

ELECTRICAL CONNECTOR AND ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

The present disclosure claims the priority to Chinese Patent Application No.
5 202010771538.8 filed on August 4, 2020, the entire contents of which are incorporated
herein by reference.

TECHNICAL FIELD

Embodiments of the present disclosure relate to the technical field of
10 communications, and in particular, to an electrical connector and an electronic device.

BACKGROUND

With rapid development of communication technology, the new generation of
devices gradually develops towards miniaturization and modularization, resulting in
15 higher and higher requirements on service performance, volume and size, and reliability
of various components. Electrical connectors are widely used in communication devices
as a basic electronic device.

The electrical connector is used for electrically connecting a plurality of Printed
Circuit Boards (hereinafter referred to as PCBs) to enable signal transmission among the
20 PCBs. However, a conventional electrical connector mainly adopts a cable to connect
two PCBs, and such connection method not only has the disadvantages of large size,
inconvenient installation, high labor cost and large operation error, but also is not
beneficial to modularization.

SUMMARY

For at least solving one of the technical problems in the existing technology,
embodiments of the present disclosure provide an electrical connector and an electronic
device.

As one technical solution, an embodiment of the present disclosure provides an
30 electrical connector for electrically connecting a plurality of to-be-connected members,
including an insulating housing structure and an electrical contact, wherein a plurality of
openings are provided on the insulating housing structure; the electrical contact includes
a main body disposed in the insulating housing structure and a plurality of contact
portions formed on the main body, and each of the contact portions penetrates each of

the openings in one-to-one correspondence and extends out of the insulating housing structure; and the electrical contact has elasticity to enable each of the contact portions to come into elastic contact with a corresponding to-be-connected member.

As another technical solution, an embodiment of the present disclosure further provides an electronic device, which includes a plurality of connected members, and further includes the electrical connector provided in the above embodiment of the present disclosure, and the electrical connector is configured for electrically connecting the plurality of connected members.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompany drawings are intended to provide a further understanding of the present disclosure and constitute a part of the specification. Together with the following specific embodiments, the drawings are used to explain the present disclosure, but do not constitute any limitation to the present disclosure. In the drawings:

FIG. 1 is a schematic diagram illustrating a connection process between an electrical connector and PCBs according to an embodiment of the present disclosure;

FIG. 2A is a schematic structural diagram of an electrical connector according to the embodiment of the present disclosure;

FIG. 2B is a side view of an electrical connector which has been connected to the PCBs according to the embodiment of the present disclosure;

FIG. 3A is a schematic structural diagram of an electrical connector according to the embodiment of the present disclosure;

FIG. 3B is a schematic structural diagram of a conductive strip of an electrical contact according to the embodiment of the present disclosure;

FIG. 4 is a schematic structural diagram of a housing base according to the embodiment of the present disclosure;

FIG. 5 is a schematic structural diagram of a cover plate according to the embodiment of the present disclosure;

FIG. 6 is a schematic diagram illustrating a connection structure between a housing base and a cover plate according to the embodiment of the present disclosure;

FIG. 7A is a schematic diagram of a back structure of a housing base according to the embodiment of the present disclosure; and

FIG. 7B is a top view of a housing base according to the embodiment of the present disclosure.

DETAILED DESCRIPTION

The specific embodiments of the present disclosure are further described in detail below with reference to the drawings. It should be understood that the specific
5 embodiments described herein are merely used to describe and explain the present disclosure, rather than limiting the present disclosure.

An electrical connector provided by an embodiment of the present disclosure is configured to electrically connect a plurality of to-be-connected members. For example, as shown in FIG. 1, the to-be-connected members are two PCBs, namely, a first PCB 3a
10 and a second PCB 3b, and the electrical connector is configured for electrically connecting the first PCB 3a with the second PCB 3b.

The electrical connector includes an insulating housing structure 1 and an electrical contact 2 (as shown in FIG. 3A). The insulating housing structure 1 is made of an insulating material, such as a plastic material. Moreover, in this embodiment, as shown
15 in FIG. 2A, the insulating housing structure 1 includes a housing base 11 and a cover plate 12, which are detachably connected to each other. The housing base 11 is configured to be fixedly connected to the first PCB 3a and the second PCB 3b. An accommodating groove capable of accommodating the electrical contact 2 is provided in the housing base 11. The cover plate 12 is configured to close an opening of the
20 accommodating groove in the housing base 11. The first PCB 3a and the second PCB 3b are parallel to each other, located in the same plane, and mounted on a side of the cover plate 12 away from the accommodating groove. Further, a plurality of openings 121 are provided on a plate surface of the cover plate 12, and as shown in FIG. 2A, a plurality of
25 contact portions 22 of the electrical contact 2 extend out of the insulating housing structure 1 through the plurality of openings 121 respectively, so as to come into electrical contact with the first PCB 3a or the second PCB 3b.

With the electrical contact 2 accommodated inside the above-described insulating housing structure 1, not only an occupied space can be reduced and a device structure can be simplified, but also easy assembly and modularization can be facilitated.

It should be noted that, in this embodiment, in order to achieve electrical connection
30 between the first PCB 3a and the second PCB 3b, which are parallel to each other and located in the same plane, the plurality of openings 121 are all located on the plate surface of the cover plate 12 (and penetrate the cover plate 12), but the embodiments of the present disclosure are not limited thereto. In practical applications, the respective

openings 121 may be provided on the housing of the insulating housing structure 1 according to specific needs, for example, at least one opening 121 may be provided on the housing base 11.

It should be noted that, in this embodiment, the insulating housing structure 1 is composed of the housing base 11 and the cover plate 12, but the embodiments of the present disclosure are not limited thereto. In practical applications, the insulating housing structure 1 may be composed of at least two separate bodies of any other structures, or the insulating housing structure 1 may adopt an integral structure, with the electrical contact 2 embedded in the cavity of the above-described insulating housing structure 1 in advance by a well-known technical means.

As shown in FIG. 3A, the electrical contact 2 includes a plurality of conductive strips 2a, which are arranged apart from each other in the above-described insulating housing structure 1. As shown in FIG. 3B, a main body 21 of each conductive strip 2a is disposed in the insulating housing structure 1, and includes a middle section 211 and two edge sections (212a, 212b) located on two sides (opposite sides) of the middle section 211. The middle section 211 is configured as a support part capable of supporting the two edge sections (212a, 212b). The two edge sections (212a, 212b) are bent towards each other relative to the middle section 211, so as to form first bent portions connected with the middle section 211 respectively, and contact portions (22a, 22b) are respectively formed at ends of the two edge sections (212a, 212b) away from the middle section 211.

In this embodiment, both the two contact portions (22a, 22b) are a part of a conductive strip 2a, and are respectively bent relative to the two edge sections (212a, 212b), so as to form second bent portions respectively. As can be known from FIG. 2A, the tip ends of the second bent portions are located inside the insulating housing structure 1. In this way, the contact portion 22 can come into electrical contact with the PCB through the bent region between two ends of the contact portion 22, resulting in a larger contact area compared to a case where the contact portion 22 comes into electrical contact with the PCB through the tip end of the contact portion 22, so that contact reliability can be improved.

With the two edge sections (212a, 212b) supported by the middle section 211, at least bent regions of the two contact portions (22a, 22b) can be kept in positions outside the insulating housing structure 1. Meanwhile, with the two edge sections (212a, 212b) bent towards each other relative to the middle section 211, the entire conductive strip 2a

can be entitled with elasticity. Specifically, when the PCBs are pressed against the cover plate 12, the two edge sections (212a, 212b) of the conductive strip 2a are elastically deformed relative to the middle section 211, so that each contact portion 22 applies an elastic force, which is opposite to the pressure applied by the PCBs, to the corresponding
5 PCB; that is, each of the contact portions (22a, 22b) can come into elastic contact with the corresponding PCB. Such elastic contact can increase a contact fit tolerance (perpendicular to the plate surface direction of the cover plate, and the tolerance can reach $\pm 1\text{mm}$) between the electrical connector and the PCB, reduce an installation error, and improve installation efficiency.

10 In this embodiment, taking electrically connecting the first PCB 3a with the second PCB 3b, which are parallel to each other and located in the same plane, as an example, the plurality of openings 121 are arranged on the plate surface of the cover plate 12 to form two columns of openings, and the two columns of openings are disposed opposite to the first PCB 3a and the second PCB 3b, respectively. Each opening 121 in one of the
15 two columns of openings and the corresponding opening 121 in the other one of the two columns of openings are arranged into one row in one-to-one correspondence. The number of the conductive strips 2a is the same as that of the rows of the openings, and the two contact portions (22a, 22b) of each conductive strip 2a are arranged in one-to-one correspondence with two openings 121 in each row. In this way, both of the
20 two contact portions (22a, 22b) of each conductive strip 2a are configured to be brought into electrical contact with the first PCB 3a and the second PCB 3b respectively, so as to achieve the electrical connection between the first PCB 3a and the second PCB 3b.

In practical applications, a conductive layer is disposed on each PCB for realizing simultaneous electrical contact with the contact portions 22 corresponding to at least one
25 opening 121 in the same column of openings. Of course, if a certain contact of the PCB is not expected to be electrically connected to a corresponding contact of a corresponding PCB, for example, there may be no conductive layer provided in the position corresponding to the contact or an insulating layer may be provided outside the conductive layer.

30 By providing a plurality of conductive strips 2a, the contact fit tolerance (perpendicular to the plate surface direction of the cover plate, and the tolerance can reach $\pm 1\text{mm}$) between the electrical connector and the PCB can be increased, installation error can be reduced, and the installation efficiency can be improved. In addition, in some implementations, each conductive strip 2a may undergo a certain degree of plastic

deformation, so that an included angle α (see FIG. 3B) between either of the two edge sections (212a, 212b) and the middle section 211 may be adjusted, and thus a maximum distance by which the contact portions 22 extend out of the insulating housing structure 1 may be adjusted, so as to obtain a proper contact force. With the proper contact force, the contact fit tolerance (perpendicular to the plate surface direction of the cover plate, and the tolerance can reach $\pm 1\text{mm}$) between the electrical connector and the PCB can be increased while it is ensured that the conductive strip 2a does not undergo excessive plastic deformation. For example, the above-described maximum distance may reach 3 mm by adjusting the included angle α .

It should be noted that, in this embodiment, the electrical contact 2 includes a plurality of conductive strips 2a, but the embodiments of the present disclosure are not limited thereto. In practical applications, the electrical contact 2 may adopt any other structure. For example, the electrical contact 2 is an integral structure, such as a single conductive sheet (for example, a width of the conductive sheet is equal to a sum of widths of all the conductive strips 2a) similar to the structure of the above-described conductive strip 2a.

In addition, the above-described conductive strip 2a is applicable to the electrical connection between the first PCB 3a and the second PCB 3b, which are parallel to each other and located in the same plane. In practical applications, the structure of the electrical contact 2 may also be changed adaptively with a change of layouts of the PCBs or when the to-be-connected members are other components except PCBs; and the objective of the embodiments of the present disclosure can be achieved as long as the electrical contact 2 has the following structure and function: the electrical contact 2 includes a main body provided in the insulating housing structure 1 and a plurality of contact portions formed on the main body, and the electrical contact 2 has elasticity to enable each contact portion 22 to come into elastic contact with a corresponding to-be-connected member. In this way, the need to use a connecting structure having a male end and a female end is obviated, and welding and insertion are avoided, so that quick connection can be achieved. In addition, since the electrical contact 2 has the elasticity to enable each contact portion 22 to come into elastic contact with each to-be-connected member in one-to-one correspondence, the contact fit tolerance between the electrical connector and the to-be-connected member can be increased, the installation error can be reduced, and the installation efficiency can be improved.

It should be further noted that, in this embodiment, the middle section 211 of the

conductive strip 2a is configured as the support part capable of supporting the two edge sections (212a, 212b), and the first bent portions are respectively formed at the two edge sections (212a, 212b), but the embodiments of the present disclosure are not limited thereto. In practical applications, the structure of the support part, and the structure and
5 bending direction of the first bent portion relative to the support part may be designed according to specific situations. In addition, the contact portion is formed at an end of each first bent portion away from the support part.

In this embodiment, as shown in FIG. 4, a first restricting structure is provided on the inner surface (e.g., a bottom surface of the accommodating groove) of the housing
10 base 11, and is configured to restrict the position of the electrical contact 2. For example, the first restricting structure includes at least one first restricting groove and at least one insertion member, which are formed on the inner surface of the housing base 11. Correspondingly, the main body of the electrical contact 2 is provided with a restricting part matched with the first restricting groove and an insertion slot for plug-in connection
15 with the insertion member. As shown in FIG. 4, for example, the first restricting groove is defined by first bumps 111a and 111b, which are arranged apart from each other; the insertion member is composed of second bumps 112a and 112b, which are arranged on two sides of the first restricting groove. Correspondingly, as shown in FIG. 3B, a part (e.g., the middle section 211) of the main body 21 of the conductive strip 2a is located in
20 the first restricting groove, and two restricting bumps 24 are provided on each of two sides of the main body 21 of the conductive strip 2a, and the two restricting bumps 24 on each of the two sides of the main body 21 are configured to restrict a first bump, which is located on the same side as the two restricting bumps 24, between the two restricting bumps 24, so that movement of the conductive strip 2a along the first restricting groove
25 may be restricted. Moreover, insertion slots 23 are provided on both of the two edge sections (212a, 212b) of the conductive strip 2a and are configured for plug-in connection with the second bumps 112a and 112b respectively, so that rotation of the conductive strip 2a may be restricted.

In this embodiment, as shown in FIG. 5, a second restricting structure is provided
30 on the inner surface (away from the front side 122 of the cover plate 12) of the cover plate 12, and is configured to restrict the position of the electrical contact 2. For example, the second restricting structure includes at least one second restricting groove 124 formed on the inner surface of the cover plate 12, and a part of the main body of the electrical contact 2 is located in the second restricting groove 124. For example, portions

of the two edge sections (212a, 212b) of the conductive strip 2a, which are far away from the middle section, are located in the second restricting groove 124.

With the first restricting structure and the second restricting structure, single-board warping occurring in single-side contact of the conductive strip 2a (that is, the contact portion on merely one edge section is in contact with the PCB) can be avoided, so that effective transmission of signals can still be ensured when a height difference exists between two PCBs. Of course, in practical applications, the first restricting structure and the second restricting structure may have any other structures as long as the position of the electrical contact 2 can be restricted.

In this embodiment, a plurality of engaging members are provided apart from each other on a circumferential side of the cover plate 12. As shown in FIG. 5, for the cover plate 12 in a rectangular shape, four engaging members 125a having relatively small widths are provided on a long side of the cover plate 12, and one engaging member 125b having a relatively large width is provided on a short side of the cover plate 12. As shown in FIG. 6, the engaging members 125a and 125b are, for example, wedge-shaped blocks, and the height of the wedge-shaped block protruding from the circumferential side of the cover plate 12 decreases along a direction towards the inner side of the plate surface of the cover plate 12.

Correspondingly, as shown in FIG. 4, a plurality of slots 113 are provided on the inner side of the housing base 11, and the engaging members are engaged with the slots 113 in one-to-one correspondence as shown in FIG. 6. When the cover plate 12 is pressed into the housing base 11, a slope of the wedge-shaped block moves along the inner side of the housing base 11 until the wedge-shaped block is moved into the slot 113, and at this time, a vertical surface of the wedge-shaped block is matched with a side of the slot 113 to make it difficult to separate the cover plate 12 from the housing base 11.

The above engagement of the wedge-shaped block and the slot can not only reduce manufacturing difficulty of the housing base 11 and the cover plate 12, but also produce a simple structure and realize reliable fixation.

In this embodiment, as shown in FIG. 7A, two mounting holes (115a, 115b) and two positioning pieces (116a, 116b) are provided on a side of the housing base 11 away from the cover plate 12 (i.e., the back side 114 of the housing base 11), and the two mounting holes (115a, 115b) and the two positioning pieces (116a, 116b) are arranged in a rectangular shape, for example, for the housing base 11 in a shape similar to a rectangle,

the two mounting holes (115a, 115b) and the two positioning pieces (116a, 116b) are arranged at four corners of the housing base 11. The two mounting holes (115a, 115b) are diagonally arranged, and each mounting hole is configured to be fixedly connected with the PCB through a fastener (such as a screw or a bolt); and the two positioning
5 pieces (116a, 116b) are diagonally arranged, and each positioning piece is configured to be matched with a positioning structure disposed on the PCB, so as to restrict the position and the direction of the housing base 11. For example, the positioning piece is a positioning column, and the positioning structure on the PCB is a positioning groove matched with the positioning column.

10 With the two positioning pieces (116a, 116b) diagonally arranged, a placement position and the direction of the housing base 11 can be determined rapidly, so as to effectively solve the problem of backward installation of the connector, and the problem of low efficiency caused when the connector needs to be placed again due to an incorrect placement position.

15 In this embodiment, as shown in FIG. 7A and FIG. 7B, a boss 117a and a boss 117b are respectively provided on the sides where the two mounting holes (115a, 115b) of the housing base 11 are located, and as shown in FIG. 7B, the presence of the boss 117a and the boss 117b make the profile of the back side 114 of the housing base 11 similar to an inverted S, which may further avoid backward installation of the connector, thereby
20 improving the installation efficiency.

In summary, according to the electrical connector provided by the embodiments of the present disclosure, the electrical contact is accommodated in the insulating housing structure, so that not only the occupied space can be reduced and the device structure can be simplified, but also the assembly and the modularization can be facilitated. Moreover,
25 the plurality of contact portions are formed on the main body of the electrical contact, each contact portion penetrates each opening in one-to-one correspondence and extends out of the insulating housing structure, thereby electrical connection can be realized simply by contacting each to-be-connected member just needs to come into contact with the respective contact portions, so that the need to use a connecting structure having a
30 male end and a female end is obviated, and welding and insertion are avoided, thereby facilitating realization of quick connection. In addition, since the electrical contact has the elasticity to enable each contact portion to come into elastic contact with each to-be-connected member in one-to-one correspondence, the contact fit tolerance between the electrical connector and the to-be-connected member can be increased, the

installation error can be reduced, and the installation efficiency can be improved.

As another technical solution, an embodiment of the present disclosure further provides an electronic device, which includes a plurality of connected members, and the electrical connector provided in the above embodiment of the present disclosure, and the electrical connector is configured for electrically connecting the plurality of connected components together.

For example, the connected members include PCBs. Optional structures of the PCBs configured to be matched with the electrical connector are described above and will not be repeated here.

The electronic device provided by the embodiments of the present disclosure adopts the electrical connector provided by the above embodiments of the present disclosure, so that not only an occupied space can be reduced and a device structure can be simplified, but also assembly and modularization can be facilitated; moreover, quick connection can be realized, a contact fit tolerance between the electrical connector and the connected member can be increased, an installation error can be reduced, and installation efficiency can be improved.

It should be understood that the above embodiments are merely exemplary embodiments adopted to illustrate the principle of the present disclosure, and the present disclosure is not limited thereto. Various modifications and improvements can be made by those of ordinary skill in the art without departing from the spirit and essence of the present disclosure, and those modifications and improvements are also considered to fall within the scope of the present disclosure.

What is claimed is:

1. An electrical connector for electrically connecting a plurality of to-be-connected members, comprising an insulating housing structure and an electrical contact, wherein a plurality of openings are provided on the insulating housing structure; the electrical contact comprises a main body disposed in the insulating housing structure and a plurality of contact portions formed on the main body, and each of the contact portions penetrates each of the openings in one-to-one correspondence and extends out of the insulating housing structure; and the electrical contact has elasticity to enable each of the contact portions to come into elastic contact with a corresponding to-be-connected member.

2. The electrical connector of claim 1, wherein the main body comprises a support part and a plurality of first bent portions bent relative to the support part, and wherein the contact portion is formed at an end of each of the first bent portions away from the support part.

3. The electrical connector of claim 2, wherein the electrical contact comprises an conductive strip, and the conductive strip comprises a middle section and two edge sections located on two sides of the middle section, and wherein the middle section is configured as the support part; the two edge sections are bent towards each other relative to the middle section, and each of the edge sections is configured as a first bent portion.

4. The electrical connector of claim 3, wherein a plurality of conductive strips are provided and are arranged apart from each other in the insulating housing structure.

5. The electrical connector of claim 2 or 3, wherein the contact portion comprises a second bent portion bent relative to the first bent portion, and an end of the second bent portion away from the first bent portion is located inside the insulating housing structure.

6. The electrical connector of any one of claims 1 to 4, wherein the insulating housing structure comprises a housing base and a cover plate detachably connected to each other, and wherein the plurality of openings are all disposed in the cover plate and

located on a plate surface of the cover plate.

7. The electrical connector of claim 6, wherein a first restricting structure is provided on an inner surface of the housing base, a second restricting structure is provided on an inner surface of the cover plate, and the first restricting structure and the second restricting structure are configured to restrict a position of the electrical contact.

8. The electrical connector of claim 7, wherein the first restricting structure comprises a first restricting groove and an insertion member, which are formed on the inner surface of the housing base; and correspondingly, a restricting part matched with the first restricting groove and an insertion slot for plug-in connection with the insertion member are formed on the main body; and wherein the second restricting structure comprises a second restricting groove formed on the inner surface of the cover plate, and a part of the main body is located in the second restricting groove.

9. The electrical connector of claim 6, wherein a plurality of engaging members are provided apart from each other on a circumferential side of the cover plate, a plurality of slots corresponding to the plurality of engaging members are provided on an inner side of the housing base, and each of the engaging members is engaged with each of the slots in one-to-one correspondence.

10. The electrical connector of claim 6, wherein two mounting holes and two positioning pieces are provided on a side of the housing base away from the cover plate, the two mounting holes and the two positioning pieces are arranged in a rectangular shape, the two mounting holes are diagonally arranged, and each of the mounting holes is configured to be fixedly connected with a corresponding to-be-connected member; and the two positioning pieces are diagonally arranged, and each of the positioning pieces is configured to be matched with a positioning structure disposed on a corresponding to-be-connected member, so as to restrict a position and a direction of the housing base.

11. The electrical connector of any one of claims 1 to 10, wherein a number of the contact portions formed on the main body of each electrical contact is two, and the two contact portions are configured for elastic contact with two to-be-connected members respectively.

12. An electronic device, comprising a plurality of connected members, and the electrical connector of any one of claims 1 to 11, wherein the electrical connector is configured for electrically connecting the plurality of connected members.

13. The electronic device of claim 12, wherein the connected members comprise printed circuit boards.