

Electrical Connector Assembly

Detailed Description of Invention

(Field of the Invention)

This invention relates to an electrical connector assembly having a case for accommodating a connector connected with a plurality of wires.

(Prior Art)

This type of conventional electrical connector assembly is disclosed in Japanese UM Laid-open No. 179682/86. The electrical connector assembly comprises a connector having a plurality of contacts that terminate a plurality of wires, and a case for accommodating the connector. The case comprises a pair of halves to be assembled and fixed each other. The wires extend out of the case when the pair of halves are assembled.

(Problem to be Solved by the Invention)

It is desired that such a connector assembly is formed in a small size, and can be easily assembled. Especially for easier assembly, it is desired that the connector and wires are preliminary disposed on either one of the halves, and then another half can be assembled thereon such that the wires do not interrupt the engagement of the halves.

(Means to Solve the Problem)

An electrical connector assembly according to the present invention comprises a connector with a plurality of contacts terminating a plurality of wires, a case including first and second halves mutually assembled for accommodating said connector therebetween, screw receiving means formed in both of said first and second halves for receiving a screw to be used for coupling said first and second halves, said plurality of wires extending from said case when said first and second halves are assembled together, and is characterized in that said first half includes connector positioning means, wire retaining means locating in the vicinity of a side edge and a single column-shaped pillar with said screw receiving means locating at the rear side of said connector positioning means and projecting outward higher than other parts of said first half, and said second half includes an engaging structure with said screw receiving means to be

engaged with inside an end of said pillar.

It is preferable that said end of said pillar includes a recessed portion while said engaging structure includes a horn to be engaged with said recessed portion.

It is preferable that said plurality of wires consist of plural kinds of wires, where said pillar can separate different kinds of wires.

It is preferable that said plurality of wires extend out of the electrical connector assembly in the perpendicular direction with respect to the mating direction, where relatively large diameter wires are disposed through outside of said pillar to said wire retaining means while relatively small diameter wires are disposed through inside said pillar directly to said wire retaining means.

It is preferable that said connector includes a sub-connector having at least a portion of said plurality of contacts, said connector further including sub-connector retaining means.

It is preferable that at least either one of said first and second halves includes sub-connector retention assuring means.

(Embodiment)

Fig.1 is a broken perspective view of an electrical connector assembly in accordance with this invention.

As shown in Fig.1, an electrical connector assembly 10 comprises a case 20 with a pair of halves 20a, 20b, and a connector 30 accommodated inside said halves 20a, 20b. The connector 30 includes a first mating portion 31 where relatively small-sized contacts 40 are disposed, and a second mating portion 33 having four cavities 32 for receiving relatively large-sized contacts (not shown). A pair of sub-connector receiving cavities, which are for receiving sub-connectors with a plurality of other contacts to be mated with the contacts 40, are formed behind the first mating portion 31. The structure of sub-connector receiving cavities is explained hereinafter. The first and second mating portions 31, 33 are exposed outside, when the connector 30 is sandwiched between the first and second halves 20a, 20b to be retained. The contacts of the sub-connectors and the relatively large-sized contacts are connected to the wire ends. A plurality of wires, which are not shown, extend inside the case 20 toward the wire retaining means 60 to be retained, and then extend out of the case 20 from a wire extending opening 82.

Fig. 2 is a plan view of the first half of the case, and Fig. 3 is a cross section view along the line A-A in Fig. 2. Fig. 4 is a plan view of the second half of the case, and Fig. 5 is a cross section view along the line B-B in Fig. 4.

Fig. 2 shows the first half 20a for the case 20, which comprises a substantially flat plate 22a, and a side wall 23a extending along the side edge. A column-shaped pillar 24 is formed at an inside position of the plate 22a. The pillar 24 is formed on a pedestal 25 projecting in small size from the plate 22a and spreading over the plate 22a. A rectangular projection 83 is formed continuously from the pedestal 25. A wall 84 is projecting inward from the side wall 23a at the position close to the projection 83. The side wall 23a has two notched portions. One of them is a portion of a mating opening 81 for exposing the first and second mating portions 31, 33 of the connector 30, while the other is a portion of the wire extending opening 82. In the vicinity of the latter structure, a pair of thick portions 26 and a thin wall 28 bridging the thick portions 26 are formed. Each of the thick portions 26 has a hall 25 extending in its height. The thin wall 28 has two recessed wire retaining channels 27a, 27b. A locking arm 29 is formed on an outer surface of the first half 20a at the position opposite to the pillar 26 as shown in Fig. 3. The locking arm 29 is for keeping the engagement between the electrical connector assembly 10 and the mating connector.

Fig. 4 shows the second half 20b for the case 20, which also comprises a substantially flat plate 22b, and a side wall 23b. A projecting structure 76 with a pair of horns 77 is formed to locate at an inside position of the plate 22b. At the close position to the projecting structure 76, a pedestal 75 projects in small size from the plate 22b and spreads over the plate 22b. A rectangular projection 85 is continuously formed from the pedestal 75. The side wall 23b also has two notched portions. One of them is a portion of a mating opening 81 for exposing the first and second mating portions 31, 33 of the connector 30, while the other is a portion of the wire extending opening 82.

Fig. 6 is a plan view showing the disposition of connector and wires by imaginary lines.

An advantage of the electrical connector assembly in accordance with this invention relates to its easier assembling process. After wires and connector 30 are firstly disposed on the first half 20a and wiring of the wires is completed, the second half 20b is assembled onto the first half 20a. The connector disposing position is mainly determined by an edge 86 of the pedestal 25 and the side wall 23a. The edge 86 is shaped to have a step. With reference to Fig. 1 and Fig. 6, it is understood that the shape is

complementary to the rear end shape of the connector 30. Therefore, it is assured that the connector 30 is correctly positioned. The position of the connector 30 on the first half 20a is shown in Fig. 6 by an imaginary line.

In Fig. 6, wires, which are connected to the connector 30, are also shown by imaginary lines. The wires consist of two kinds of wires W1, W2. The wires W1 have relatively small diameter and electrically connected to smaller contacts 40. The wires W2 have relatively large diameter and terminated to larger contacts 50. The important feature is that the pillar 24 on the plate 22a functions as wire separating means for separating different kinds of wires. It is notable that the wires W1 with relatively small diameter directly reach the wire retaining channel 27a from the connector 30, while the wires W2 with relatively large diameter goes through outside of the pillar 24 to the wire retaining channel 27b. Therefore, the wires W1, W2 having different diameters are properly wired in accordance with their mechanical strength. Especially with reference to Fig. 3, it is to be understood that the pillar 24 has sufficient projecting height to assure wire separation so that wires W1, W2 are not mutually interfered once the wires W1, W2 are properly disposed on the first half 20a. The wires W1, W2 are retained in the wire retaining channels 27a, 27b by a metal retaining member 18 shown in Fig. 1. The metal retaining member 18 is fixed onto the first half 20a by a pair of screws 19 to be engaged with holes 25.

Fig. 7 is a partial cross section view showing functional engaging structure between the first half and the connector.

Additional advantageous functions is caused by the cooperation of the connector 30 and the half 20a, when the connector 30 is correctly positioned on the first half 20a as explained above. As shown in Fig. 6, the connector 30 is positioned over the rectangular projection 83 on the first half 20a. The cross section in the vicinity of the projection 83 is shown in Fig. 7. The connector 30 has a pair of sub-connector receiving cavities 35 arranged in its height direction at the rear side. The sub-connector receiving cavity 35 is for receiving a sub-connector 200 (shown by imaginary lines in Fig. 5), which is locked by a latch arm 36 to maintain the sub-connector 200 in the cavity 35. It is notable that the projection 83 locates behind the latch arm 36. Thereby, the latch arm 36 cannot be bent once the connector 30 is positioned on the half 20a so that sub-connector 200 is reliably kept in the sub-connector receiving cavity 35. In addition, it is also notable that when the connector 30 is positioned on the half 20a, the projection 83 engages with a notch 37, since the latch arm 36 locates inside the notch 37. This engagement also acts as connector positioning means for correctly positioning the connector 30 on the first half 20a.

Fig. 8 is a cross section view for explaining the engagement between the pillar and the projecting structure.

The second half 20b is attached onto the first half 20a after the connector 30 and the wires W1, W2 are disposed on the first half 20a. Thereby, the side walls 23a, 23b are mutually engaged to complete the mating opening 82 and wire extending opening 83, while the pillar 24 of the first half 20a is engaged with the projecting structure 76 of the second half 20b. The pillar 24 cooperates with the projecting structure 76 to complete a screw receiving means for receiving a screw to fix the first and second halves 20a, 20b. The engagement structure between the pillar and the projecting portion can be understood by referring Fig. 2, Fig. 4 and Fig. 6. The pillar 24 has a screw receiving hole 91 extending in the height direction at the center thereof, and a substantially fan-shaped recessed portion 92 at its top end. The substantially fan-shaped recessed portion 92 can be seen in Fig. 2 or Fig. 6. The recessed portion 92 communicates with the screw receiving hole 91, and have a larger diameter toward the top end of the pillar 24 to make inclined surface 95. The projecting structure 76 also has a center screw receiving hole 93 between a pair of horns 77. The screw receiving hole 93 extends through the second half 20b and has a relatively large diameter. As shown in Fig. 4, each of the horns 77 also has a substantially fan-shaped configuration, and sharpened to have an inclined outer surface 96. In this embodiment, the horns 77 have complementary shape to the recessed portions 92. Therefore, the horns 77 are completely engaged with the recessed portions 92 inside the pillar when the first half 20a is engaged with the second half 20b, whereby the screw receiving holes 91, 93 are aligned and communicated. The inclined surfaces 95, 96 cooperate to act as guiding means for smooth engagement between the horns 77 and the recessed portions 92.

The screw receiving hole 93 of the second half 20b has a large diameter portion 97. A screw (not shown) is received into the screw receiving hole 93 from the large diameter portion 97. A screw head of the screw is received in the large diameter portion 97. On the other hand the screw body is disposed through the screw receiving hole 93 of the second half 20b, and mechanically engaged with the screw receiving hole 91 having a smaller diameter than the screw receiving hole 93. Thereby, the first and second halves 20a, 20b are securely fixed each other.

As explained above, the second half 20b also has a rectangular projection 85. The function of the projection 85 is similar to that of the projection 83 of the first half 20a. When the connector 30 is sandwiched between the first and second halves 20a, 20b, the projection 85 is engaged with a notch 37 which is formed to correspond to the upper sub-connector receiving cavity 35 (Fig. 7), and locates behind the latch arm 36 inside a

notch 37 to keep the sub-connector 200 in the sub-connector receiving cavity 35. Furthermore, the connector 30 is positioned by an edge 87 of the pedestal 75 of the second half 20b so that the connector 30 can be securely retained at the desired position in the case 20.

Fig. 9 and Fig. 10 show an example of a connector housing of the connector to be used in the electrical connector assembly where Fig. 9 is a rear view and Fig. 10 is a cross section view along the line C-C in Fig. 9. Fig. 11 is a perspective view of a contact that can be received in the connector housing.

Fig. 9 and Fig. 10 show a detail of the connector housing 38 for the connector 30. According to these figures, it can be seen that the housing 38 has a pair of sub-connector receiving cavities 35 with latch arms 36 behind the first mating portion 31 and four relatively large cavities 32 for receiving relatively large contacts. An example of the contact to be received into the cavity 32 is shown in Fig. 11. The contact is referred as 50. The contact 50 has an engaging projection 51 to be engaged with a lance 39 which is formed in each of the cavities 32 for retaining the contact 50 therein. The engaging projection 51 is formed by bending a metal plate as shown in Fig. 11.

It is notable that the contact 50 includes a pair of wings 55 extending outward from its side surface, while each of the cavities 32 has a pair of channels 66 on its opposed inner surfaces 67 to receive the wings 55. The wings 55 advantageously cooperate with the channels 66 and other portions of the cavity 32 to determine proper contact orientation for the contact 50 to be inserted into the cavity 32. In addition, when the contact 50 is fully inserted in the cavity 32, undesired movement of the contact 50 in the cavity 32 is limited since the wings 55 are engaged with the channels 66 in the sufficient length along the cavity 32. In the alternative embodiment the lance 39 can be configured to provide the contact 50 with biasing force in its height direction while the wings 55 are engaged with the channels 66 so that the movement of the contact 50 is completely prevented.

A preferred embodiment of the present invention has been described above. However this embodiment is just an example, and does not limit the present invention. For example, the connector 30 can be modified to receive a plurality of male type contacts instead of the female contacts 50.

(Advantages of the Invention)

The connector assembly of the present invention includes a first half having connector positioning means, wire retaining means locating in the vicinity of a side edge and a single column-shaped pillar locating at the

rear side of the connector positioning means and projecting outward higher than other parts of the first half, and the second half includes an engaging structure to be engaged with inside an end of the pillar.

Accordingly the connector assembly can be easily assembled since a plurality of wires can be easily and reliably wired on the half. The assembly total size becomes sufficiently small, since the case halves can be fixed by a single screw means and the pillar also advantageously functions as wire separating means to achieve compact and smooth wire arrangement. In addition, in the process for assembling the first and second halves, the pillar and the projecting structure can start their engagement earlier than other parts so that the halves are assembled smoothly.

Brief Description of Drawings

- (Fig. 1) A broken perspective view of an electrical connector assembly in accordance with this invention.
- (Fig. 2) A plan view of first half of the case.
- (Fig. 3) A cross section view along the line A-A in Fig. 2.
- (Fig. 4) A plan view of second half of the case.
- (Fig. 5) A cross section view along the line B-B in Fig. 4
- (Fig. 6) A plan view showing the disposition of connector and wires by imaginary lines.
- (Fig. 7) A partial cross section view showing functional engaging structure between the first half and the connector.
- (Fig. 8) A cross section view for explaining the engagement between the pillar and the projecting structure.
- (Fig. 9) A rear view of an example of a connector housing of the connector to be used in the electrical connector assembly.
- (Fig. 10) A cross section view along the line C-C in Fig. 9
- (Fig. 11) A perspective view of a contact that can be received in the connector housing.

(Description of Reference Numerals)

10	electrical connector assmbly
18	retaining member (wire retaining means)
20	case
20a	first half
20b	second half
24	pillar
27a, 27b	wire retaining channel (wire retaining means)
30	connector
76	projecting structure
86	edge(connector positioning means)
91, 93	screw receiving means
W1, W2	wire



Claim for Patent

- 1) An electrical connector assembly having a connector with a plurality of contacts terminating a plurality of wires, a case including first and second halves mutually assembled for accommodating said connector therebetween, and screw receiving means formed in both of said first and second halves for receiving a screw to be used for coupling said first and second halves, said plurality of wires extending from said case when said first and second halves are assembled together, characterized in that:
 said first half includes connector positioning means, wire retaining means locating in the vicinity of a side edge and a single column-shaped pillar with said screw receiving means locating at the rear side of said connector positioning means and projecting outward higher than other parts of said first half; and
 said second half includes an engaging structure with said screw receiving means to be engaged with inside an end of said pillar.
- 2) An electrical connector assembly as claimed in claim 1, wherein said end of said pillar includes a recessed portion while said engaging structure includes a horn to be engaged with said recessed portion.
- 3) An electrical connector assembly as claimed in claim 1, wherein said plurality of wires consist of a plural kinds of wires, where said pillar can separate different kinds of wires.
- 4) An electrical connector assembly as claimed in claim 3, wherein said plurality of wires extend out of the electrical connector assembly in the perpendicular direction with respect to the mating direction, where relatively large diameter wires are disposed through outside of said pillar to said wire retaining means while relatively small diameter wires are disposed through inside said pillar directly to said wire retaining means.
- 5) An electrical connector assembly as claimed in claim 1, wherein said connector includes a sub-connector having at least a portion of said plurality of contacts, said connector further including sub-connector retaining means.
- 6) An electrical connector assembly as claimed in claim 5, wherein at least either one of said first and second halves includes sub-connector retention assuring means.