ELECTRICAL TERMINATOR ASSEMBLY AND METHOD OF MAKING COMPONENTS OF THE SAME

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ABSTRACT
An electrical terminator assembly comprises a connector having a cavity open at the back side for receiving terminals each with opposed contact arms. The arms are adapted to receive therebetween conductors which project through holes that are cold-formed in the connector from the front side. The terminal also has a U-shaped central body portion joined to the arms and which seat on opposed lips in the connector to prevent retraction therefrom. The connector is an extruded plastic piece in which notches are sawed to receive stop wings on the terminal and in which grooves are sawed to receive module supports that interfit with the connector and provide opposed channels for receiving a circuit module. The module contains the conductors that project through the cold-formed holes in the terminal.

11 Claims, 14 Drawing Figures
ELECTRICAL TERMINATOR ASSEMBLY AND METHOD OF MAKING COMPONENTS OF THE SAME

BACKGROUND OF THE INVENTION

This invention relates to improvements in electrical terminator assemblies, and to parts thereof, as well as to a method of making a connector and other plastic components of the assembly.

In the manufacture of electrical connectors in which electrical terminals are housed, the usual practice is to mold the plastic connectors and then assemble them with the terminals. Molding the connectors tends to be expensive considering that it is the aim of the producer of such connectors to keep costs at a minimum compatible with a structurally sound and properly designed product. Furthermore, it is often desired that such connectors be adaptable for use with plug-in circuit modules and to provide suitable support for such modules.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an electrical termination assembly in which the connector is an extruded plastic piece which may thereafter be sawed and punched to final shape. Such a method provides a significant reduction in production costs over molding the connector to shape.

A further object of this invention is to provide a terminator arrangement in which the lead end of a terminal is inserted through an opening in the rear of the connector, and a central body portion of the terminal seats on opposed lips at the rear of the connector, thus resulting in a simplified construction of both the terminal and the connector.

Another object of this invention is to provide an arrangement of the type stated in which the terminal has opposed contact-making arms within the connector that are engaged and are shaped to provide a passageway for receiving a pin-type terminal projecting through a punched hole in the front of the connector.

A still further object of the present invention is to provide a terminator assembly including plastic circuit-module supports which may also be extruded and which interfit with the connector to provide opposed guides for receiving the circuit module. The circuit module contains the pin-type terminals that are engagable with the terminals within the connector.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view showing the connector and module supports which form part of the present invention;

FIG. 7 is an exploded perspective view of the terminator assembly;

FIG. 8 is a fragmentary side elevational view of the structure of FIG. 7, the module supports at the ends of the connector being omitted for the sake of clarity;

FIG. 9 is a side elevational view of an electrical terminal that forms part of the present invention;

FIG. 10 is a fragmentary sectional view taken along line 10-10 of FIG. 9;

FIG. 11 is a perspective view of the terminal;

FIG. 12 is a top plan view of the terminal;

FIG. 13 is a fragmentary sectional view taken approximately along line 13-13 of FIG. 8; and,

FIG. 14 is a fragmentary sectional view taken along line 14-14 of FIG. 13.

DETAILED DESCRIPTION

Referring now in more detail to the drawing, and more particularly to FIGS. 1 and 6, there is shown a connector 1 of a dielectric material, such as nylon or polyvinylchloride. The connector 1 comprises a generally rectilinear body 2 having opposed ends 3, 4 and a longitudinal cavity 6 extending from one end 3 to the other end 4. The body 2 is of generally channel shape with opposed front and rear sides 7, 8 and opposed walls 9, 11 extending between the sides 7, 8. At their ends nearest the side 8 the walls 9, 11 have interior tapers 12, 13 and are thus thickened thereat, whereby the cavity 6 is narrower adjacent to the side 8 than at the side 7. These tapered portions 12, 13 merge into parallel opposed or facing surfaces 14, 16 which terminate in opposed shoulders or lugs 17, 18.

Formed on the exterior of the side 7 and extending from one end 3 to the other end 4 is a longitudinal inwardly tapering groove 19, and at the groove 19 are spaced holes 21 that project through the side 7 for communication with the cavity 6. At the rear side 8 the body 2 has pairs of opposed, aligned, transverse notches 22, 23, these being a pair of notches corresponding to each hole 21 but offset therefrom. Finally, the walls 9, 11 are provided with pairs of opposed grooves 24, 26, each pair being adjacent to an end 3 or 4 and each groove 24, 26 running completely across its associated wall transversely.

A method of making the connector 1 is shown in FIGS. 2-5. There an extrusion apparatus 28 may typically comprise a cylinder 29 having a bore 31 receiving an extrusion billet 32 or like plastic stock material. Secured to the front of the cylinder 39 is an extrusion die 33 having a die cavity 34 with a cross-section corresponding to the cross-sectional shape of the connector body blank 1b shown in FIG. 3. For effecting pressure on the billet 32, an extrusion ram 36 is in the bore 31, which when moved to the right, forces the plastic material through the die cavity 34.

When the blank 1b is extruded, the plastic is hot and is cut off to proper length by a suitable cutter 37 after which the blank 1b is cooled on a pair of support rails 38, 39. These rails might be part of a conveyor which moves the cooling blank 1b away from in front of the extrusion die 33 so that the next blank can be extruded onto support rails.

The cooled blank 1b is then subject to the operations to the operations shown in FIGS. 4 and 5. To form the slots 24, 26 at each end of the connector, saws 41, 42
are used at a suitable station in the production line. If desired, two sets of saws 41, 42 may be utilized to cut both pairs of slots 24, 26 simultaneously. Each pair of opposed transverse notches 22, 23 is cut by a saw 43 and for this purpose there may be, if desired, a number of such saws 43 ganged together for simultaneous operations. The blank 16 is also cold worked upon with one or more punches 44 to form the holes 21. In this regard it should be noted that while there are different working operations shown in FIGS. 4 and 5, it will be understood that each working operation may be carried out at a different station or all of the operations could be carried out at the same station, it merely being necessary that the slots 24, 26 and notches 22, 23 are cut at their proper locations, and that the correct number and location of holes 21 are punched. The number of hole 21 and associated pairs of notches 22, 23 will depend upon the desired contact spacing for which the connector 1 is designed.

Turning now to FIGS. 9–13 there is shown a sheet metal terminal 50 having a lead section 51, a central body section 52, and a trailing end section 53. The lead section 51 comprises opposed contact-making arms 54, 55 which have trailing ends 56, 57 that merge with the spaced, generally parallel legs 57, 58 of a U-shaped bight 58 that forms part of the central body section 52. The arms 54, 55 have first portions that extend from their trailing ends 56, 57 and converge toward regions of engagement 59, 59, and from the regions 59, 59 the arms have second portions 61, 61 that diverge from each other. The arms may be notched or cut away at 62 to enhance their resiliency. On opposite sides of the regions 59, 59 and extending into the aforesaid first and second portions each arm 54 is deformed to provide opposed concavities 62, 62 that define an oval-shaped passageway 63.

Formed on the central body section 52 are opposed wings 64, 64 that project from an edge 66 of the U-shaped part and which serve to limit the insertion of the terminal 50 into the connector 1. The trailing end section 53 is offset from the wings and is comprised of a tail piece 67.

In assembling a terminal 50 with the connector 1, the terminal is inserted, lead section 51 first, through the opening into the cavity 6 between the lips 17, 18. The spacing of the legs 57, 58 is greater than the distance between the lips 17, 18 and the lips 17, 18 spread apart due to yielding of the plastic to enable the legs 57, 58 to pass thereby. When the legs have cleared the lips 17, 18, the latter snap back to prevent retraction of the terminal 50 from the connector 1. In this regard it should be noted that the invention also contemplates an arrangement where the terminal instead of connector yields or where both yield to some extent. The wings 64, 64 enter the notches 22, 23 to limit movement of the connector into the connector 1. It will be apparent that each terminal 50 is inserted into the connector in the manner just described so that the terminals are generally parallel and with each having its oval shaped opening 63 in substantial alignment with one of the holes 21 in the connector 1.

The depending tail pieces 67 of the respective terminals 50 may be passed through a circuit board 70 containing printed wiring and/or like circuitry and soldered in place at connections 71.

Provided for use with the connector 1 are like module supports 72, 73, which are channel shaped pieces having a bight 73 which embraces the ends of the connector, and spaced legs 75, 76 which are at the sides of the connector. The legs 75, 76 terminate in opposed inwardly directed flanges 77, 78 which fit snugly in the grooves 24, 26. The module supports 72, 73 may be slid onto the connector and abut the circuit board 70, the module supports 72, 73 being of a length such that they project beyond the connector wall 7. The module supports 72, 73 are preferably of plastic and may be extruded to shape, then cut to length, and then allowed to cool, all in substantially the same manner as the connector 1.

A circuit module 79, such as a printed circuit board, circuit-containing housing, or the like, has a series of parallel terminals 81 projecting therefrom. These may be any suitable type, such as the round pin-type which is herein illustrated as being typical. The number and spacing of the terminals 81 corresponds to number and spacing of the holes 21 and female terminals 50.

When the module 79 is plugged into the connector 1, each terminal 81 projects through a hole 21, being guided to some extent by the tapered groove 19. The terminal 81 is of larger diameter than the short distance across the opening 63 with the result that the contact arms 54, 55 are spread apart and their spring bias toward each other bear against and contact the terminal 81, as best seen in FIGS. 13 and 14.

The width of the circuit module 79 is preferably slightly smaller than the spacing between the facing edges of the flanges 77, 78. In such case the module supports 72, 73 tend to retain the circuit module 79 in its plugged in position so that the latter need not be entirely supported by the interfit of the terminals 81, 50.

While a preferred form of the invention has been disclosed, it will be apparent that various modifications may be made and all those falling within the purview of the claims are to be regarded as part of the invention.

The invention is claimed as follows:

1. An electrical termination assembly comprising a plurality of terminals each with contact-making means and wing portions, and a piece generally rectilinear dielectric body with opposed ends, said body having a cavity extending therethrough from one end to the other end, said body also having opposed sides, said cavity being narrower at one of said sides than at the other side and having an opening at said one side throughout the length thereof, said one side having inwardly extending lips for retaining said terminals in said cavity and said one side also having notches at opposite edges of said opening for receiving said wing portions of said terminals, and said other side of the body having a wall with a plurality of openings into said cavity in alignment respectively with said contact-making means.

2. A structure according to claim 1 having opposed walls extending between said opposed sides, said opposed walls having external grooves running between said opposite sides for reception by supporting structure that receives a circuit module.

3. An electrical termination assembly comprising a connector of dielectric material and having a longitudinal cavity and opposed sides, one of said sides having an opening into said cavity, said side at said opening
having opposed lips and also having opposed outwardly opening notches adjacent to said lips, and a terminal in said cavity and insertable through said opening, said terminal having opposed wings in said notches and abutting the bases of said notches to limit the insertion of the terminal into said connector, said terminal having a portion with opposed legs that abut said lips to prevent retraction of the terminal from the connector, said terminal having opposed contact-making arms in said cavity, said arms extending from said portion toward the other side of the connector, said connector having an opening into the cavity at said other side for receiving a conductor for electrical connection with said terminal, said cavity being narrower at said one side than at said other side, and the cavity adjacent to said one side having facing surfaces juxtaposed with said legs.

4. An electrical termination according to claim 3 in which said contact-making arms have engaging portions with opposed deformations that provide opposed concavities defining a generally oval-shaped passageway for receiving said conductor.

5. In an electrical termination assembly, a connector having a dielectric body with a cavity for receiving electrical terminals, said body having a longitudinal opening for insertion of the electrical terminals into the cavity, and channel-shaped bodies at opposite ends of said connector body and each at an angle thereto, said channel-shaped bodies each having spaced legs at opposed sides of said connector body and having flanges on said legs, said flanges projecting towards each other and constituting tongues fractionally engaging grooves on said opposed sides to retain the bodies in place, said channel-shaped bodies opening toward each other for receiving and supporting a circuit-containing module and with said flanges defining a space that slidably receives the module.

6. In an electrical termination assembly, a connector having a dielectric body with a cavity, said body having a longitudinal opening and opposed lips at said opening, channel-shaped bodies at opposite ends of the connector body and each at an angle thereto, said bodies interfitting by a groove on one engaging a tongue on the other, said channel-shaped bodies opening toward each other for receiving a circuit-containing module, at least one terminal in said cavity and at least one conductor projecting from said module through said connector body and electrically connected to said terminal, said terminal having opposed legs engaging said lips, and said cavity having facing surfaces juxtaposed with said legs.

7. A method of making an electrical termination component having a generally channel-shaped configuration comprising: extruding a channel-shaped plastic body having opposed walls and a bight-forming wall joining said opposed walls, and thereafter cutting away exterior portions of said body to form recesses on the exterior of said opposed walls that only partially penetrate said walls.

8. A method according to claim 7 in which the cutting away is carried out after the body has cooled a substantial amount below the temperature at which the body was extruded.

9. A method according to claim 7 further including cutting notches across the free ends of said walls transversely thereto and to a depth that is less than the full depth of said walls.

10. A method according to claim 9 further including cold-forming a plurality of holes in said bight-forming wall after completion of said extrusion process, the number of holes being equal to the number of notches.

11. A method of making an electrical termination component having a generally channel-shaped configuration comprising: extruding a channel-shaped plastic body having opposed walls, a bight-forming wall joining said opposed walls, and a tapered groove in the exterior of said bight-forming wall, cutting away portions of said body to forming recesses on the exterior of said opposed walls, and cold-forming holes in said bight-forming wall after completion of said extrusion process.

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