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(54) **Illuminated Ethernet Line Jack**

(57) In a connector having a molded plug receptacle for receiving a translucent molded plug used for cable termination, the improvement comprising a light-emitting device mounted in a recess of the receptacle adjacent a distal portion of the translucent moulded plug for trans-

mitting light energy through the translucent molded plug, thereby providing a visual indication of connection status between the plug and the plug receptacle.

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Description

Field of the Invention

[0001] This invention relates in general to electrical connectors, and more particularly to an illuminated jack for telephone or Ethernet line connections.

Background of the Invention

[0002] It is well known in the art to utilize jacks for providing electrical connection between circuit boards and wire connectors. For example, the ubiquitous RJ11 and RJ45 jacks have been used for decades to electrically connect telephone sets and computer equipment, respectively, to terminations such as network wiring, printed circuit boards, etc.

[0003] One problem often encountered when mating a connector with a jack is user uncertainty as to whether a proper and complete electrical connection has been made (i.e. the desired link state has been achieved). To address this problem, special jacks have been designed that contain molded-in LEDs that are caused to illuminate in response to proper and complete connection of the wire connector with the jack. One such special jack is disclosed in United States Patent No. 4,978,317 (Pocrass) entitled Connector with Visual Indication, issued December 18, 1990. Unfortunately, such specialized jacks are more costly than discrete parts due to the integration of the LED into the molded plastic and are available through a very limited number of suppliers due to limited application of the part.

[0004] Another approach to addressing the problem of user certainty in making an electrical connection between a wire connector and a jack is to provide apertures or holes in an enclosure to allow the user to see a surface-mounted LED that illuminates in response to a complete electrical connection. Unfortunately, the LEDs often are not located near the connector itself, so that it is difficult for the user to see them. Also, the holes or apertures can allow potential ESD (electrostatic discharge) to occur.

[0005] Yet another approach to this problem is the provision of special light pipes for directing light from a surface-mounted LED within an enclosure to outside of the enclosure (i.e. visible to the user). Again, the provision of such special light pipes contributes to the overall product and tooling costs, as well as to the total design time for the product.

Summary of the Invention

[0006] According to the present invention, an LED is placed within the confines of the jack footprint such that when a connector is fully inserted into the jack, light is directed from the LED through the clear molded connector plug so as to be visible to the user.

[0007] The illuminated jack of the present invention

provides immediate feedback to the user of proper link status and the connection is easily viewed by the user. Placement of the LED within the confines of the jack footprint results in an optimal use of space. There is no requirement for apertures or holes to be provided in the enclosure, thereby improving electrostatic discharge immunity. Also, fewer parts are required to be stocked by the manufacturer as the illuminated jack of the present invention can be constructed using standard stocked parts.

Brief Description of the Drawings

[0008] A detailed description of the preferred embodiment is set forth herein below with reference to the following drawings, in which

Figure 1 is a plan view of a printed circuit board incorporating multiple jacks;

Figure 2 is a cross-section through the line II - II of Figure 1;

Figure 3 is a detail of the cross-sectional view in Figure 2; and

Figure 4 is another detail cross-sectional view through line II - II of Figure 1.

Detailed Description of the Preferred Embodiment

[0009] Figure 1 is a plan view of a printed circuit board having multiple electrical components and jacks mounted thereon. Figures 2 and 3 are cross-sectional views through the line II - II of Figure 1, showing a molded plug 1 used for an Ethernet cable termination 3, disposed within a molded plug receptacle 2 of the jack, in accordance with well-known prior art design. The molded plug receptacle 2 is of a standard vertical mount style, which has a cavity between the distal portion of the plug 1 (when inserted) and the printed circuit board 6.

[0010] According to the present invention, an LED 4, or other light source of suitable dimension, is mounted within the cavity or space between the distal portion of the plug 1 and the printed circuit board 6. The molded plug 1 functions as a light pipe, such that upon complete insertion of the plug into the receptacle 2, light energy 5 is directed from the surface-mounted LED 4, through the plug 1 via Total Internal Reflection (TIR) so as to be visible to the user.

[0011] As discussed above, the provision of LED 4 within the footprint of the jack provides immediate visual indication of connection status when the plug 1 is completely inserted into the receptacle 2.

[0012] Reference is now made to Figure 4 to describe another embodiment of the present invention. Figure 4 is another detail cross-sectional view through the line II-II of Figure 1. It will be appreciated that the parts shown in Figure 4 are similar to those shown in Figure 3. In the present embodiment, however, rather than a single LED 4, three LEDs are mounted within the cavity between the

distal portion of the plug 1 (when inserted) and the printed circuit board 6. The three LEDs include one LED of each of the three primary colours, including a red LED 4a, a green LED 4b and a blue LED 4c.

[0013] As in the first-described embodiment, the molded plug 1 functions as a light pipe such that upon complete insertion of the plug 1 into the receptacle 2, the light energy 5 is directed from the surface-mounted LEDs 4a, 4b and 4c, through the plug 1 via TIR so as to be visible to the user.

[0014] The different coloured LEDs provide different colours of light directed through the molded plug 1. The colour that is directed through the molded plug 1 is controlled by the voltage to the different LEDs. Thus, different colours are directed through the molded plug by changing the voltage to the different LEDs. The different colours are provided using drive control circuitry (not shown) that controls the voltage to each of the LEDs 4a, 4b and 4c, depending on the status. Thus, the provision of the three different coloured LEDs 4a, 4b and 4c permits the provision of different coloured light for indicating different status conditions.

[0015] A person of ordinary skill in the art may conceive of other variations and alternative embodiments within the scope of the invention. For example, although the invention has been described in terms of an RJ45 jack, the invention may advantageously be used with RJ11 or other RJ-style connectors, provided that the molded plug portion 1 to which the cable termination 3 is connected, is sufficiently translucent to be used as a light pipe. Whereas molded jack receptacles are typically manufactured from opaque (e.g. black) plastic, it is contemplated that the use of clear plastic jack receptacles would also allow the connector housing to be illuminated in addition to the plug itself. This would be advantageous since the clear plastic molded jacks are often shrouded by opaque strain relief boots that reduce effective illumination. Also, as indicated above, whereas the above-described embodiments utilize LEDs to provide illumination, any suitable light emitting device may be used.

[0016] Still other modifications and variations are possible. All such modifications and variations are believed to be within the sphere and scope of the invention as defined by the claims appended hereto.

Claims

1. In a connector having a molded plug receptacle for receiving a translucent molded plug, the improvement comprising a light-emitting device mounted in a recess of said receptacle adjacent a distal portion of said translucent moulded plug for transmitting light energy through said translucent molded plug, thereby providing a visual indication of connection status between said plug and said plug receptacle.

2. The improvement of claim 1, wherein said light-emitting device is a light-emitting diode (LED).

3. The improvement of claim 1, wherein said light-emitting device comprises a plurality of LEDs.

4. The improvement of claim 3, wherein said plurality of LEDs comprises three LEDs.

5. The improvement of claim 4, wherein said three LEDs include one LED of each of the three primary colours.

6. The improvement of claim 1, wherein said receptacle is manufactured from translucent material for illumination by said light-emitting device.

7. The improvement of claim 1, wherein said molded plug is fabricated from clear plastic.

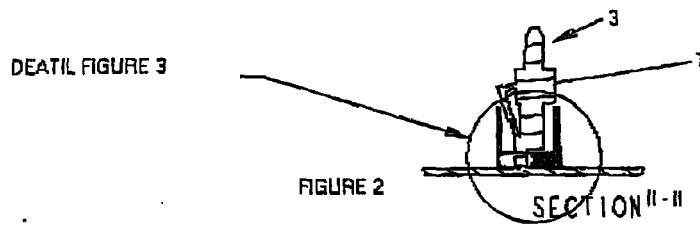
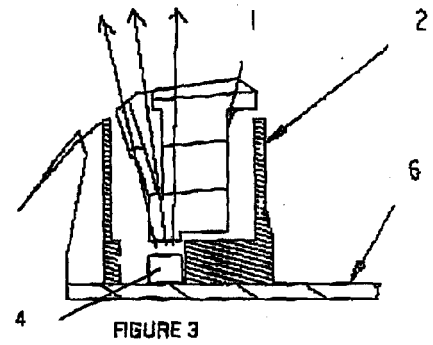
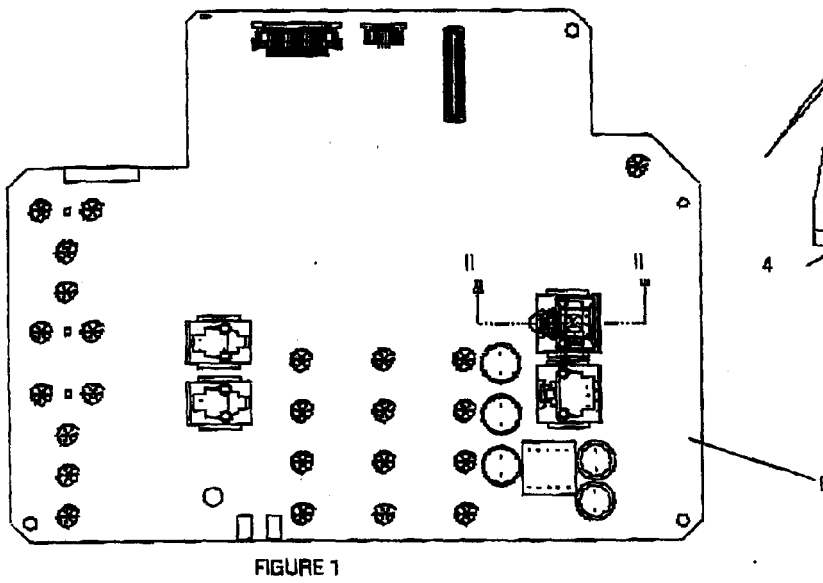
8. The improvement of claim 6, wherein said molded plug receptacle is fabricated from clear plastic.

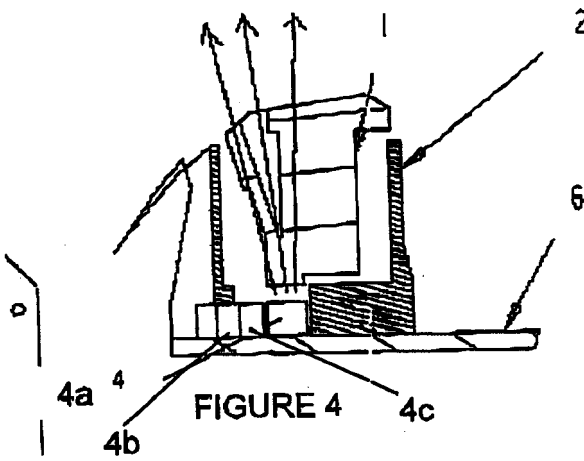
9. A connector comprising:

a receptacle configured to receive a plug; and a light-emitting device mounted within said receptacle;

the connector being arranged so that, when said plug is received within the receptacle, the light-emitting device is operated to selectively illuminate the plug and thereby to provide a visual indication of connection status between the plug and the connector.

10. A plug configured so that to act as a light pipe for light emitted by a light-emitting device located in a receptacle portion of a corresponding connector.







DOCUMENTS CONSIDERED TO BE RELEVANT			
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X	EP 0 895 318 A (HEWLETT-PACKARD COMPANY) 3 February 1999 (1999-02-03) * paragraphs [0016], [0022] - [0030], [0033] * * figures 1,4-6 *	1-3,9,10	

X	US 6 241 550 B1 (LAITY IAN A ET AL) 5 June 2001 (2001-06-05) * column 3, lines 1-32 * * column 4, lines 18-43 * * figures 2,3,5 *	1-3,9,10	

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The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 25 February 2005	Examiner Ledoux, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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