

"ELECTRICAL CONNECTOR"

5 This invention concerns an electrical connector which can, for example, be used broadly for audio equipments, amplifiers, tuners, receivers, CD players or VTRs etc to which a front panel plate may be mounted at right angles.

10 In a known electrical connector having female connector portions, as shown in Japanese Utility Model Publication No. 55-11085, a conductor part 6 is disposed beneath an insulation part 5. In this construction, however, connector members could be drawn out only in one direction when they were removed, so that connector members which were to be mounted on the front panel suffered damage during insertion or withdrawal.

15 It is an object of the invention to provide an electrical connector in which such insertion or withdrawal can be effected through a broader range of directions.

20 According to the present invention, there is provided an electrical connector comprising a male connector portion having a plurality of male contact pins; a female connector portion whose periphery is provided with a plurality of openings having female contact arms therein for gripping the male contact pins; and
25 a panel to which the male connector portion is secured and which has an aperture through which the female connector portion extends, the aperture limiting relative movement between the male and female connector portions.

30 Preferably, each male contact pin is gripped between a pair of female contact arms.

The aperture preferably has wall surface portions which are disposed on opposite sides of and are spaced from the female connector portion.

5 Preferably, the space between a said wall surface portion and the female connector portion is less than the distance over which there can be contact between the male contact pins and the female contact arms.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

10 Figure 1 is an exploded perspective view of part of an electrical connector according to the present invention;

15 Figure 2 is a view showing the connection between male contact pins and female contact arms of the electrical connector of Figure 1;

Figure 3 is a sectional view showing an equipment provided with the electrical connector of the present invention;

20 Figure 4 is a sectional view illustrating the insertion or removal of the male contact pins from the female contact arms; and

Figure 5 is a side view showing the range throughout which the male contact pins remain connected to the female contact arms.

25 The invention will now be described with reference to an embodiment of the present invention shown in Figures 1-5.

30 Figure 1 is an exploded perspective view of part of an electrical connector of the invention, in which the numeral 1 indicates a male connector portion consisting of terminals 3 to be inserted into and soldered to a vertical plate or panel 11 so that part of the terminals 3 are buried in an insulator body of synthetic resin with an exposed part. The male connector

portion 1 has male contact pins 2 to be connected to a female connector portion 4 having female contact arms 6 therein connected to terminals 8.

5 The female connector portion 4 is provided with connecting bars 5, the terminals 8 and the female contact arms 6 so as to form a united structure.

10 As a result, one end of the connecting bars 5 which are buried partly into an insulator body of synthetic resin is connected to the terminals 8 which are to be soldered into a horizontal plate 12. The other end of the connecting bars 5 is connected to the female connector arms 6 to which the male contact pins 2 of the male connector portion 1 are inserted by pressing.

15 Figure 2 illustrates the connection of the female contact arms 6 with the male contact pins 2, in which each pair of female contact arms 6 press against opposite sides of the respective male contact pin 2 so as to grip the latter.

20 Figure 3 shows an electrical connector of the present invention connected to an equipment.

25 In Figure 3, the numeral 9 indicates an operating panel of the equipment and the numeral 13 indicates an operating knob. The numeral 11 indicates a vertical panel fixed to the front panel 9 by a screw 14. The panel 11 is provided for mounting the male connector portion 1, the panel 11 being soldered to the operating knob 13. A horizontal plate 12 is fixed to a chassis 10 and the female connector portion 4 is fixed to the horizontal plate 12.

30 Figure 4 shows the relationship between the male contact pin 2 and the female contact arms 6 at the time of the insertion or removal of the male connector portion 1 into or from the female connector portion 4.

 In Figures 3 and 4, when a repair has to be

effected, it is very convenient to insert or remove the connector portion 1 while the vertical panel 11 and the front panel 9 are fixed together by the screw 14.

In this case, the male contact pins 2 can be inserted or removed through the openings 7 of the female connector portion 4 at any angle in the range of θ degrees from the horizontal direction H to the direction P.

Accordingly, to effect insertion or removal of the male contact pins 2 at any angle within the angle θ' indicated by H-P' as well as at the angle θ indicated by H-P, it is necessary to provide an adequate aperture 16 in the panel 11 through which the female connector portion 4 extends.

Relative displacement can occur between the vertical panel 11 and the horizontal plate 12 if a certain vibration is produced by an exterior force after the male contact pins 2 and the female contact arms 6 have been connected together because the openings 7 extend beyond the end of the female contact arms 6 and are wider than the latter. Consequently, it is necessary to ensure that even in this case the male contact pins 2 and the female contact arms 6 will remain in contact.

As shown in Figure 5, this is achieved by simply providing the aperture 16 with a restricting wall surface portion 15 for restricting the amount of travel of the male connector portion 1 on the side opposite to the openings 7.

Namely, by providing the restricting wall surface portion 15 so as to set the ratio of the distance b between the restricting wall surface portion 15 and one end of the female connector portion 4 to $B > b$, where B is the width of the region in which there can be contact between the male contact pins 2 and the female contact arms 6, the male contact pins 2 and the female contact

arms 6 will be kept continually in contact with each other.

5 Also, if the wall of the aperture 16 is spaced from both sides of the male contact pins 2 and the female contact arms 6, the aperture 16 should be provided with a restricting wall surface portion 15' so as to ensure continuity of connection between the parts 2, 6.

10 Thus in the electrical connector of the present invention, excessive exterior forces will not be imposed on the female connector portion 4 because of the insertion or removal of the male connector portion 1 into or from the female connector portion 4 within the range of the angle θ in the direction of insertion or removal.

15 Therefore, there is no damage to the female connector portion 4.

CLAIMS

1. An electrical connector comprising a male connector portion having a plurality of male contact pins; a female connector portion whose periphery is provided with a plurality of openings having female contact arms therein for gripping the male contact pins; and a panel to which the male connector portion is secured and which has an aperture through which the female connector portion extends, the aperture limiting relative movement between the male and female connector portions.

2. An electrical connector as claimed in claim 1 in which each male contact pin is gripped between a pair of female contact arms.

3. An electrical connector as claimed in claim 1 or 2 in which the aperture has wall surface portions which are disposed on opposite sides of and are spaced from the female connector portion.

4. An electrical connector as claimed in claim 3 in which the space between a said wall surface portion and the female connector portion is less than the distance over which there can be contact between the male contact pins and the female contact arms.

5. An electrical connector substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

