

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN AND RELATING TO ELECTRICAL CONNECTOR ASSEMBLIES

(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:—

The present invention relates to electrical connector assemblies and in particular electrical connector assemblies for electrically interconnecting coaxial cables with the conductors on a printed circuit board.

According to the present invention, an electrical connector assembly comprises a housing of insulating material, having a plurality of spaced cavities each extending between opposed first and second surfaces of the housing, and a plurality of electrical contacts each received in a different individual cavity, each contact having at one end a pin extending from the first surface for insertion into an aperture of a printed circuit board and at the opposite end a pair of spaced opposed contact arms which extend at least partially from the second surface for electrically engaging a wire positioned between the arms, and a flange extending from the second surface at one end of the housing, the flange having a plurality of slots, each slot being in alignment with an individual cavity.

In a preferred embodiment, first and second flanges extend from the second surface at opposed ends of the housing, the flanges each having a plurality of slots, each slot being in alignment with an individual cavity and with a slot in the opposed flange.

An embodiment of the invention will now be described, by way of example, reference

being made to the Figures of the accompanying diagrammatic drawings in which:—

Figure 1 is an exploded perspective view of an electrical connector assembly and a coaxial ribbon cable; and

Figures 2 to 5 are cross-sectional details of the assembly of Figure 1 illustrating various stages during the assembly of the coaxial ribbon cable to the electrical connector assembly.

As shown in Figure 1, a coaxial ribbon cable 10 comprises a plurality of spaced, parallel coaxial cables extending the length of the ribbon cable 10 and enveloped in an outer insulating jacket 20. Each coaxial cable includes a central conductor wire 12, a dielectric 14 spacing the conductor wire 12 from an electrically conductive foil 16 and a drain wire 18 in electrical contact with the foil 16.

Referring also to Figures 2 to 5, an electrical connector assembly for terminating the ribbon cable 10 and making electrical contact with the conductive paths (not shown) on a printed circuit board 76 comprises a housing 24, a cover 28 and a plurality of electrical contacts 26.

The housing 24 which is made of electrically insulating material, for example, flame retardant nylon has a first lower surface 46 and an opposed second upper surface 38. A plurality of through cavities 44 are provided in the housing 24 each extending from surface 46 to surface 38 and each having a square cross-section. The cavities 44 are arranged in two spaced, parallel rows extending between opposite sides 48 of the housing 24, the rows being in staggered array. A plurality of grooves 42 extend across the surface 38, each groove 42 communicating with an individual cavity 44. The grooves 42 are each dimensioned to

receive an individual wire 12 or 18.

A first forward flange 32 and a second opposed rear flange 34 extend upwardly (as shown) from surface 38. Each flange 32, 34 has a plurality of slots 36, each slot being in alignment with an individual groove 42 and extending downwardly from the free end of the flange 32, 34 to the surface 38. Each slot 36 in the forward flange 32 extends downwardly along the outer forward surface 39, that is, the surface remote from the rear flange 34 as a groove 40. In other words, each groove 40 is in alignment and communication with an individual slot 36. The grooves 40 and slots 36 are each dimensioned to receive an individual wire 12 or 18.

Each side 48 of the housing 24 has a recess 50 the base of which recess is undercut to provide a downwardly (as shown) facing shoulder 52. A portion of the base has a chamfer 54.

An electrical contact 26 is received in each cavity 44. Each contact 26 which is stamped and formed, for example, from beryllium copper has at one end a pin 62 and at the opposite end two pairs of spaced, opposed contact arms 64. Between the two ends, the body 66 of the contact is formed with two pairs of lances 68 and a pair of depending stops 70. Each pair of contact arms 64 define between them a wire receiving slot 72. The size of each contact 26 as defined by its perimeter is such as to fit into a cavity 44 with the lances 68 biting into the walls of the cavity to secure the contact 26 in the cavity 44.

The cover 28 is dimensioned to fit between the forward and rear flanges 32, 34 and cover the upper surface 38 of the housing 24. Resilient legs 55 depend from each side of the cover 28 and have internally directed lugs 56 with upwardly (as shown) facing shoulders 58. Through apertures 60 are formed in the cover 28 in alignment with shoulders 58.

Initially the contacts 26 are each pushed into an individual cavity 44 to a position where the free end of each contact arm 64 is flush with or slightly lower than the surface 38. The contacts 26 are prevented from falling through the cavities 44 by the interference fit between the lances 68 and the walls of the cavities. The contacts 26 are orientated so that the slot 72 between each pair of contact arms 64 is in alignment with a groove 42. The pins 62 are then passed through holes 74 in the printed circuit board 76 (see Figure 2) until the stops 70 engage the upper surface of the board. The pins 62 are then soldered to the board 76 and thereby make electrical contact with conductive paths (not shown) on the board.

An end of the ribbon cable 10 is then prepared as shown in Figure 1 to expose bared conductor and drain wires. The wires

12, 18 are combed and pushed down slots 36 in the forward and rear flanges 32, 34 with their free ends protruding beyond the forward surface 39. An upper die 82 then engages the housing 24 (see Figure 3) and as it moves down, the leading edge 84 of the die 82 bends the free ends of the wires 12, 18 into the grooves 40. The upper die 82 has recesses 86 which accommodate the flanges 32, 34 and recesses 88 to accommodate the contacts 26.

The housing 24 is prevented from downward movement by a lower die 90 which engages the underside (as shown) of the board 76. The lower die 90 has recesses 92 for accommodating the ends of the pins 62 protruding below the underside of the board 76.

Continued movement of the upper die 82 downwardly, will force the housing 24 completely onto the contacts 26 which move relatively upwardly in their cavities 44 so that each wire 12, 18 is forced into slots 72 between the pairs of arms 64 of an individual contact 26 (see Figures 4 and 5). The arms electrically engage and mechanically retain the wires 12, 18.

Finally, the cover 28 is releasably secured to the housing by pressing the legs 55 into respective recesses 50 so that the legs are initially cammed outwardly by the chamfers 54 and then latch behind the shoulders 52. To remove the cover 28 a tool can be inserted into each aperture 60 to flex each leg 55 outwardly so that the shoulders 52, 58 disengage. The cover 28 can then be lifted away from the housing 24.

Modifications can be made to the electrical connector assembly described above. For example, the forward and rear flanges 32, 34 can be omitted or just one flange need be provided. Also the grooves 42 are not essential and could be omitted or alternatively, grooves could be provided in the surface of the cover 28 immediately adjacent the upper surface 38 of the housing 24.

The embodiment of the electrical connector assembly described, is advantageous in that it permits the substantially simultaneous termination of a plurality of wires emanating from a coaxial ribbon cable and the electrical interconnection of the wires to conductive paths on a printed circuit board.

WHAT WE CLAIM IS:—

1. An electrical connector assembly comprising a housing of insulating material, having a plurality of spaced cavities each extending between opposed first and second surfaces of the housing, and a plurality of electrical contacts each received in a different individual cavity, each contact having at one end a pin extending from the first surface for insertion into an aperture of a

receive an individual wire 12 or 18.

A first forward flange 32 and a second opposed rear flange 34 extend upwardly (as shown) from surface 38. Each flange 32, 34 has a plurality of slots 36, each slot being in alignment with an individual groove 42 and extending downwardly from the free end of the flange 32, 34 to the surface 38. Each slot 36 in the forward flange 32 extends downwardly along the outer forward surface 39, that is, the surface remote from the rear flange 34 as a groove 40. In other words, each groove 40 is in alignment and communication with an individual slot 36. The grooves 40 and slots 36 are each dimensioned to receive an individual wire 12 or 18.

Each side 48 of the housing 24 has a recess 50 the base of which recess is undercut to provide a downwardly (as shown) facing shoulder 52. A portion of the base has a chamfer 54.

An electrical contact 26 is received in each cavity 44. Each contact 26 which is stamped and formed, for example, from beryllium copper has at one end a pin 62 and at the opposite end two pairs of spaced, opposed contact arms 64. Between the two ends, the body 66 of the contact is formed with two pairs of lances 68 and a pair of depending stops 70. Each pair of contact arms 64 define between them a wire receiving slot 72. The size of each contact 26 as defined by its perimeter is such as to fit into a cavity 44 with the lances 68 biting into the walls of the cavity to secure the contact 26 in the cavity 44.

The cover 28 is dimensioned to fit between the forward and rear flanges 32, 34 and cover the upper surface 38 of the housing 24. Resilient legs 55 depend from each side of the cover 28 and have internally directed lugs 56 with upwardly (as shown) facing shoulders 58. Through apertures 60 are formed in the cover 28 in alignment with shoulders 58.

Initially the contacts 26 are each pushed into an individual cavity 44 to a position where the free end of each contact arm 64 is flush with or slightly lower than the surface 38. The contacts 26 are prevented from falling through the cavities 44 by the interference fit between the lances 68 and the walls of the cavities. The contacts 26 are orientated so that the slot 72 between each pair of contact arms 64 is in alignment with a groove 42. The pins 62 are then passed through holes 74 in the printed circuit board 76 (see Figure 2) until the stops 70 engage the upper surface of the board. The pins 62 are then soldered to the board 76 and thereby make electrical contact with conductive paths (not shown) on the board.

An end of the ribbon cable 10 is then prepared as shown in Figure 1 to expose bared conductor and drain wires. The wires

12, 18 are combed and pushed down slots 36 in the forward and rear flanges 32, 34 with their free ends protruding beyond the forward surface 39. An upper die 82 then engages the housing 24 (see Figure 3) and as it moves down, the leading edge 84 of the die 82 bends the free ends of the wires 12, 18 into the grooves 40. The upper die 82 has recesses 86 which accommodate the flanges 32, 34 and recesses 88 to accommodate the contacts 26.

The housing 24 is prevented from downward movement by a lower die 90 which engages the underside (as shown) of the board 76. The lower die 90 has recesses 92 for accommodating the ends of the pins 62 protruding below the underside of the board 76.

Continued movement of the upper die 82 downwardly, will force the housing 24 completely onto the contacts 26 which move relatively upwardly in their cavities 44 so that each wire 12, 18 is forced into slots 72 between the pairs of arms 64 of an individual contact 26 (see Figures 4 and 5). The arms electrically engage and mechanically retain the wires 12, 18.

Finally, the cover 28 is releasably secured to the housing by pressing the legs 55 into respective recesses 50 so that the legs are initially cammed outwardly by the chamfers 54 and then latch behind the shoulders 52. To remove the cover 28 a tool can be inserted into each aperture 60 to flex each leg 55 outwardly so that the shoulders 52, 58 disengage. The cover 28 can then be lifted away from the housing 24.

Modifications can be made to the electrical connector assembly described above. For example, the forward and rear flanges 32, 34 can be omitted or just one flange need be provided. Also the grooves 42 are not essential and could be omitted or alternatively, grooves could be provided in the surface of the cover 28 immediately adjacent the upper surface 38 of the housing 24.

The embodiment of the electrical connector assembly described, is advantageous in that it permits the substantially simultaneous termination of a plurality of wires emanating from a coaxial ribbon cable and the electrical interconnection of the wires to conductive paths on a printed circuit board.

WHAT WE CLAIM IS:—

1. An electrical connector assembly comprising a housing of insulating material, having a plurality of spaced cavities each extending between opposed first and second surfaces of the housing, and a plurality of electrical contacts each received in a different individual cavity, each contact having at one end a pin extending from the first surface for insertion into an aperture of a





- printed circuit board and at the opposite end a pair of spaced opposed contact arms which extend at least partially from the second surface for electrically engaging a wire positioned between the arms, and a flange extending from the second surface at one end of the housing, the flange having a plurality of slots, each slot being in alignment with an individual cavity.
2. An electrical connector assembly as claimed in claim 1, in which first and second flanges extend from the second surface at opposed ends of the housing, the flanges each having a plurality of slots, each slot being in alignment with an individual cavity and with a slot in the opposed flange.
3. An electrical connector assembly as claimed in claim 2, in which there are two spaced parallel rows of cavities, each cavity extending between the first and second surfaces of the housing and receiving an individual contact, the rows being in staggered array, the second surface having a plurality of grooves each groove extending between aligned slots in the opposed flanges and communicating with an individual cavity, each groove being adapted to receive a portion of a wire.
4. An electrical connector assembly as claimed in claim 2 or 3, in which the first flange has a plurality of grooves on its surface remote from the second flange each groove being in alignment and communication with an individual slot and adapted to receive an end portion of a wire.
5. An electrical connector assembly as claimed in any one of claims 1 to 4, in which a cover is provided which is releasably secured to the housing and covers the second surface of the housing.
6. An electrical connector assembly as claimed in any one of claims 1 to 5, in which each contact includes means for securing the contact in its individual cavity.
7. An electrical connector assembly as claimed in any one of claims 1 to 6, in which each contact has at the opposite end two pairs of spaced opposed contact arms both of which pairs extend at least partially from the second surface.
8. An electrical connector assembly, constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the Figures of the accompanying drawings.
- For the Applicants:
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