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### Electrical connector with plural terminals

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#### Abstract

An electrical connector is configured to couple to a butt plug. The electrical connector includes an insulation body, plural signal terminals, plural ground terminals, and at least one conductive plastic. The insulation body has an accommodating recess. The signal terminals are located in the accommodating recess. The ground terminals are located in the accommodating recess, and the ground terminals and the signal terminals are arranged at intervals. The conductive plastic is located on a top surface of the insulation body facing the butt plug. When the butt plug is inserted into the accommodating recess of the insulation body, plural ground terminals of the butt plug are in electrical contact with the conductive plastic.

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**Background/Summary**

**CROSS-REFERENCE TO RELATED APPLICATIONS**

(1) This application claims priority to Taiwan Application Serial Number 111137419, filed Sep. 30, 2022, which is herein incorporated by reference.

**BACKGROUND**

**Field of Invention**

(2) The present disclosure relates to an electrical connector. More particularly, the present disclosure relates to an electrical connector having ground terminals.

**Description of Related Art**

(3) To achieve electrical connection between different electronic devices, various types of electrical

connectors have existed. The electrical connectors may include the type of a wire end connector and the type of a board end connector according to disposed positions, in which the wire end connector is located at one end of a cable and is used to adapt and couple to the board end connector, while the board end connector is disposed on a printed circuit board. With the continuous advancement and innovation of the technology of various electronic products, the performance of new electronic products has been greatly improved, and the types of electrical signals tend to be more diverse and require more bandwidth. Therefore, the demand for high-speed connectors is also increasing to apply to high-speed and high-frequency connections.

(4) However, in order to meet the transmission of a large amount of data, the transmission bandwidth of the electrical connector needs to be increased, and when the transmission bandwidth is increased, the frequency of a transmitted electronic signal must be increased. In a traditional electrical connector, when signal terminals are too close to each other, high frequency signals are prone to crosstalk phenomenon, thereby affecting the transmission of the signals.

#### SUMMARY

(5) One aspect of the present disclosure provides an electrical connector configured to couple to a butt plug.

(6) According to some embodiments of the present disclosure, an electrical connector includes an insulation body, plural signal terminals, plural ground terminals, and at least one conductive plastic. The insulation body has an accommodating recess. The signal terminals are located in the accommodating recess. The ground terminals are located in the accommodating recess, and the ground terminals and the signal terminals are arranged at intervals. The conductive plastic is located on a top surface of the insulation body facing the butt plug. When the butt plug is inserted into the accommodating recess of the insulation body, plural ground terminals of the butt plug are in electrical contact with the conductive plastic.

(7) In some embodiments, when the butt plug is inserted into the accommodating recess of the insulation body, the conductive plastic of the electrical connector is in contact with the ground terminals of the electrical connector.

(8) In some embodiments, the conductive plastic has a main portion and a plurality of finger portions protruding from the main portion, and the finger portions respectively cover a plurality of contact portions of the ground terminals of the electrical connector.

(9) In some embodiments, there is a distance between one end of each of the finger portions adjacent to the accommodating recess and the main portion.

(10) In some embodiments, the main portion of the conductive plastic is disposed along a lengthwise direction of the accommodating recess of the insulation body.

(11) In some embodiments, an extending direction of the finger portions of the conductive plastic is perpendicular to a lengthwise direction of the main portion.

(12) In some embodiments, a distance between two adjacent ones of the finger portions of the conductive plastic is greater than a distance between two adjacent ones of the signal terminals.

(13) In some embodiments, each of the ground terminals of the electrical connector comprises one of the contact portions, a fixed portion, and a welding portion that are connected in sequence, and the contact portions respectively correspond to the finger portions of the conductive plastic in position.

(14) In some embodiments, when the butt plug is inserted into the accommodating recess of the insulation body, each of the contact portions is in electrical contact with one of the ground terminals of the butt plug and one of the finger portions of the conductive plastic.

(15) In some embodiments, there is a plurality of the conductive plastics respectively located on two opposite sides of the insulation body.

(16) Another aspect of the present disclosure provides an electrical connector configured to couple to a butt plug.

(17) According to some embodiments of the present disclosure, an electrical connector includes an

insulation body, plural signal terminals, plural ground terminals, and at least one conductive plastic. The insulation body has an accommodating recess. The signal terminals are located in the accommodating recess. The ground terminals are located in the accommodating recess, and the ground terminals and the signal terminals are arranged at intervals. The conductive plastic is located on a top surface of the insulation body facing the butt plug. When the butt plug is inserted into the accommodating recess of the insulation body, the conductive plastic of the electrical connector is in contact with the ground terminals of the electrical connector.

(18) In some embodiments, the conductive plastic has a main portion and a plurality of finger portions protruding from the main portion, and the finger portions respectively cover a plurality of contact portions of the ground terminals of the electrical connector.

(19) In some embodiments, there is a distance between one end of each of the finger portions adjacent to the accommodating recess and the main portion.

(20) In some embodiments, the main portion of the conductive plastic is disposed along a lengthwise direction of the accommodating recess of the insulation body.

(21) In some embodiments, an extending direction of the finger portions of the conductive plastic is perpendicular to a lengthwise direction of the main portion.

(22) In the aforementioned embodiments of the present disclosure, since the electrical connector includes the conductive plastic and the conductive plastic is located on the top surface of the insulation body facing the butt plug, the ground terminals of the butt plug can be in electrical contact with the conductive plastic when the butt plug is inserted into the accommodating recess of the insulation body. Moreover, the ground terminals of the electrical connector can be respectively in electrical contact with the ground terminals of the butt plug, such that the ground terminals of the electrical connector are pressed by the ground terminals of the butt plug to be in electrical contact with the conductive plastic. Through such a configuration, when this electrical connector is coupled to the butt plug, the electrical connector can enable its ground terminals to electrically conduct with the ground terminals of the butt plug by the conductive plastic, thereby preventing the problem of crosstalk between differential signals caused by high-speed signal transmission. Therefore, the electrical connector can meet the transmission of high-frequency signals and is beneficial to improve transmission bandwidth and increase electronic signal frequency, and is suitable for a large amount of data transmission requirements.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

(1) Aspects of the present disclosure are best understood from the following detailed description when read with the accompanying figures. It is noted that, in accordance with the standard practice in the industry, various features are not drawn to scale. In fact, the dimensions of the various features may be arbitrarily increased or reduced for clarity of discussion.

(2) FIG. 1 is a perspective view of an electrical connector and a butt plug that are not coupled to each other yet according to one embodiment of the present disclosure.

(3) FIG. 2 is a cross-sectional view of the electrical connector taken along line 2-2 of FIG. 1.

(4) FIG. 3 is a perspective view of the electrical connector and the butt plug of FIG. 1 after being coupled to each other.

(5) FIG. 4 is a cross-sectional view of the electrical connector and the butt plug taken along line 4-4 of FIG. 3.

(6) FIG. 5 is a cross-sectional view of the electrical connector and the butt plug taken along line 5-5 of FIG. 3.

(7) FIG. 6 is a top view of the electrical connector of FIG. 1.

(8) FIG. 7 is a top view of the electrical connector of FIG. 6 after a conductive plastic is removed.

#### DETAILED DESCRIPTION

(9) The following disclosure provides many different embodiments, or examples, for implementing different features of the provided subject matter. Specific examples of components and arrangements are described below to simplify the present disclosure. These are, of course, merely examples and are not intended to be limiting. In addition, the present disclosure may repeat reference numerals and/or letters in the various examples. This repetition is for the purpose of simplicity and clarity and does not in itself dictate a relationship between the various embodiments and/or configurations discussed.

(10) Further, spatially relative terms, such as “beneath,” “below,” “lower,” “above,” “upper” and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. The spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. The apparatus may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein may likewise be interpreted accordingly.

(11) FIG. 1 is a perspective view of an electrical connector **100** and a butt plug **200** that are not coupled to each other yet according to one embodiment of the present disclosure. FIG. 2 is a cross-sectional view of the electrical connector **100** taken along line 2-2 of FIG. 1. As shown in FIG. 1 and FIG. 2, the electrical connector **100** is configured to couple to the butt plug **200**. The electrical connector **100** may be disposed on a printed circuit board to serve as a board end connector, while the butt plug **200** may be connected to a cable to serve as wire end connector. In some embodiments, the electrical connector **100** may be applied to a server and a workstation, but the present disclosure is not limited in this regard.

(12) The electrical connector **100** includes an insulation body **110**, plural signal terminals **120**, plural ground terminals **130**, and at least one conductive plastic **140**. The insulation body **110** has an accommodating recess **S** capable of being inserted by a connection portion **210** of the butt plug **200**. The signal terminals **120** and the ground terminals **130** are located in the accommodating recess **S**, and the ground terminals **130** and the signal terminals **120** are arranged at intervals, such as in a parallel arrangement along the X-axis. The ground terminal **130** of the electrical connector **100** includes a contact portion **132**, a fixed portion **134**, and a welding portion **136** that are connected in sequence. The conductive plastic **140** has a main portion **142** and plural finger portions **144** protruding from the main portion **142**. In the Z-axis direction, the finger portions **144** of the conductive plastic **140** respectively cover the contact portions **132** of the ground terminals **130**. In other words, the contact portions **132** respectively correspond to the finger portions **144** of the conductive plastic **140** in position.

(13) In this embodiment, any two adjacent signal terminals **120** are located between two of the ground terminals **130**, such as an arrangement with the order of the ground terminal **130**, the signal terminal **120**, the signal terminal **120**, and the ground terminal **130**. In such a configuration, two adjacent signal terminals **120** may be a pair of differential signal terminals.

(14) Furthermore, in this embodiment, the conductive plastic **140** is located on a top surface (a surface facing the butt plug **200**) of the insulation body **110**. The number of the conductive plastics **140** may be plural, such as two. As shown in FIG. 1, the two conductive plastics **140** are disposed opposite each other, and are respectively located on two opposite sides of the insulation body **110**.

(15) In some embodiments, the material of the insulation body **110** may be plastic, and the material of the signal terminal **120** and the material of the ground terminal **130** may be metal, such as copper, but not limited to copper. The material of the conductive plastic **140** may include plastic and a conductive material doped in plastic. For example, the conductive material may be gold, silver, copper, carbon or graphite related compounds, but the present disclosure is not limited to the aforementioned materials. Through the aforementioned design, the resistance of the conductive plastic **140** is greater than the resistance of the ground terminal **130**, but less than the resistance of

the insulation body **110**.

(16) When the electrical connector **100** is not coupled to the butt plug **200** yet, as shown in FIG. 2, the conductive plastic **140** partially extends to a position above the ground terminal **130** and is spaced apart from the ground terminal **130**. Specifically, when the contact portion **132** of the ground terminal **130** of the electrical connector **100** is not pressed by a ground terminal **230** (see FIG. 1) of the butt plug **200**, there is a gap G between the finger portion **144** of the conductive plastic **140** and the contact portion **132** of the ground terminal **130** in the Z-axis direction, and thus the ground terminal **130** does not electrically conduct to the conductive plastic **140**. In the following description, the state about the ground terminal **130** after the electrical connector **100** is coupled to the butt plug **200** will be described.

(17) FIG. 3 is a perspective view of the electrical connector **100** and the butt plug **200** of FIG. 1 after being coupled to each other. As shown in FIG. 1 and FIG. 3, the connection portion **210** of the butt plug **200** can be inserted into the accommodating recess S of the insulation body **110** of the electrical connector **100**. After the electrical connector **100** is coupled to the butt plug **200**, the connection portion **210** is accommodated in the accommodating recess S of the insulation body **110**. Moreover, in the accommodating recess S, the ground terminal **130** and the signal terminal **120** of the electrical connector **100** can respectively abut against the ground terminal **230** and a signal terminal **220** of the butt plug **200** to cause conduction.

(18) FIG. 4 is a cross-sectional view of the electrical connector **100** and the butt plug **200** taken along line 4-4 of FIG. 3. For the electrical connector **100**, the cross-sectional position of FIG. 4 is the same as that of FIG. 2. As shown in FIG. 3 and FIG. 4, when the butt plug **200** is coupled to the electrical connector **100**, the ground terminal **230** of the butt plug **200** is in electrical contact with the conductive plastic **140**, and each of the contact portions **132** of the ground terminals **130** is in electrical contact with one of the ground terminals **230** of the butt plug **200** and one of the finger portions **144** of the conductive plastic **140**. The fixed portion **134** of the ground terminal **130** may be positioned on the inner sidewall of the insulation body **110**, and the welding portion **136** of the ground terminal **130** may be used for being soldered on a printed circuit board.

(19) Specifically, since the electrical connector **100** includes the conductive plastic **140** and the conductive plastic **140** is located on the top surface of the insulation body **110** facing the butt plug **200**, the ground terminals **230** of the butt plug **200** can be in electrical contact with the conductive plastic **140** when the butt plug **200** is inserted into the accommodating recess S (see FIG. 1) of the insulation body **110** of the electrical connector **100**. Moreover, the ground terminals **130** of the electrical connector **100** can be respectively in electrical contact with the ground terminals **230** of the butt plug **200**, such that the ground terminals **130** of the electrical connector **100** are pressed by the ground terminals **230** of the butt plug **200** to be in electrical contact with the conductive plastic **140**. Through such a configuration, when this electrical connector **100** is coupled to the butt plug **200**, the electrical connector **100** can enable its ground terminals **130** to electrically conduct with the ground terminals **230** of the butt plug **200** by the conductive plastic **140**, thereby preventing the problem of crosstalk between differential signals caused by high-speed signal transmission. Therefore, the electrical connector **100** can meet the transmission of high-frequency signals and is beneficial to improve transmission bandwidth and increase electronic signal frequency, and is suitable for a large amount of data transmission requirements.

(20) FIG. 5 is a cross-sectional view of the electrical connector **100** and the butt plug **200** taken along line 5-5 of FIG. 3. As shown in FIG. 1 and FIG. 5, the signal terminal **120** of the electrical connector **100** includes a contact portion **122**, a fixed portion **124**, and a welding portion **126** that are connected in sequence. When the butt plug **200** is inserted into the accommodating recess S of the insulation body **110** of the electrical connector **100**, the contact portion **122** of the signal terminal **120** is exposed and not covered by the conductive plastic **140** in the Z-axis direction, and the contact portion **122** of the signal terminal **120** is adjacent to the finger portion **144** of the conductive plastic **140**. In addition, the fixed portion **124** of the signal terminal **120** of the electrical

connector **100** may be positioned on the inner sidewall of the insulation body **110**, and the welding portion **126** of the signal terminal **120** may be used for being soldered on a printed circuit board. (21) As shown in FIG. 3 and FIG. 5, when the butt plug **200** is inserted into the accommodating recess S (see FIG. 1) of the insulation body **110** of the electrical connector **100**, the signal terminals **120** of the electrical connector **100** can be respectively electrically connected to the signal terminals **220** of the butt plug **200** to transmit signals. In this state, the contact portion **122** of the signal terminal **120** of the electrical connector **100** may be in contact with the signal terminal **220** of the butt plug **200** to cause conduction, but the signal terminal **120** of the electrical connector **100** is spaced apart from the conductive plastic **140**.

(22) It is to be noted that the connection relationships, the materials, and the advantages of the elements described above will not be repeated in the following description. In the following description, the ground terminals **130** and the conductive plastic **140** of the electrical connector **100** will be explained in detail.

(23) FIG. 6 is a top view of the electrical connector **100** of FIG. 1. FIG. 7 is a top view of the electrical connector **100** of FIG. 6 after the conductive plastic **140** is removed. As shown in FIG. 6 and FIG. 7, the conductive plastic **140** is located on a top surface **112** of the insulation body **110**, and the top surface **112** of the insulation body **110** faces toward the butt plug **200** (see FIG. 1). There is a distance  $d$  between one end of the finger portion **144** adjacent to the accommodating recess S and the main portion **142**. In other words, the finger portion **144** extends outward from the main portion **142** to the accommodating recess S. The main portion **142** of the conductive plastic **140** is disposed along a lengthwise direction  $D1$  of the accommodating recess S of the insulation body **110**. In this embodiment, an extending direction  $D2$  of the finger portions **144** of the conductive plastic **140** is perpendicular to the lengthwise direction  $D1$  of the main portion **142**, and the finger portions **144** are configured to cover the ground terminals **130**.

(24) In addition, a distance between two adjacent finger portions **144** of the conductive plastic **140** is greater than a distance between two adjacent signal terminals **120**. Such a configuration can ensure that the finger portions **144** of the conductive plastic **140** do not overlap the two adjacent signal terminals **120** in the Z-axis direction (see FIG. 5) such that the two adjacent signal terminals **120** can be exposed, thereby preventing structural interference.

(25) The foregoing outlines features of several embodiments so that those skilled in the art may better understand the aspects of the present disclosure. Those skilled in the art should appreciate that they may readily use the present disclosure as a basis for designing or modifying other processes and structures for carrying out the same purposes and/or achieving the same advantages of the embodiments introduced herein. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the present disclosure, and that they may make various changes, substitutions, and alterations herein without departing from the spirit and scope of the present disclosure.

## Claims

1. An electrical connector, configured to couple to a butt plug, and the electrical connector comprising: an insulation body having an accommodating recess; a plurality of signal terminals located in the accommodating recess; a plurality of ground terminals located in the accommodating recess, wherein the ground terminals and the signal terminals are arranged at intervals; and at least one conductive plastic located on a top surface of the insulation body facing the butt plug, wherein the conductive plastic has a main portion and a plurality of finger portions protruding from the main portion, and the finger portions respectively cover a plurality of contact portions of the ground terminals of the electrical connector, and when the butt plug is inserted into the accommodating recess of the insulation body, a plurality of ground terminals of the butt plug are in electrical contact with the conductive plastic.

2. The electrical connector of claim 1, wherein when the butt plug is inserted into the accommodating recess of the insulation body, the conductive plastic of the electrical connector is in contact with the ground terminals of the electrical connector.
  3. The electrical connector of claim 1, wherein there is a distance between one end of each of the finger portions adjacent to the accommodating recess and the main portion.
  4. The electrical connector of claim 1, wherein the main portion of the conductive plastic is disposed along a lengthwise direction of the accommodating recess of the insulation body.
  5. The electrical connector of claim 1, wherein an extending direction of the finger portions of the conductive plastic is perpendicular to a lengthwise direction of the main portion.
  6. The electrical connector of claim 1, wherein a distance between two adjacent ones of the finger portions of the conductive plastic is greater than a distance between two adjacent ones of the signal terminals.
  7. The electrical connector of claim 1, wherein each of the ground terminals of the electrical connector comprises one of the contact portions, a fixed portion, and a welding portion that are connected in sequence, and the contact portions respectively correspond to the finger portions of the conductive plastic in position.
  8. The electrical connector of claim 7, wherein when the butt plug is inserted into the accommodating recess of the insulation body, each of the contact portions is in electrical contact with one of the ground terminals of the butt plug and one of the finger portions of the conductive plastic.
  9. The electrical connector of claim 1, wherein there is a plurality of the conductive plastics respectively located on two opposite sides of the insulation body.
  10. An electrical connector, configured to couple to a butt plug, and the electrical connector comprising: an insulation body having an accommodating recess; a plurality of signal terminals located in the accommodating recess; a plurality of ground terminals located in the accommodating recess, wherein the ground terminals and the signal terminals are arranged at intervals; and at least one conductive plastic located on a top surface of the insulation body facing the butt plug, wherein the conductive plastic has a main portion and a plurality of finger portions protruding from the main portion, and the finger portions respectively cover a plurality of contact portions of the ground terminals of the electrical connector, and when the butt plug is inserted into the accommodating recess of the insulation body, the conductive plastic of the electrical connector is in contact with the ground terminals of the electrical connector.
  11. The electrical connector of claim 10, wherein there is a distance between one end of each of the finger portions adjacent to the accommodating recess and the main portion.
  12. The electrical connector of claim 10, wherein the main portion of the conductive plastic is disposed along a lengthwise direction of the accommodating recess of the insulation body.
  13. The electrical connector of claim 10, wherein an extending direction of the finger portions of the conductive plastic is perpendicular to a lengthwise direction of the main portion.
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