

ELECTRICAL CONNECTOR

An electrical connector comprising a dielectric housing having lower and upper walls and side walls enclosing a contact reception space in which an electrical contact is received when the contact is inserted into the contact reception space in a direction parallel to the lower wall, a housing lance extending from an inner surface of the upper wall and engaging the contact thereby latching the contact in position in the contact reception space with a contact section of the contact being aligned with a hole in the upper wall through which a mating contact extends for engagement with the contact section, a double-lock member mounted on the housing engaging the housing lance thereby preventing the housing lance from becoming unlatched from the contact when a pull-out force is applied to the contact.

Electrical connectors are widely used to electrically connect electric circuits. Usually, electrical connectors comprise a housing and contacts with the contacts being arranged in a contact reception space formed in the housing. The contacts are generally connected to electrical wires and are inserted in the contact reception space from an insertion direction. There is a danger that contacts can be pulled out of the housing if the wires are pulled.

Various devices are known in order to prevent the contacts from being pulled out of the housing. One of such devices constitutes housing lances which extend from an inner wall of the housing in the direction of the contact insertion therein and engage the contacts thereby preventing the contacts from being pulled out. Another known device is a double-lock member, the purpose of which is to reinforce the latching action of the housing lances in preventing contacts from being pulled out as disclosed in Utility Model Publication No.

87-129782 and Utility Model Publication No. 89-64872. A housing lance is basically an arm extending in the direction of the contact insertion into the housing, and when contacts are inserted in the contact reception space in the housing, the lances are bent in a direction perpendicular to that of the contact insertion, and after the contacts have been fully inserted, the lances return to their original position thereby latching the contacts in position in the housing so that they cannot be pulled out from the contact reception space. The conventional double-lock member described in the publications cited above represents a plate-shaped member which is inserted in the housing and positioned over the housing lances from the front end in the direction opposite to that in which the contacts are inserted and which prevents the housing lances from being deflected in the direction perpendicular to the direction of contact insertion when the contacts are in a fully-inserted position.

The conventional double-lock member described above represents a plate-shaped member inserted in the housing from the front end adjacent which the front ends of the contacts are located and which, in order to be able to be placed over the housing lances, must be rather long.

Because of this, the conventional double-lock member can be bent in the direction perpendicular to the direction of contact insertion, and if this happens, the supplementary force applied by the double-lock member to the housing lances is reduced, thus making the retention of the contacts less reliable.

Mating contacts connected to the contacts latched in place by the housing lances can be inserted in the housing both in the direction opposite to the direction of insertion of the primary contacts and in the direction perpendicular to that of the insertion of the primary contacts. Mating contacts inserted in the

direction opposite to the direction of insertion of the primary contacts are inserted in the housing nearly parallel to the direction of insertion of the double-lock member. Mating contacts, which are inserted in the direction perpendicular to the direction the primary contacts, are inserted in the housing in the direction perpendicular to that of the insertion of the double-lock member. Therefore, the double-lock member and the mating contacts interfere with each other. It is therefore difficult to use an electrical connector with a double-lock member to connect with a mating connector whose contacts are inserted in the housing of the primary connector in a direction perpendicular to that of the insertion of the contacts in the housing of the primary connector.

Considering the above mentioned circumstances, the purpose of this invention is to provide an electrical connector equipped with a double-lock member making it possible to reliably secure the contacts in a housing without reducing the reinforcement of the housing lances and at the same time allowing for the use of mating connectors whose contacts are inserted in the housing in a direction intersecting with the direction of insertion of the contacts within the housing.

In order to achieve the purposes stated above, an electrical connector according to this invention comprises a dielectric housing having lower and upper walls and side walls enclosing a contact reception space in which an electrical contact is received when the contact is inserted into the contact reception space in a direction parallel to the lower wall, a housing lance extending from an inner surface of the upper wall and engaging the contact thereby latching the contact in position in the contact reception space with a contact section of the contact being aligned with a hole in the upper wall through which a mating contact extends for

engagement with the contact section, a double-lock member mounted on the housing engaging the housing lance thereby preventing the housing lance from becoming unlatched from the contact when a pull-out force is applied to the contact, wherein a protrusion on the double-lock member extends through an opening in the upper wall of the housing and engages the housing lance in a direction perpendicular relative to the direction of contact insertion thereby maintaining the housing lance in engagement with the contact.

An important advantage of the present invention is that contacts of a mating connector are connectable with the contacts of the connector of the present invention in a direction that intersects with the direction of insertion of the contacts into the housing without interfering with the double-lock member that maintains the housing lances in latchable engagement with the contacts.

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

Figure 1 is a top plan view of an electrical connector housing of the present invention.

Figure 2 is a front view of the housing of Figure 1.

Figure 3 is a cross-sectional view taken along line 3-3 of Figure 1.

Figure 4 is a top plan view of an electrical contact to be inserted into the housing of Figure 1.

Figure 5 is a side elevational view of the contact of Figure 4.

Figure 6 is a perspective view of a double-lock member for use on the housing of Figure 1.

Figure 7 is a cross-sectional view similar to Figure 3 showing the electrical contact of Figures 4 and

5 in position in the housing and the double-lock member of Figure 6 in position on the housing.

Electrical connector 10 comprises a dielectric housing 20, electrical contacts 50 arranged in housing 20 and a double-lock member 60 fixed to housing 20.

Housing 20 has a mutually opposed bottom wall 22 and upper wall 24 spaced from each other by side walls 34 and inner walls between which contact reception spaces 26 are provided into which contacts 50 are inserted in a direction parallel to the bottom wall 22 (shown by arrow B). In upper wall 24, three holes 28 are provided for receipt therethrough of protrusions 62 of double-lock member 60, and three holes 30 for receipt therethrough of pin contacts 80 as shown in Figure 7. In addition, housing lances 32 are located under holes 28 extending from an inner surface 24a of the upper wall 24 in the direction of the contact insertion. These housing lances 32 have latching surfaces 32a for engagement with latching surfaces 50a of contacts 50.

Contacts 50 are latched in place in contact reception spaces 26 by housing lances 32 when latching surfaces 32a and 50a engage with each other, thereby preventing the contacts from being pulled out of the housing. On outer surfaces of side walls 34 of housing 20, latching lugs 36 are located which fit into latching openings 64 of the double-lock member 60 provided for the purpose of latchably securing double-lock member 60 to housing 20. Openings 40 in front wall 38 of housing 20 are provided for the extraction of the mold member used as part of the mold for molding of housing lances 32.

Contacts 50 have a contact section 52 for the connection with mating contacts 80 as pin contacts and termination section 56 intended for termination to electrical wire 54 (see Figure 7). Three contacts 50 are inserted in respective contact reception spaces 26

of housing 20 in the direction of insertion therein and latched therein by housing lances 32.

As shown in Figure 6, double-lock member 60 has a U-shaped configuration and includes upper wall 66 and two side walls 68. As was mentioned above, latching openings 64 are provided in side walls 68 which fit over latching lugs 36 of housing 20. By means of these latching openings 64 and latching lugs 36, double-lock member 60 is latchably secured to the upper wall 24 of the housing 20. In the upper wall 66, an aperture or hole 70 is provided for receiving mating pin contact 80 therethrough, and on the inside surface 66a of the upper wall 66, protrusions 62 are located which extend through openings 28 of the housing 20.

In the condition when the double-lock member 60 is latched to housing 20 by means of latching openings 64 of double-lock member 60 and latching lugs 36 of housing 20, as can be seen in Figure 7, protrusions 62 of double-lock member 60 engage with housing lances 32 in a direction perpendicular relative to the direction of the contact insertion (shown by arrow B) thereby maintaining the housing lances 32 in engagement with the contacts 50. Since the distance between upper wall 24 and housing lances 32 is short, protrusions 62 also can be made short, thus making it possible to sufficiently reinforce housing lances 32. As a result, housing lances 32 cannot be bent toward upper wall 24, thus providing reliable retention of contacts 50 in housing 20. If contacts 50 are not fully inserted in the contact reception spaces 26, the upper surface 50b of contacts 50 will push on the lower surface 32b of housing lances 32 and will slightly bend them toward the upper wall 24. The result of such action will be that an attempt to insert protrusions 62 through openings 28 and latching lugs 36 of housing 20 in engagement with latching openings 64 of the double-lock member 60 will

fail, and it will be impossible to latch double-lock member 60 to housing 20. Therefore, the failure to latch double-lock member 60 to housing 20 serves as an indicator that contacts 50 are not fully inserted in the contact reception spaces 26. From Figure 7, it is also clear that when double-lock member 60 is used, mating contacts 80 can be easily inserted in housing 20 in the direction intersecting with the direction of the insertion of contacts 50 into housing 20.

Due to the fact that in the electrical connector according to this invention described above, a double-lock member having protrusions pass through openings in an upper wall of a housing which engage with housing lances, the reinforcement of the housing lances is not reduced, thus providing sufficient protection against contacts being pulled out from the housing. It is also possible to use a mating connector the contacts of which are inserted in the housing at a direction intersecting the direction of contact insertion into the housing.

CLAIMS

1. An electrical connector comprising a dielectric housing having lower and upper walls and side walls enclosing a contact reception space in which an electrical contact is received when the contact is inserted into the contact reception space in a direction parallel to the lower wall, a housing lance extending from an inner surface of the upper wall and engaging the contact thereby latching the contact in position in the contact reception space with a contact section of the contact being aligned with a hole in the upper wall through which a mating contact extends for engagement with the contact section, a double-lock member mounted on the housing engaging the housing lance thereby preventing the housing lance from becoming unlatched from the contact when a pull-out force is applied to the contact, characterized in that a protrusion on the double-lock member extends through an opening in the upper wall of the housing and engages the housing lance in a direction perpendicular relative to the direction of contact insertion thereby maintaining the housing lance in engagement with the contact.

2. An electrical connector as claimed in claim 1, wherein the latching lugs are located on the side walls of the housing which are disposed in the latching openings of the double-lock member thereby latching the double-lock member to the housing.

3. An electrical connector as claimed in claim 1, wherein the double-lock member has an aperture in alignment with the hole in the upper wall of the housing so that the mating contact extends through the aperture and the hole for engagement with the contact section of the contact in a direction that intersects with the direction of insertion of the contact within the contact reception space.



4. An electrical connector as claimed in claim 1, wherein the housing lance extends downwardly from the inner surface of the upper wall and then forwardly in the direction of insertion of the contact into the contact reception space of the housing.