

PATENT SPECIFICATION

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(54) ELECTRICAL CONNECTOR

(71) We, AMP INCORPORATED, a corporation organised and existing under the laws of the State of New Jersey, United States of America, of Eisenhower Boulevard, Harrisburg, Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an electrical connector, and particularly to an electrical connector comprising a housing carrying a plurality of elongate electrical terminals extending in parallel spaced relationship through the housing, the housing having a first part containing an electrically insulating member through which the terminals pass.

Many forms of such a connector are known, with the terminals being either male or female for mating of the connector with an appropriate other connector to make a plurality of electrical circuits through the mated terminals.

There is often now a need to provide filters on one or more circuits passing through such a connector, for example to filter out interference signals or to limit the pass band frequency of a circuit.

There is thus a need for such an electrical connector in which filters can selectively be provided on any one or more of the terminals in a simple and effective manner.

According to this invention there is provided an electrical connector comprising a housing carrying a plurality of elongate electrical terminals extending in parallel spaced relationship through the housing, the housing having a first part containing an electrically insulating member through which the terminals pass, and a second part containing an apertured electrically conductive plate member, at least one of the terminals passing through an individual aperture in the plate member with all-round clearance,

and at least one other terminal carrying a tubular filter device which passes through an individual aperture in the plate member with a first inner electrode connected to the associated terminal and a second outer electrode connected to the plate member, the second part of the housing being filled, on both sides of the plate member with an electrically insulating material mass which completely surrounds the filter device and fills the aperture in the plate member through which the one terminal passes with clearance.

With the connector of this invention an individual tubular filter device, for example as described in U.S. Patent Specification No. 3743978, can be mounted on any one or more selected terminals within the second part of the housing and be electrically connected, as by soldering, to the terminal and to the plate member through which the filter passes, prior to filling of the second part of the housing with the electrically insulating mass which thereafter serves to isolate the terminals and filters from each other and to support the terminals without filters in their correct positions spaced from the walls of the apertures in the plate member through which they pass.

The ground electrodes of the filter or filters, these being the outer electrodes, are electrically connected to the plate member which serves as a ground plane, and which can be integrally formed with the second part of the housing.

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

Figure 1 is a perspective view of the connector;

Figure 2 is a section on the line II-II in Figure 1;

Figure 3 is a perspective view of a terminal which is not to carry a filter, and a

retaining means therefor; and

Figure 4 is a perspective view of a terminal which is to carry a filter and the associated filter.

5 The connector shown in Figures 1 and 2 comprises a housing 1 carrying a plurality of elongate electrical terminals in the form of double-ended pins 2a and 2b extending in parallel spaced relationship through the
10 housing 1.

The housing 1 has a first part 3 of metal containing an electrically insulating member through which the terminals 2a and 2b pass, the member comprising a layer 4 of relatively hard insulating material sandwiched between two layers 5 and 6 of resilient compressible insulating material such as silicone rubber, which layers 5 and 6 serve to seal the connector against the ingress of moisture
20 from the open end of the housing part 3.

Secured to the first part 3 of the housing 1 is a second part 7 of metal, the two parts having mating flanges 8 and 9 provided with corner apertures 10 in which securing means
25 such as nuts and bolts, not shown, can be mounted to secure the two housing parts 3 and 7. The housing parts 3 and 7 are also secured to each other, and the junction between them sealed, by electrically conductive adhesive material 11 between the opposed
30 faces of the flanges 8 and 9.

Extending across the second part 7 of the housing 1 is an integrally formed plate member 12 having a plurality of apertures 13 therein, an individual one of the terminals
35 2a or 2b passing through each of the apertures 13.

Referring now to Figures 3 and 4 also, the left-hand terminal 2a shown in Figure 2 is shown in Figure 3, and the right-hand terminal 2b is as shown in Figure 4.

As shown, the left-hand terminal 2a passes through an aperture 13 in the plate member 12 with all-round clearance, this terminal 2a
45 being secured in the housing 1 by means of a collar 14 in which is received and retained in a recess in the layer 4 of relatively hard insulating material, the collar 14 having an inwardly directed resilient finger 15 which
50 engages in an annular groove 16 in the terminal 2a thereby to restrain the terminal 2a against upward movement as shown in Figure 2. Downward, as seen in Figure 2, movement of the terminal 2a is prevented by engagement of a collar 17 on the terminal 2a
55 in a recess 18 in the insulating layer 6.

The right-hand terminal 2b shown in Figure 2 and in Figure 4, carries a tubular filter device 19 which can be as described in
60 U.S. Patent Specification No. 3743978, the filter device being located in the second part 7 of the housing 1 extending through an aperture 13 in the plate member 12. The filter plate 19 has a first inner electrode 19a connected to the terminal 2b, and a second outer
65 electrode 19b connected to the plate member 12 by solder 20 as shown. The terminal 2b has a collar 21 against which the filter device 19 seats, and which has a conical surface 22 which engages in the insulating layer 5.

70 The second part 7 of the housing 1 is filled, on both sides of the plate member 12, with an electrically insulating material mass 23 which completely surrounds the filter device 19, and fills the aperture 13 in the plate member 12 through which the terminal 2a passes with clearance.

The material 23 is introduced in a fluid state, and subsequently sets into a rigid condition in which it supports, in particular, the terminal 2a with the necessary clearance
80 from the plate member 12, supports the filter device 19 thus preventing breaking of the solder connection 20, and also seals the connector against the ingress of moisture through
85 the second part 7 of the housing 1.

It will be appreciated that in a complete connector as shown in Figure 1 there may be a plurality of terminals 2a as shown in Figure 3, and a plurality of terminals 2b as
90 shown in Figure 4, in which case the insulating material mass 23 serves to electrically isolate all of the terminals 2a and 2b from each other in the second part 7 of the housing 1, while the plate member 12 serves as
95 a ground plane and electrically connects the second electrodes 19b of the filter devices 19 to each other and to the second part 7, and thus the first part 3, of the housing 1.

The connector above described can be
100 used to provide a plurality of electrical connections by way of the terminals 2, selected ones of which connections are filtered by means of a filter device 19.

Although in the connector described the terminals 2 are in the form of double-ended pins, it will be appreciated that the ends of the terminals may be in any other desired form, for example for connection to a wire, or in the form of a receptacle for mating
110 with a male terminal.

WHAT WE CLAIM IS:—

1. An electrical connector comprising a housing carrying a plurality of elongate electrical terminals extending in parallel spaced
115 relationship through the housing, the housing having a first part containing an electrically insulating member through which the terminals pass, and a second part containing an apertured electrically conductive plate
120 member at least one of the terminals passing through an individual aperture in the plate member with all-round clearance, and at least one other terminal carrying a tubular filter device which passes through an individual aperture in the plate member with
125 all-round clearance, and a first inner electrode connected to the associated terminal and a second outer electrode connected to the plate member, the second part of the housing being filled, on both
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retaining means therefor; and

Figure 4 is a perspective view of a terminal which is to carry a filter and the associated filter.

- 5 The connector shown in Figures 1 and 2 comprises a housing 1 carrying a plurality of elongate electrical terminals in the form of double-ended pins 2a and 2b extending in parallel spaced relationship through the housing 1.

- 10 The housing 1 has a first part 3 of metal containing an electrically insulating member through which the terminals 2a and 2b pass, the member comprising a layer 4 of relatively hard insulating material sandwiched between two layers 5 and 6 of resilient compressible insulating material such as silicone rubber, which layers 5 and 6 serve to seal the connector against the ingress of moisture from the open end of the housing part 3.

- 20 Secured to the first part 3 of the housing 1 is a second part 7 of metal, the two parts having mating flanges 8 and 9 provided with corner apertures 10 in which securing means such as nuts and bolts, not shown, can be mounted to secure the two housing parts 3 and 7. The housing parts 3 and 7 are also secured to each other, and the junction between them sealed, by electrically conductive adhesive material 11 between the opposed faces of the flanges 8 and 9.

- 30 Extending across the second part 7 of the housing 1 is an integrally formed plate member 12 having a plurality of apertures 13 therein, an individual one of the terminals 2a or 2b passing through each of the apertures 13.

- 40 Referring now to Figures 3 and 4 also, the left-hand terminal 2a shown in Figure 2 is shown in Figure 3, and the right-hand terminal 2b is as shown in Figure 4.

- 50 As shown, the left-hand terminal 2a passes through an aperture 13 in the plate member 12 with all-round clearance, this terminal 2a being secured in the housing 1 by means of a collar 14 in which is received and retained in a recess in the layer 4 of relatively hard insulating material, the collar 14 having an inwardly directed resilient finger 15 which engages in an annular groove 16 in the terminal 2a thereby to restrain the terminal 2a against upward movement as shown in Figure 2. Downward, as seen in Figure 2, movement of the terminal 2a is prevented by engagement of a collar 17 on the terminal 2a in a recess 18 in the insulating layer 6.

- 60 The right-hand terminal 2b shown in Figure 2 and in Figure 4, carries a tubular filter device 19 which can be as described in U.S. Patent Specification No. 3743978, the filter device being located in the second part 7 of the housing 1 extending through an aperture 13 in the plate member 12. The filter plate 19 has a first inner electrode 19a connected to the terminal 2b, and a second outer

electrode 19b connected to the plate member 12 by solder 20 as shown. The terminal 2b has a collar 21 against which the filter device 19 seats, and which has a conical surface 22 which engages in the insulating layer 5.

70 The second part 7 of the housing 1 is filled, on both sides of the plate member 12, with an electrically insulating material mass 23 which completely surrounds the filter device 19, and fills the aperture 13 in the plate member 12 through which the terminal 2a passes with clearance.

80 The material 23 is introduced in a fluid state, and subsequently sets into a rigid condition in which it supports, in particular, the terminal 2a with the necessary clearance from the plate member 12, supports the filter device 19 this preventing breaking of the solder connection 20, and also seals the connector against the ingress of moisture through the second part 7 of the housing 1.

90 It will be appreciated that in a complete connector as shown in Figure 1 there may be a plurality of terminals 2a as shown in Figure 3, and a plurality of terminals 2b as shown in Figure 4, in which case the insulating material mass 23 serves to electrically isolate all of the terminals 2a and 2b from each other in the second part 7 of the housing 1, while the plate member 12 serves as a ground plane and electrically connects the second electrodes 19b of the filter devices 19 to each other and to the second part 7, and thus the first part 3, of the housing 1.

100 The connector above described can be used to provide a plurality of electrical connections by way of the terminals 2, selected ones of which connections are filtered by means of a filter device 19.

105 Although in the connector described the terminals 2 are in the form of double-ended pins, it will be appreciated that the ends of the terminals may be in any other desired form, for example for connection to a wire, or in the form of a receptacle for mating with a male terminal.

WHAT WE CLAIM IS:—

1. An electrical connector comprising a housing carrying a plurality of elongate electrical terminals extending in parallel spaced relationship through the housing, the housing having a first part containing an electrically insulating member through which the terminals pass, and a second part containing an apertured electrically conductive plate member at least one of the terminals passing through an individual aperture in the plate member with all-round clearance, and at least one other terminal carrying a tubular filter device which passes through an individual aperture in the plate member with a first inner electrode connected to the associated terminal and a second outer electrode connected to the plate member, the second part of the housing being filled, on both 130



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sides of the plate member, with an electrically insulating material mass which completely surrounds the filter device and fills the aperture in the plate member through which the one terminal passes with clearance.

2. A connector as claimed in Claim 1, in which the plate member is formed integrally with the second part of the housing.

10 3. A connector as claimed in Claim 1 or Claim 2, in which the electrically insulating member in the first part of the housing comprises a layer of relatively hard insulating material sandwiched between two layers of
15 resilient compressible insulating material.

4. A connector as claimed in Claim 3, in which the one terminal is secured within the first part of the housing by means of a collar located in a recess in the layer of relatively hard insulating material, the collar 20 having an inwardly directed resilient finger which engages in a groove in the one terminal.

5. An electrical connector substantially as hereinbefore described with reference to the 25 drawing.

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