



166166

24 MAY 2002

1

SPECIFICATION



G00002

ELECTRICAL CONNECTOR FOR
TERMINATING DISCRETE ELECTRICAL WIRES

Field of the Invention

5 This invention generally relates to the art of electrical connectors and, particularly, to an electrical connector for terminating a plurality of discrete electrical wires. The connector is illustrated in combination with a second connector whereby the connector assembly connects the wires to the circuits on a printed circuit board.

Background of the Invention

10 With the ever-increasing miniaturization and density of electrical circuitry and corresponding electronic devices, it has become increasingly difficult to terminate small electrical wires, such as very fine insulated wires. The wires may be connected to the
15 terminals of an electrical connector by such techniques as soldering, insulation displacement or the like. However, such techniques become extremely difficult, time consuming and labor intensive when the wires are extremely small or fine. In fact, insulation displacement techniques cannot
20 even be used with extremely fine insulated wires because of the tendency to damage or even cut through the wires. Soldering such very fine wires requires elaborate and expensive equipment. It has been proposed to secure the wires to a preliminary wire maintenance member or backing
25 member and to use this subassembly to facilitate terminating the very fine wires. However, even this approach has not proven effective in small electrical connectors.

The present invention is directed to solving these problems by providing a simple and effective electrical connector for providing adequate wire maintenance in terminating discrete electrical wires, such as very fine insulated wires.

Summary of the Invention

An object, therefore, of the invention is to provide a new and improved electrical connector for terminating discrete electrical wires.

Another object of the invention is to provide a new and improved electrical connector assembly for connecting a plurality of discrete electrical wires to the circuits on a printed circuit board.

As disclosed herein, the electrical connector assembly includes a first connector adapted for mounting on the printed circuit board and including a plurality of first terminals for connection to the circuits on the board. A backing member is adhered to the discrete electrical wires to maintain the wires in a predetermined relative array. The invention contemplates a second connector for mating with the first connector and including a plurality of second terminals for contacting the first terminals of the first connector. The second connector includes a receptacle for receiving the electrical wires and the backing member, with the wires positioned in contact with the second terminals. An actuator of the second connector is engageable with the backing member to maintain the discrete electrical wires in contact with the second terminals.

In the illustrated embodiment, the electrical wires are insulated wires and have portions of the insulation removed to expose lengths of the conductors of the wires, such that the insulation of the wires is adhered to the backing member and the conductors of the wires are

in contact with the second terminals. The electrical wires are in a generally parallel array, and the second terminals are spaced corresponding to the spacing of the wires.

5 The second terminals of the second connector have forward contact ends for contacting the first terminals of the first connector and rear ends at the receptacle for contacting the electrical wires. The rear end of each of the second terminals is bifurcated to define a pair of legs forming a mouth into which one of the electrical wires and
10 the backing member are inserted. One of the legs of each second terminal is engageable with a respective one of the electrical wires.

 The actuator includes a forward insertion portion for inserting into the mouths between the legs of the
15 second terminals. The actuator also includes a flange having a plurality of recesses for embracing the electrical wires. As disclosed herein, the backing member is a plate-like member, with the actuator engageable with an edge thereof, and the recesses in the flange of the actuator are
20 notches for embracing the electrical wires.

 Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is a vertical section through an electrical connector assembly embodying the concepts of the invention;

FIGURE 2 is a vertical section through only the second connector of the connector assembly;

FIGURE 3 is an end elevational view of the second connector;

FIGURE 4 is a rear elevational view of the second connector;

FIGURE 5 is a plan view of a plurality of the parallel discrete electrical wires adhered to the backing plate; and

FIGURE 6 is a side elevational view looking toward the right-hand side of Figure 5.

Detailed Description of the Preferred Embodiment

Referring to the drawings in greater detail, and first to Figure 1, an electrical connector assembly, generally designated 1, is illustrated for connecting a plurality of discrete electrical wires to the circuits of a printed circuit board. Generally, connector assembly 1 includes a first connector, generally designated 2, adapted for mounting on the printed circuit board (not shown), and a second connector, generally designated 3, for mating with the first connector.

First connector 2 includes an insulating housing 4 mounting a plurality of first terminals 5 arranged at regular spaced intervals along the housing. The housing has a terminating end 4a and a mating end 4b. Each terminal 5 includes a solder tail 16 projecting from housing 4 for solder connection to a circuit on the printed circuit board. Each terminal includes a bifurcated contact end 7 disposed within housing 4.

Referring to Figures 2-4 in conjunction with Figure 1, second connector 3 includes an insulating housing 8 mounting a plurality of second terminals 9 arranged at regular spaced intervals along the housing, along with an actuator 10. Insulating housing 8 has a front insertion end or nose 8a for insertion into mating end 4b of housing 4 of first connector 2. Housing 8 has a rear end 8b defining a receptacle 8c. Terminals 9 extend between front insertion end 8a and rear end 8b of housing 8 of the second connector.

Each terminal 9 has a forward contact end 9a for contacting bifurcated contact end 7 of one of the first terminals 5 of first connector 2. Each second terminal 9 has a bifurcated rear end 9b defining a pair of legs 11 and 12 which form a mouth 9c therebetween. Each leg 12 has an upwardly projecting contact protrusion 12a at the rear end of the leg.

Actuator 10 of second connector 3 includes a forward insertion portion 13 for inserting into the mouths 9c between legs 11 and 12 of second terminals 9. The actuator has a bottom, generally planar surface 13a extending from a forward insertion portion back to an engagement flange 14 defining a forwardly facing abutment shoulder 15. When the forward insertion portion 13 of actuator 10 is inserted into mouths 9c between legs 11 and 12 of second terminals 9, the top legs 11 of the terminals act as pressure levers to sandwich the forward insertion portion of the actuator within the bifurcated rear ends of the terminals. Finally, as best seen in Figure 4, engagement flange 14 is provided with a plurality of semicircular recesses or notches 16 which are precisely aligned with bottom legs 12 and contact protrusions 12a of properly spaced second terminals 9.

Figures 5 and 6 show a plurality of discrete insulated electrical wires 17 in a generally parallel array, with the insulation 19 of each wire stripped to expose very fine conductors 17a of the wires. A given length "l" of the insulation remains on conductors 17a at forward ends of wires 17. A backing member in the form of a planar member or backing plate 18 is adhered to electrical wires 17, particularly to insulation 19 of the wires on opposite sides of conductors 17a. The backing plate may be fabricated of plastic material. In essence, the backing plate maintains wires 17 in their generally parallel array and at a spacing corresponding to bottom legs 12 and contact protrusions 12a of second terminals 9 of second connector 4.

In terminating the discrete electrical wires 17 within second connector 3, the subassembly of the wires and backing plate 18 are inserted into mouths 9c formed by bifurcated rear ends 9b of second terminals 9 as shown best in Figures 1 and 2. When this subassembly is so inserted,

exposed conductors 17a of the wires are aligned with contact protrusions 12a of the second terminals. Forward insertion portion 13 of actuator 10 then is inserted into the bifurcated rear ends of the second terminals until abutment shoulder 15 at the front of engagement flange 14 of the actuator engages rear edge 18a of backing plate 18. Not only does the actuator maintain the backing plate and the adhered electrical wires properly within second connector 3, but the recesses or notches 16 in the bottom of engagement flange 14 embrace the electrical wires and maintain proper relative spacing of the wires, as seen in Figure 4. In an alternative concept, the bottom of backing plate 18 can be adhered to the electrical wires and the top of the backing plate can be adhered to bottom surface 13a of actuator 10, whereby the entire subassembly of the actuator, the backing plate and the discrete insulated wires can be inserted simultaneously into the rear end of the second connector and into the bifurcated rear ends 9b of the second terminals.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

CLAIMS

1. An electrical connector assembly (1) for connecting a plurality of discrete electrical wires (17) to the circuits on a printed circuit board, comprising:

5 a first connector (2) adapted for mounting on the printed circuit board and including a plurality of first terminals (5) for connection to the circuits on the board;

10 a backing member (18) adhered to the discrete electrical wires (17) to maintain the wires in a predetermined relative array; and

15 a second connector (3) for mating with the first connector (2) and including a plurality of second terminals (9) for contacting the first terminals of the first connector, a receptacle (8c) for receiving the electrical wires and the backing member with the wires positioned in contact with the second terminals, and an actuator (10) engageable with said backing member (18) to maintain the discrete electrical wires (17) in contact with the second terminals (9).

20 2. The electrical connector assembly of claim 1 wherein said electrical wires (17) are insulated wires having portions of the insulation (19) removed to expose lengths of the conductors (17a) of the wires, such that the insulation of the wires is adhered to the backing member
25 (18) and the conductors of the wires are in contact with the second terminals (9).

3. The electrical connector assembly of claim 1 wherein said electrical wires (17) are in a generally parallel array, and the second terminals (9) are spaced corresponding to the spacing of the wires.

5 4. The electrical connector assembly of claim 1 wherein said second terminals (9) have forward contact ends (9a) for contacting the first terminals (5) of the first connector (2) and rear ends (9b) at said receptacle (8c) for contacting the electrical wires (17).

10 5. The electrical connector assembly of claim 4 wherein the rear end (9b) of each of the second terminals (9) is bifurcated to define a pair of legs (11,12) forming a mouth into which one of the electrical wires (17) and the backing member (18) are inserted.

15 6. The electrical connector assembly of claim 5 wherein one of the legs (12) of each second terminal (9) is engageable with a respective one of the electrical wires (17).

20 7. The electrical connector assembly of claim 5 wherein said actuator (10) includes a forward insertion portion (13) for inserting into the mouths between the legs (11,12) of the second terminals (9).

25 8. The electrical connector assembly of claim 1 wherein said actuator (10) includes a flange (14) having a plurality of recesses (16) for embracing the electrical wires (17).

10

9. The electrical connector assembly of claim 1 wherein said backing member (18) is a plate-like member with the actuator (10) engageable with an edge (18a) thereof.

5

10. The electrical connector assembly of claim 9 wherein said actuator (10) has a flange (14) engageable with the edge (18a) of the backing member (18), the flange having a plurality of notches (16) for embracing the electrical wires (17).

11

11. An electrical connector assembly (1) for connecting a plurality of discrete insulated electrical wires (17) to the circuits on a printed circuit board, the insulated wires having portions of the insulation (19) removed to expose lengths of the conductors (17a) of the wires, comprising:

a first connector (2) adapted for mounting on the printed circuit board and including a plurality of first terminals (5) for connection to the circuits on the board;

a backing member (18) adhered to the insulation (19) of the discrete electrical wires (17) to maintain the wires in a generally spaced array; and

a second connector (3) for mating with the first connector and including a plurality of second terminals (9) for contacting the first terminals of the first connector, a receptacle (8c) for receiving the electrical wires and the backing member, each second terminal having a forward end (9a) for contacting one of the first terminals of the first connector and a rear end (9b) at said receptacle for contacting the conductor (17a) of one of the electrical wires (17), the rear end of each of the second terminals being bifurcated to define a pair of legs (11,12) forming a mouth into which one of the electrical wires and the backing member are inserted, one of the legs (12) of each second terminal (9) being engageable with a respective one of the electrical wires (17), and an actuator (10) including a forward insertion portion (13) for inserting into the mouths between the legs of the second terminals (9) and engageable with the backing member (18) to maintain the electrical wires (17) in contact with the second terminals, the actuator including a flange (14) engageable with an edge (18a) of the backing member, and the flange having a plurality of notches (16) for embracing the electrical wires.

12

12. An electrical connector (3) for terminating a plurality of discrete electrical wires (17) adhered to backing member (18), comprising:

5 a housing (8) defining a receptacle (8c) for receiving the electrical wires and the backing member;

a plurality of terminals (9) mounted on the housing along the receptacle for contacting the electrical wires; and

10 an actuator (10) mountable on the housing (8) and engageable with the backing member (18) to maintain the discrete electrical wires (17) in contact with the terminals (9).

13. The electrical connector assembly of claim 12 wherein a rear end (9b) of each of the terminals (9) is bifurcated to define a pair of legs (11,12) forming a mouth into which one of the electrical wires (17) and the backing member (18) are inserted.

14. The electrical connector assembly of claim 13 wherein one of the legs (12) of each terminal (9) is engageable with a respective one of the electrical wires (17).

15. The electrical connector assembly of claim 13 wherein said actuator (10) includes a forward insertion portion (13) for inserting into the mouths between the legs (11,12) of the terminals (9).

13

16. The electrical connector assembly of claim 12 wherein said actuator (10) includes a flange (14) having a plurality of recesses (16) for embracing the electrical wires (17).

5

17. The electrical connector assembly of claim 12 wherein said actuator (10) has a flange (14) engageable with an edge (18a) of the backing member (18), the flange having a plurality of notches (16) for embracing the electrical wires (17).