more peripheral grooves (14).

5. An assembly as claimed in claim 1, claim 2, claim 3 or claim 4, characterised in that the first housing (1) has a plurality of said inner walls (4) each surrounding one or more contact-receiving cavities (3) in the first housing (1), the gasket (11) being formed with a corresponding plurality of through holes (12) in which the inner walls (4) are respectively received when the housings (1, 2) are mated, the projecting wall (9) of the shroud (8) then surrounding the complete gasket (11).

6. An electrical connector assembly according to claim 2 or any one of claims 3 to 5 when dependent on claim 2, characterised in that an aperture is formed in a cavity wall of the first housing (1) in alignment with the rib (15) in the mating direction.

housing 3 engages the gasket 11 and compresses it in the direction of insertion of the shroud 8 into cavity 6. The projecting wall 9 of the shroud 8 is received between the ribs 13 on the gasket 11 and the outer wall 5 of the housing 1, as best seen in Figure 5. The compression of the gasket 11 by the wall 10 of the shroud 8 urges the gasket 11 into sealing engagement with the inner walls 4 of the cavity 6 and the projecting wall 9 of the shroud 8, this causing compression of the ribs 13 as shown in Figure 5.

The gasket 11 thus serves to seal the interface between the housings 1 and 2 when mated as shown in Figure 4, by preventing any moisture which enters between the outer wall 5 of the housing 1 and the shroud 8 of the housing 2 from passing into the contact-containing cavities 3 and 7 of the housings 1 and 2.

As clearly shown in Figure 5 the ribs 15 on the inner walls 4 of the housing 1 have a chamfered corner 16 facing the open end of the cavity 6. This chamfered corner 16 serves to facilitate insertion of the gasket 11 into the cavity 6, the gasket 11 simply being pushed into the cavity 6 with the chamfered corners 16 serving to lift the leading end of the gasket 11 over the ribs 15 until the ribs 15 become received in the grooves 18 in the gasket 11.

The housings 1 and 2 are provided with co-operating latching means which serve to hold the housings 1 and 2 together in the mated condition with the gasket 11 in its compressed, sealing condition. These latching means comprise a pair of ramps 17 on one side of the housing 2 and a co-operating arm arrangement 18 on the housing 1. Such a latching means is described in U.S. Patent Specification No. 4,272,145 and will not therefore be described in detail herein. The essential difference is that in the assembly disclosed in the U.S. patent there is only a single ramp which is used by the arm arrangement as a pivot to effect release of the latching between the housings, whereas in the present assembly the arm arrangement pivots on the housing carrying the arm arrangement to effect release of the latching.

At the conductor-entry end each housing 1 or 2 is sealed by ribbed plug members 19 one of which is crimped into each conductor 21 or 31 together with the associated contact 20 or 30 so as to be received in the cavity 3 or 7 receiving the contact 20 or 30 to seal the conductor-entry end of each cavity 3 or 7 against the ingress of moisture.

Each contact 20 or 30 is secured in its associated cavity 3 or 7 in housing 1 or 2 by means of a resilient latch arm 22 formed in a wall of the cavity 3 or 7, the latch arm 22 having a projection 23 at its free end, which engages in an aperture in the associated contact 20 or 30. A second means of securing the contacts 20 or 30 in their cavities 3 or 7 is provided by a fingered plate 24 which is received and becomes latched in a slot 25 (Figure 1) in one wall of the housing 1 or 2 with the free ends of the fingers 26 of the plate 24 being received in holes 27 in the opposite wall of

the housing 1 or 2. The spacing between the fingers 26 of the plate 24 is just sufficient to pass the conductors 21 or 31 but will not pass the contacts 20 or 30 or the sealing plug members 19 whereby with the plate 24 in place the contacts 20 or 30, and the plug member 19 are secured in their cavities 3 or 7.

Claims

1. An electrical connector assembly comprising first and second mateable housings (1 and 2) and means (11) to seal the interface between the housings (1, 2) when mated, against the ingress of moisture, the sealing means (11) comprising a resilient gasket, the second housing (2) having a projecting shroud (8) receivable in a blind cavity (6) formed by inner and outer walls of the first housing (1) with a projecting wall (9) of the shroud (8) received between the outer wall (5) of the cavity and the gasket (11), characterised in that the gasket is mounted in the blind cavity and a further wall (10) of the shroud (8) serves to compress the gasket (11) in the direction of insertion of the shroud (8) into the cavity (6), such compression serving to urge the gasket (11) into sealing engagement with the inner wall (4) of the cavity (6) and the projecting wall (9) of the shroud (8).

2. An assembly as claimed in claim 1, characterised in that the surface of the gasket (11) facing the inner wall (4) of the first housing (1) is formed with an annular groove (18) to receive a rib (15) on the inner wall (4) thereby to secure the gasket (11) in the cavity (6).

3. An assembly as claimed in claim 1 or claim 2, characterised in that the outer surface of the gasket (11) is formed with one or more peripheral ribs (13) which is or are urged into contact with the projecting wall (9) of the shroud (8) on the second housing (2) when the gasket (11) is compressed.

4. An assembly as claimed in claim 1, claim 2 or claim 3, characterised in that the surface of the gasket (11) facing the inner wall (4) of the first housing (1) is formed with one or more peripheral grooves (14).

5. An assembly as claimed in claim 1, claim 2, claim 3 or claim 4, characterised in that the first housing (1) has a plurality of said inner walls (4) each surrounding one or more contact-receiving cavities (3) in the first housing (1), the gasket (11) being formed with a corresponding plurality of through holes (12) in which the inner walls (4) are respectively received when the housings (1, 2) are mated, the projecting wall (9) of the shroud (8) then surrounding the complete gasket (11).

6. An electrical connector assembly according to claim 2 or any one of claims 3 to 5 when dependent on claim 2, characterised in that an aperture is formed in a cavity wall of the first housing (1) in alignment with the rib (15) in the mating direction.



Patentansprüche

Revendications

1. Elektrischer Verbinderaufbau mit ersten und zweiten zusammenfügbaren Gehäusen (1) und (2) sowie Mitteln (11) zur Abdichtung der Zwischenfläche zwischen den Gehäusen (1, 2) in ihrem zusammengefügt Zustand gegen das Eindringen von Feuchtigkeit, wobei die Dichtmittel (11) eine elastische Dichtung umfassen und das zweite Gehäuse (2) eine vorspringende Haube (8) besitzt, die in einem Blindhohlraum (6) aufgenommen werden kann, der durch innere und äußere Wände des ersten Gehäuses (1) gebildet ist, wobei eine vorspringende Wand (9) der Haube (8) zwischen der äußeren Wand (5) des Hohlraums und der Dichtung (11) aufgenommen ist, dadurch gekennzeichnet, daß die Dichtung in dem Blindhohlraum montiert ist und eine weitere Wand (10) der Haube (8) dazu dient, die Dichtung (11) in Richtung des Einsetzens der Haube (8) in den Hohlraum (6) zusammenzudrücken, wobei dieses Zusammendrücken dazu dient, die Dichtung (11) in abdichtenden Eingriff mit der inneren Wand (4) des Hohlraums (6) und der vorspringenden Wand (9) der Haube (8) zu drücken.

2. Aufbau nach Anspruch 1, dadurch gekennzeichnet, daß die Oberfläche der Dichtung (11), die der inneren Wand (4) des ersten Gehäuses (1) zugewandt ist, mit einer ringförmigen Nut (18) zur Aufnahme einer Rippe (15) auf der inneren Wand (4) versehen ist, wodurch die Dichtung (11) in dem Hohlraum (6) festgelegt wird.

3. Aufbau nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die äußere Oberfläche der Dichtung (11) mit einer oder mehreren Umfangsrippen (13) versehen ist, welche in Kontakt mit der vorspringenden Wand (9) der Haube (8) auf dem zweiten Gehäuse (2) gedrückt wird oder werden, wenn die Dichtung (11) zusammengedrückt ist.

4. Aufbau nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß die Oberfläche der Dichtung (11), die der inneren Wand (4) des ersten Gehäuses (11) zugewandt ist, mit einer oder mehreren Umfangsnuten (14) versehen ist.

5. Aufbau nach Anspruch 1, 2, 3 oder 4, dadurch gekennzeichnet, daß das erste Gehäuse (1) eine Vielzahl der inneren Wände (4) besitzt, von denen jede einen oder mehrere Kontaktaufnahmehohlräume (3) in dem ersten Gehäuse (1) umgibt, daß die Dichtung (11) mit einer entsprechenden Vielzahl von Durchgangslöchern (12) versehen ist, in denen die inneren Wände (4) jeweils aufgenommen werden, wenn die Gehäuse (1, 2) zusammengefügt sind, und daß die vorspringende Wand (9) der Haube (8) dann die ganze Dichtung (11) umgibt.

6. Elektrischer Verbinderaufbau nach Anspruch 2 oder einem der Ansprüche 3 bis 5 in Abhängigkeit von Anspruch 2, dadurch gekennzeichnet, daß eine Öffnung in einer Hohlraumwand des ersten Gehäuses (1) in Ausrichtung mit der Rippe (15) in der Zusammensetzrichtung geformt ist.

1. Assemblage de connecteur électrique comprenant des premier et second boîtiers accouplables (1 et 2) et des moyens (11) destinés à assurer l'étanchéité, contre l'entrée d'humidité, de l'interface entre les boîtiers (1, 2) lorsqu'ils sont accouplés, les moyens d'étanchéité (11) comprenant un joint élastique, le second boîtier (2) comportant une jupe (8) en saillie pouvant être logée dans une cavité borgne (6) formée par des parois intérieure et extérieure du premier boîtier (1), une paroi (9) en saillie de la jupe (8) étant logée entre la paroi extérieure (5) de la cavité et le joint (11), caractérisé en ce que le joint est monté dans la cavité borgne et en ce qu'une autre paroi (10) de la jupe (8) sert à comprimer le joint (11) dans la direction d'insertion de la jupe (8) à l'intérieur de la cavité (6), cette compression servant à appliquer le joint (11) en contact étanche avec la paroi intérieure (4) de la cavité (6) et avec la paroi en saillie (9) de la jupe (8).

2. Assemblage selon la revendication 1, caractérisé en ce que la surface du joint (11) tournée vers la paroi intérieure (4) du premier boîtier (1) présente une gorge annulaire (18) destinée à loger une nervure (15) située sur la paroi intérieure (4) afin de fixer le joint (11) dans la cavité (6).

3. Assemblage selon la revendication 1 ou la revendication 2, caractérisé en ce que la surface extérieure du joint (11) comporte une ou plusieurs nervures périphériques (13) qui est ou qui sont appliquée(s) en contact contre la paroi en saillie (9) de la jupe (8) située sur le second boîtier (2) lorsque le joint (11) est comprimé.

4. Assemblage selon la revendication 1, la revendication 2 ou la revendication 3, caractérisé en ce que la surface du joint (11) tournée vers la paroi intérieure (4) du premier boîtier (1) présente une ou plusieurs gorges périphériques (14).

5. Assemblage selon la revendication 1, la revendication 2, la revendication 3 ou la revendication 4, caractérisé en ce que le premier boîtier (1) comporte plusieurs desdits parois intérieures (4) entourant chacune une ou plusieurs cavités (3) de réception de contacts situées dans le premier boîtier (1), le joint (11) étant traversé par un nombre correspondant de trous (12) dans lesquels les parois intérieures (4) sont logées respectivement lorsque les boîtiers (1, 2) sont accouplés, la paroi en saillie (9) de la jupe (8) entourant alors le joint complet (11).

6. Assemblage de connecteur électrique selon la revendication 2 ou l'une quelconque des revendications 3 à 5 en dépendance de la revendication 2, caractérisé en ce qu'une ouverture est formée dans une paroi de la cavité du premier boîtier (1) en alignement avec la nervure (15) dans la direction d'accouplement.

