



(11) **EP 4 164 065 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
12.04.2023 Bulletin 2023/15

(21) Application number: **21831591.9**

(22) Date of filing: **22.03.2021**

(51) International Patent Classification (IPC):
H01R 13/42 ^(2006.01) **H01R 12/50** ^(2011.01)
H01R 24/76 ^(2011.01)

(52) Cooperative Patent Classification (CPC):
H01R 12/50; H01R 13/42; H01R 24/00; H01R 24/76

(86) International application number:
PCT/CN2021/082121

(87) International publication number:
WO 2022/001214 (06.01.2022 Gazette 2022/01)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **28.06.2020 CN 202010600836**

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(54) **CONNECTOR RECEPTACLE, CONNECTOR, AND ELECTRONIC DEVICE**

(57) A connector receptacle (1), a connector, and an electronic device (0) are provided, and relate to the field of electronic device technologies. The connector receptacle (1) includes a housing (101), a tongue (102), and a welding plate (103). The housing (101) is provided with a stop part (1011). The tongue (102) is inserted into the housing (101) and presses against the stop part (1011) through limiting, to prevent the tongue (102) from fluttering in a direction of insertion into the housing (101). The tongue (102) is provided with a plurality of terminals (1021), the terminal (1021) includes a contact portion (10211) and a welding portion (10212), and welding portions (10212) of the plurality of terminals (1021) are arranged in one row. The contact portion (10211) is configured to perform signal transmission with a connector plug (4), and the welding portion (10212) is connected to a pin pad of a circuit board (2). The welding plate (103) is fixedly connected to the housing (101), and presses against the tongue (102), and the tongue (102) is accommodated in a cavity formed between the welding plate (103) and the housing (101). In addition, the welding plate (103) is provided with a notch (1031). The notch (1031) can avoid the welding portion (10212), so that the welding

portion (10212) extends to the outside of the cavity from the notch (1031). The connector receptacle (1) is small in size, so that a miniaturization design of an electronic device (0) with the connector receptacle (1) is implemented.

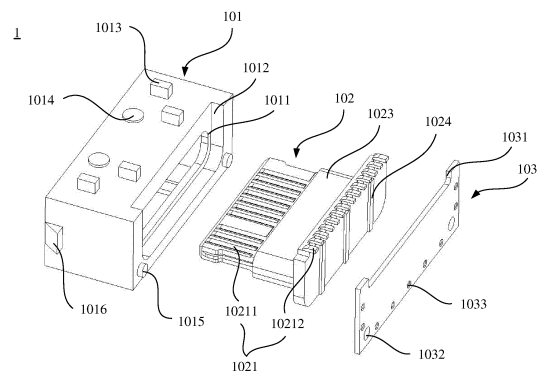


FIG. 2

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202010600836.0, filed with the China National Intellectual Property Administration on June 28, 2020 and entitled "CONNECTOR RECEPTACLE, CONNECTOR, AND ELECTRONIC DEVICE", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] This application relates to the field of electronic device technologies, and in particular, to a connector receptacle, a connector, and an electronic device.

BACKGROUND

[0003] Wearable electronic devices such as smart watches and smart bands combine latest IT technologies with functions of conventional devices, and are increasingly popular due to advantages such as portability, ease of use, and abundant functions.

[0004] Currently, users impose higher requirements on portability and wearing aesthetics of wearable electronic devices. A smart band is used as an example. A span of a watch face of a mainstream smart band product in the industry is usually between 46 mm and 50 mm. The smart band with the span size is suitable for only a user with a relatively thick wrist. When a user with a thin wrist wears the smart band, wearing aesthetics of the smart band is severely affected, and consequently wearing experience of the user with the thin wrist is affected.

[0005] Therefore, how to expand an application scope of a wearable electronic device and implement a miniaturization design of a wearable product becomes a technical difficulty to be urgently resolved by a person skilled in the art.

SUMMARY

[0006] According to a first aspect of this application, a connector receptacle is provided. The connector receptacle may be used as a signal transmission interface of a connector. During specific disposition, the connector receptacle in this application may include a housing, a tongue, and a welding plate. The housing is provided with a stop part. The tongue is inserted into the housing and presses against the stop part through limiting, to prevent the tongue from fluttering in a direction of insertion into the housing. The tongue includes a plurality of terminals. The terminal includes a contact portion and a welding portion, the contact portion is in contact with a terminal of a connector plug to implement signal transmission between the contact portion and the terminal, and the welding portion is welded with a pin pad on a circuit board to implement signal transmission between the circuit board

and the terminal. The welding portion is formed by bending an end of the terminal, and the welding portions of the plurality of terminals are arranged in one row. The contact portion is connected to the welding portion by using a connection portion, and the connection portion is a once-bent structure. This simplifies a structure of the terminal. The welding plate is secured to the housing to form a cavity for accommodating the tongue, and presses against the tongue to prevent the tongue from shaking in the cavity between the welding plate and the housing. This improves structural stability of the connector receptacle. The connector receptacle in this embodiment of this application has a smaller size. This helps implement a miniaturization design of an electronic device provided with the connector receptacle.

[0007] In a possible implementation, the welding plate is further provided with a notch, and the welding portion extends from the notch to the outside of the cavity. This helps welding between the welding portion and the circuit board.

[0008] In a possible implementation, when the housing is specifically disposed, a positioning pin is disposed on the housing, the positioning pin and the welding portion of the tongue are disposed on a same side of the connector receptacle, and the positioning pin is positioned within a contour range of a bottom surface of the housing. In this way, size increase, due to additional depositing of the positioning pin, in a length or width direction of the connector receptacle can be avoided. This helps implement a miniaturization design of the connector receptacle. The positioning pin may be plugged into a positioning hole on the circuit board, to position a mounting position of the connector receptacle on the circuit board, thereby improving accuracy of a connection between the welding portion of the tongue and the corresponding pin pad on the circuit board, improving stability of contact between the welding portion and the pin pad, and enabling the positioning pin to protect the terminal.

[0009] In a possible implementation, a support pin may be further disposed on the housing, and the support pin and the positioning pin are disposed on a same surface of the housing. In this way, size increase, due to additional depositing of the support pin, in a length or width direction of the connector receptacle can be avoided. This helps implement a miniaturization design of the connector receptacle. In addition, the support pin is higher than the same surface by a height by which the welding portion of the tongue is higher than the same surface. When the connector receptacle in this embodiment of this application is mounted on the circuit board, the support pin and the welding portion jointly support the connector receptacle, thereby avoiding tilting of the connector receptacle and improving reliability of a connection between the connector receptacle and the circuit board.

[0010] In a possible implementation, the housing is further provided with an avoidance opening, the avoidance opening and the welding portion of the tongue are disposed on a same side of the connector receptacle, and

a part or all of the welding portion is inserted into the avoidance opening. In this way, the welding portion is avoided by using the avoidance opening. In addition, the welding portion is avoided by using the avoidance opening, so that a part or all of the welding portion can overlap the housing. This helps reduce a size of an assembly of the tongue and the housing in a direction in which the tongue is disposed in the housing, thereby facilitating a miniaturization design of the connector receptacle in this embodiment of this application.

[0011] In a possible implementation, when the welding plate is connected to the housing, a first positioning structure may be disposed on the housing, and a second positioning structure is disposed on the welding plate. In this way, the welding plate and the housing may be positioned by connecting the first positioning structure and the second positioning structure in a matched manner. In addition, when the welding plate is secured to the housing specifically, the welding plate may be melted by laser spot welding to form a welding spot, so that the welding plate is welded to the housing by using the welding spot.

[0012] In a possible implementation, when the tongue is squeezed onto the housing by using the welding plate, a protrusion may be disposed on a surface that is of the tongue and that faces the welding plate. The protrusion may be but is not limited to a dot-shaped protrusion, a bulge-shaped protrusion, an annular protrusion, or the like. The protrusion may be made of a plastic insulation material such as plastic, so that when the welding plate presses against the protrusion, the protrusion is deformed to compensate for a gap between the welding plate and the tongue. In this case, the tongue is pressed tightly on the housing, to prevent the tongue from shaking in the housing, so that the connector receptacle in this embodiment of this application has better structural stability. In addition, disposing a deformable protrusion on the tongue implements interference between the tongue and the welding plate, and further helps avoid a relatively large gap between the welding plate and the housing.

[0013] In a possible implementation, when a quantity of terminals disposed on the tongue is set, the quantity may be selected based on a function to be implemented by the tongue. For example, the tongue may include 12 terminals, contact portions of the 12 terminals are disposed in two rows, and contact portions of the 12 terminals are disposed in one row. This can effectively simplify a manner of disposing terminals on the tongue, to facilitate welding between the terminals and the circuit board.

[0014] In a possible implementation, the plurality of terminals of the connector receptacle may include a signal terminal, a power terminal, and a ground terminal. In this case, a spacer part made of an insulation material may be disposed on the tongue, and the spacer part is disposed between the power terminal and the ground terminal. In this way, when liquid enters the connector receptacle, a risk that the power terminal and the ground terminal are shortcircuited can be reduced.

[0015] According to a second aspect of this application,

an embodiment of this application further provides a connector. The connector includes the connector receptacle and the connector plug in the first aspect. The connector plug and the connector receptacle may be pluggable.

[0016] In the connector in this embodiment of this application, a smaller size of the connector receptacle helps implement a miniaturization design of the connector. In addition, when the connector plug is plugged into the connector receptacle, a contact length between a terminal of the connector plug and a terminal of the connector receptacle can meet a signal transmission requirement between the two. In addition, contact between the terminals is relatively reliable.

[0017] According to a third aspect of this application, an electronic device is further provided. The electronic device includes a casing and the connector receptacle according to the first aspect that is disposed on a casing. In the connector in this embodiment of this application, the smaller size of the connector receptacle helps implement a miniaturization design of the electronic device, so that use requirements of more consumers can be met, and an application scope of the electronic device can be expanded.

[0018] In a possible implementation, a first limiting structure may be further disposed on the housing of the connector receptacle, and a second limiting structure is disposed on the electronic device. The first limiting structure may be clamped to the second limiting structure through limiting, so as to pre-position the connector receptacle on the casing.

[0019] In a possible implementation, a contour-imitating hole may be provided on the casing to implement a fixed connection between the connector receptacle and the casing, and the connector receptacle is plugged into and secured to the contour-imitating hole. The connector receptacle is secured to the casing by clamping.

[0020] In addition, an adhesive may be put between the connector receptacle and the casing, so that the connector receptacle is bonded to the casing. This implements protection and waterproofing for the structure of the connector receptacle. In this embodiment of this application, the connector receptacle is secured to the electronic device by pre-positioning and bonding, so that the connector receptacle occupies relatively small space in the electronic device, thereby facilitating the miniaturization design of the electronic device, meeting use requirements of more consumers, and expanding an application scope of the electronic device.

BRIEF DESCRIPTION OF DRAWINGS

[0021]

FIG. 1 is a schematic diagram of a structure of an electronic device according to an embodiment of this application;

FIG. 2 is a schematic diagram of a structure of a connector receptacle according to an embodiment

of this application;

FIG. 3 is a schematic diagram of a structure of a tongue according to an embodiment of this application;

FIG. 4 is a schematic diagram of a structure of a terminal of a tongue according to an embodiment of this application;

FIG. 5 is a schematic diagram of a structure of a terminal of a tongue according to another embodiment of this application;

FIG. 6 is a schematic diagram of an assembly structure of mounting a connector receptacle on a circuit board according to an embodiment of this application;

FIG. 7A is a schematic diagram of a structure of a housing according to an embodiment of this application;

FIG. 7B is a schematic diagram of a structure of a housing according to another embodiment of this application;

FIG. 8 is a sectional view of an assembly structure of mounting a connector receptacle on a circuit board according to an embodiment of this application;

FIG. 9 is a schematic diagram of a structure of a connector receptacle according to another embodiment of this application;

FIG. 10 is a schematic diagram of a structure of a connector receptacle according to another embodiment of this application;

FIG. 11 is a schematic diagram of a structure of a connector receptacle according to an embodiment in the conventional technology;

FIG. 12 is a schematic diagram of a structure of a connector receptacle according to another embodiment in the conventional technology;

FIG. 13 is a schematic diagram of a structure of a connector receptacle according to another embodiment in the conventional technology;

FIG. 14 is a schematic diagram of a structure of mounting a connector receptacle on an electronic device in the conventional technology;

FIG. 15 is a schematic diagram of a structure of mounting a connector receptacle on an electronic device according to an embodiment of this application;

FIG. 16 is a schematic diagram of a structure of mounting a connector receptacle on an electronic device according to another embodiment of this application; and

FIG. 17 is a schematic diagram of a structure of plugging in a connector receptacle and a connector plug according to an embodiment of this application.

[0022] Descriptions of reference numerals:

0-Electronic device; 01-Casing; 1-Connector receptacle; 11-Contact area; 12-Welding area; 13-Wall thickness area; 101-Housing;

1011-Stop part; 1012-Avoidance opening; 1013-First positioning pin; 1014-Support pin;

1015-First positioning structure; 1016-Second limiting structure; 102-Tongue; 1021-Terminal; 10211-Contact portion;

10212-Welding portion; 10213-Connection portion; 1022-Spacer part; 1023-First limiting structure; 1024-Protrusion;

103-Welding plate; 1031-Notch; 1032-Second positioning structure; 1033-Welding spot; 2-Circuit board; 201-positioning hole;

3-Filling area; 4-Connector plug; 401-Terminal; 1'-Connector receptacle; 11'-Contact area; 12'-Limiting area;

13'-First welding area; 14'-Pin area; 15'-Second welding area; 101'-Casing; 1011'-Stop point;

1012'-Bending point; 1013'-Second positioning pin; 102'-Tongue; 1021'-Terminal; 10211'-Contact portion;

10212'-Welding portion; 2'-First mechanical part; and 3'-Second mechanical part.

DESCRIPTION OF EMBODIMENTS

[0023] To make the objectives, technical solutions, and advantages of this application clearer, the following further describes this application in detail with reference to the accompanying drawings.

[0024] Currently, wearable electronic devices such as smartwatches and smart bands combine latest IT technologies with functions of conventional devices, and are increasingly popular to a large quantity of consumers due to advantages such as portability, ease of use, and abundant functions. Some conventional wearable electronic devices are relatively large in size, are inconvenient to carry, and affect wearing aesthetics.

[0025] Refer to FIG. 1. A smart band is used as an example. The smart band usually includes a watch face and a watch band. A span L of the watch face in a wearing direction of the smart band is usually between 46 mm and 50 mm. The smart band with the span size is suitable for only a user with a relatively thick wrist. When a user with a thin wrist wears the smart band, wearing aesthetics of the smart band is severely affected, and consequently wearing experience of the user with the thin wrist is affected.

[0026] Currently, an electronic device 0 mostly uses a Type-C interface as a charging interface and a signal transmission interface, and there is no exception in wearable devices such as smartwatches and smart bands. However, when a conventional standardized Type-C interface is disposed, limited by stacking space of the entire electronic device 0, the Type-C interface cannot be reduced to implement a miniaturization design of the entire electronic device 0. To resolve the foregoing problem, this application provides a connector receptacle 1. The connector receptacle 1 may be disposed on the electronic device 0 to serve as a charging interface and a signal

transmission interface of the electronic device. To understand the connector receptacle 1 provided in embodiments of this application, the following describes in detail a specific disposing manner of the connector receptacle 1 with reference to the accompanying drawings.

[0027] Refer to FIG. 2. An embodiment of this application provides a connector receptacle 1. The connector receptacle 1 includes a housing 101, a tongue 102, and a welding plate 103. The tongue 102 is inserted into a cavity of the housing 101, and the welding plate 103 is connected to the housing 101, to secure the tongue 102 to the housing 101.

[0028] When the tongue 102 is specifically disposed, the tongue 102 includes a plurality of terminals 1021, and the plurality of terminals 1021 each have a contact portion 10211 and a welding portion 10212. The contact portion 10211 is in contact with a terminal of a connector plug, to perform signal transmission between the connector receptacle 1 and the connector plug. The welding portion 10212 of the tongue 102 is connected to a corresponding pin pad on a circuit board 2 (flexible circuit board 2 or printed circuit board 2) of the electronic device 0, to implement signal transmission between the connector receptacle 1 and the circuit board 2. Refer to FIG. 2. The welding portions 10212 of the terminals 1021 are arranged side by side and spaced from each other, and end faces of the welding portions 10212 for contact with the pin pad are flush with each other, to implement stable connections between the welding portions 10212 of the terminals 1021 and the pin pad.

[0029] In this embodiment of this application, a quantity of terminals 1021 in the tongue 102 is not specifically limited, and may be set based on a function to be implemented by the connector receptacle 1. For example, as shown in FIG. 4, in a possible embodiment of this application, the tongue 102 may have 12 terminals. Refer to FIG. 5. Contact portions 10211 of the 12 terminals may be arranged in two rows, and welding portions 10212 of a plurality of terminals 1021 may be arranged in one row, to simplify a structure of the tongue 102. In addition, still refer to FIG. 5. In some embodiments of this application, the welding portion 10212 is formed by bending an end of the terminal 1021. In this embodiment of this application, the contact portion 10211 is connected to the welding portion 10212 by using a connection portion 10213, and the connection portion 10213 is a once-bent structure, to effectively simplify a structure of the terminal 1021.

[0030] It should be noted that the connection portion 10213 is a structure formed by bending a part of the terminal other than the contact portion 10211 and the welding portion 10212 once.

[0031] It may be understood that when the connector receptacle 1 in this embodiment of this application is connected to the connector plug, usually, a quantity of terminals 1021 of the connector receptacle 1 in this embodiment of this application is the same as a quantity of terminals of the connector plug. In some embodiments of

this application, with reference to FIG. 2 and FIG. 3, to simplify a structure of the tongue 102, terminals 1021 corresponding to some functions that are not commonly used may be omitted. In this way, a quantity of welding portions 10212 of the tongue 102 that are disposed side by side may be reduced, to help reduce a width (a length in an arrangement direction of the welding portions 10212) of the tongue 102, so as to provide a possibility for a miniaturization design of the connector receptacle 1.

[0032] In addition, the connector receptacle 1 has a contact area 11 (refer to FIG. 9) in contact with the connector plug, and the contact portion 10211 of the terminal 1021 of the tongue 102 is located in the contact area 11. When the quantity of terminals 1021 in this embodiment of this application is adjusted, it can be avoided that the width of the contact area 11 of the tongue 102 is changed, so that the connector receptacle 1 in this embodiment of this application can match most standardized connector plugs. Therefore, the connector receptacle 1 in this embodiment of this application has a wide application scope.

[0033] When the quantity of terminals 1021 of the connector receptacle 1 in this embodiment of this application is less than a quantity of terminals 1021 of the connector plug, as shown in FIG. 3, a distribution manner of the terminals 1021 on the tongue 102 may be the same as a distribution manner of the terminals 1021 that are in the connector plug and that are used to implement a same function. In this way, when the connector plug is plugged into the connector receptacle 1, terminals at a corresponding position can effectively touch each other, to effectively transmit a signal. Because the plurality of terminals of the connector receptacle 1 include a signal terminal, a power terminal, and a ground terminal, in some other embodiments of this application, an insulation material may be used to form a spacer part 1022 between the power terminal 1021 and the ground terminal 1021. The spacer part 1022 may be disposed at, but is not limited to, a position of the omitted terminal 1021 (for example, a signal transmission terminal). In this way, when liquid enters the connector receptacle 1, a risk that two adjacent terminals 1021 are shortcircuited can be reduced. In addition, a quantity of spacer parts 1022 may be adjusted according to a disposing manner of the terminal 1021, and may be 1, 2, 3, or more.

[0034] Still refer to FIG. 3. A first limiting structure 1023 is further disposed on the tongue 102, and the first limiting structure 1023 may be configured to fasten and limit the plurality of terminals 1021 of the tongue 102. A material of the first limiting structure 1023 may be but is not limited to a plastic insulation material such as plastic. In some embodiments of this application, the spacer part 1022 may be but is not limited to being manufactured by using a same process as the first limiting structure 1023. This helps simplify a manufacturing process of the tongue 102, and enables the tongue 102 to have relatively high structural stability.

[0035] Still refer to FIG. 2. When the housing 101 is specifically disposed, the housing 101 has a stop part

1011. In a process of inserting the tongue 102 into a cavity of the housing 101, the stop part 1011 limits the tongue 102, to prevent the tongue 102 from fluttering in a direction in which the tongue 102 is inserted into the housing 101. This improves structural stability of the connector receptacle 1 in this embodiment of this application.

[0036] In addition, an avoidance opening 1012 is further provided on the housing 101, and an opening direction of the avoidance opening 1012 is opposite to the direction in which the tongue 102 is inserted into the housing 101. When the tongue 102 is inserted into the housing 101, the avoidance opening 1012 may avoid the welding portion 10212 of the terminal 1021 of the tongue 102, to avoid interference caused by the housing 101 to the welding portion 10212. In this embodiment, the avoidance opening 1012 avoids the welding portion 10212, so that a part or all of the welding portion 10212 may overlap the housing 101. This helps reduce a length of an assembly of the tongue 102 and the housing 101 (a size in the direction in which the tongue 102 is inserted into the housing 101), and facilitates a miniaturization design of the connector receptacle 1 in this embodiment of this application.

[0037] Still refer to FIG. 2. A first positioning pin 1013 is further disposed on a surface of the housing 101, the first positioning pin 1013 is disposed within a contour range of a bottom surface of the housing 101 (the bottom surface of the housing 101 is a surface that is of the housing 101 and that faces the circuit board when the housing 101 is mounted on the circuit board), and the first positioning pin 1013 and the welding portion 10212 of the tongue 102 are disposed on a same side of the connector receptacle 1. In this way, a size in a length or width direction of the connector receptacle 1 can be prevented from being additionally increased due to disposition of the first positioning pin 1013. This facilitates implementation of a miniaturization design of the connector receptacle 1. In addition, to implement limiting, two or more first positioning pins 1013 may be disposed. For example, there are three, four, or six first positioning pins 1013. Refer to FIG. 6. That there are four first positioning pins 1013 is used as an example. When the connector receptacle 1 in this embodiment of this application is mounted on the circuit board 2, positioning holes 201 are provided on the circuit board 2. The first positioning pins 1013 may be plugged into the positioning holes 201 on the circuit board 2 in a one-to-one correspondence, to limit a relative position between the connector receptacle 1 and the circuit board 2. Therefore, accuracy of a connection between the welding portion 10212 of the tongue 102 and the corresponding pin pad on the circuit board 2 is improved, contact stability between the welding portion 10212 and the pin pad is improved, and the first positioning pin 1013 is enabled to protect the terminal 1021. In addition, the first positioning pin 1013 may be welded to the circuit board 2 by filling the positioning hole 201 with solder, to implement a fixed connection between the connector receptacle 1 and the circuit board 2. It may be

understood that, a flexible circuit board may be disposed in an electronic device more flexibly because of a relatively small thickness and a bendable feature. Therefore, in this embodiment of this application, the flexible circuit board may be selected as the circuit board 2, to facilitate a miniaturization design of the electronic device.

[0038] In some embodiments of this application, as shown in FIG. 7A and FIG. 7B, a support pin 1014 may be further disposed on the housing 101, and the support pin 1014 and the first positioning pin 1013 are disposed on a same side surface of the housing 101. When the support pin 1014 is specifically disposed, as shown in FIG. 7A, the support pin 1014 may be an independent structure disposed on a surface of the housing 101. In some other embodiments, as shown in FIG. 7B, a step may be further disposed between the first positioning pin 1013 and the housing 101 as the support pin 1014. In this embodiment, the support pin 1014 and the first positioning pin 1013 may be an injection-molded integrated structure. Alternatively, a gasket may be sleeved on the first positioning pin 1013 as the support pin 1014. Refer to FIG. 8. The support pin 1014 is higher than the surface of the housing 101 by a height by which the welding portion 10212 of the tongue 102 is higher than the surface of the housing 101. When the connector receptacle 1 in this embodiment of this application is mounted on the circuit board 2, the support pin 1014 and the welding portion 10212 jointly support the connector receptacle 1, to avoid tilting of the connector receptacle 1 and improve reliability of a connection between the connector receptacle 1 and the circuit board 2.

[0039] Still refer to FIG. 2. After the tongue 102 is mounted on the housing 101, the welding plate 103 may be secured to the housing 101, to prevent the tongue 102 from falling off from the housing 101. When the welding plate 103 is specifically disposed, a notch 1031 is provided on the welding plate 103, and the notch 1031 may avoid the welding portion 10212 of the tongue 102.

[0040] In addition, as shown in FIG. 2, in a process of mounting the welding plate 103 on the housing 101, to position the welding plate 103 and the housing 101, a first positioning structure 1015 may be further disposed on the housing 101, and a second positioning structure 1032 may be disposed on the welding plate 103. In this way, the welding plate 103 and the housing 101 are positioned by connecting the first positioning structure 1015 and the second positioning structure 1032 in a matched manner. When the first positioning structure 1015 and the second positioning structure 1032 are specifically disposed, for example, the first positioning structure 1015 may be a positioning post disposed on a surface of the housing 101, and the second positioning structure 1032 may be a positioning hole provided on the welding plate 103; or the first positioning structure 1015 is a positioning hole provided on the welding plate 103, and the second positioning structure 1032 is a positioning post disposed on the surface of the housing 101. In this way, the welding plate 103 and the housing 101 may be conveniently po-

sitioned by plugging the positioning post into the positioning hole in a matched manner.

[0041] In some embodiments of this application, when the welding plate 103 is connected to the housing 101, a welding spot 1033 may be formed on the welding plate 103 through laser spot welding, so that the welding plate 103 is welded to the housing 101 by using the welding spot. In addition, it may be understood that when the second positioning structure 1032 on the welding plate 103 is a positioning hole, solder may also be put in the positioning hole, to implement a fixed connection between the welding plate 103 and the housing 101.

[0042] In some other embodiments of this application, as shown in FIG. 2, a protrusion 1024 may be further disposed on a surface that is of the tongue 102 and that faces the welding plate 103. The protrusion 1024 is made of a plastic insulation material such as plastic. In addition, the protrusion 1024 may be but is not limited to a dot-shaped protrusion, a rib-shaped protrusion, an annular protrusion, or the like. When the protrusion 1024 is in a rib shape, an extension direction of the protrusion 1024 may be but is not limited to a direction perpendicular to or parallel to the welding surface of the terminal 1021. In a possible implementation, the protrusion 1024 may be made with the spacer part 1022 of the tongue 102 and the first limiting structure 1023 in the foregoing embodiment by using one process. This helps simplify a structure of the tongue 102 and improve structural stability of the tongue 102. In some embodiments of this application, a height by which the protrusion 1024 is higher than a disposing surface of the protrusion 1024 may be but is not limited to 0.01 mm, 0.02 mm, 0.03 mm, or the like. In this way, after the tongue 102 is inserted into the housing 101, the welding plate 103 squeezes the protrusion 1024 in a process of fastening the tongue 102 by using the welding plate 103, to compensate for a gap between the welding plate 103 and the tongue 102 through deformation of the protrusion 1024. Therefore, the tongue 102 is pressed tightly on the housing 101, to prevent the tongue 102 from shaking in the housing 101, so that the connector receptacle 1 in this embodiment of this application has high structural stability. In addition, disposing a deformable protrusion 1024 on the tongue 102 implements interference between the tongue 102 and the welding plate 103, and further helps avoid a relatively large gap between the welding plate 103 and the housing 101.

[0043] It can be learned from USB bending simulation performed on the terminal 1021 of the tongue 102 of the connector receptacle 1 and the first positioning pin 1013 of the housing 101 in this embodiment of this application that maximum principal stress of the terminal 1021 of the connector receptacle 1 and the first positioning pin 1013 in this embodiment of this application is 121.34 Mpa, which is less than the simulation baseline 200 Mpa. Therefore, a failure risk of the connection is relatively low.

[0044] FIG. 9 is a top view of a connector receptacle 1 according to an embodiment of this application. In a possible embodiment of this application, the connector

receptacle 1 further has a welding area 12, and the welding portion 10212 of the terminal is disposed in the welding area 12. A length L1 of the contact area 11 of the connector receptacle 1 is 4.05 mm, and a length L2 of the welding area 12 is 1.05 mm. Therefore, a total length of the connector receptacle 1 in this embodiment is $L=L1+L2=4.05\text{ mm}+1.05\text{ mm}=5.1\text{ mm}$.

[0045] In this embodiment, the first positioning pin 1013 on the housing 101 of the connector receptacle 1 falls within the range of the contact area 11. In addition, as shown in FIG. 10, a quantity of terminals 1021 in the tongue 102 of the connector receptacle 1 may be set to 12. A width of the contact area 11 is D1. In a width direction, widths of wall thickness areas 13 that are of the housing 101 and that are located on two sides of the contact area 11 are D2 respectively. Therefore, a width of the connector receptacle 1 in this embodiment is $D=D1+2\times D2$.

[0046] To further describe a through-current capability of the connector receptacle 1 in this application, the through-current capability is compared with that of a conventional connector receptacle 1'. For the conventional connector receptacle 1', as shown in FIG. 11, the connector receptacle 1' includes a tongue 102' and a housing 101', the tongue 102' has a plurality of terminals 1021', the terminal 1021' has a contact portion 10211' and a welding portion 10212', and the housing 101' has a stop point 1011', a bending point 1012', and a second positioning pin 1013'. The stop point 1011' is used to limit a length of the tongue 102' inserted into the housing 101'. When the tongue 102' is inserted into the housing 101' and is in contact with the stop point 1011', the tongue 102' cannot continue to move in an insertion direction thereof. In this case, the tongue 102' and the housing 101' may be connected by riveting the bending point 1012' on the tongue 102'.

[0047] In addition, still refer to FIG. 11. The second positioning pins 1013' are disposed on two sides in a width direction of the housing 101'. Refer to FIG. 12. The conventional connector receptacle 1' is divided into a contact area 11', a limiting area 12', and a first welding area 13' in a length direction thereof. According to the specifications of the Type C association, a length L1' of the contact area 11' of the connector receptacle 1' is 4.45 mm. A length L2' of the limiting area 12' of the connector receptacle 1' is mainly determined by a width of the stop point 1011' and a length of the bending point 1012', and a length L3' of the first welding area 13' is mainly determined by lengths of the second positioning pins 1013' on both sides of the housing 101' and a length of the welding portion 10212' of the terminal 1021'. Generally, the length L2' of the limiting area 12' of the conventional Type C interface is 0.95 mm, and the length L3' of the first welding area 13' is 1.15 mm. Therefore, a length of the connector receptacle 1' in this embodiment is $L'=L1'+L2'+L3'=4.45\text{ mm}+0.95\text{ mm}+1.15\text{ mm}=6.55\text{ mm}$.

[0048] Refer to FIG. 13. A size of the conventional connector receptacle 1' in the width direction thereof is

formed by a width of the contact area 11', a width of a pin area 14', and a width of a second welding area 15' formed by the second positioning pin 1013' extending outward to the housing 101' (refer to FIG. 11). According to the specifications of the Type C association, a width D1' of the contact area 11' of the connector receptacle 1' is 8.34 mm. In addition, because the connector receptacle 1' in this embodiment is a standard Type interface, and a quantity of terminals 1021' of the connector receptacle 1' is 18, widths D2' of the two pin areas 14' are mainly determined by a difference between a width of the welding portions 10212' that are arranged side by side and that are of the 18 terminals 1021' and the width of the contact area 11', and the width of the second welding area 15' is D3'. Therefore, a width of the connector receptacle 1' in this embodiment is $D' = D1' + 2 \times D2' + 2 \times D3'$.

[0049] It can be learned from the foregoing comparison between the connector receptacle 1 in this embodiment of this application and the conventional connector receptacle 1' that: In a length direction, as shown in FIG. 9 and FIG. 12 together, the length L of the connector receptacle 1 in this embodiment of this application is a sum of the length L1 of the contact area 11 and the length L2 of the welding area 12, and the length L' of the conventional connector receptacle 1' is a sum of the length L1' of the contact area 11', the length L2' of the limiting area 12', and the length L3' of the first welding area 13'. First, the length L1 of the contact area 11 of the connector receptacle 1 in this embodiment of this application is less than the length L1' of the contact area 11' of the conventional connector receptacle 1'. Second, the length L2 of the welding area 12 of the connector receptacle 1 in this embodiment of this application is mainly determined by the welding portion 10212 of the terminal 1021 and the welding plate 103, and the length L3' of the first welding area 13' of the conventional connector receptacle 1' is mainly determined by lengths of the second positioning pins 1013' on two sides of the housing 101' and the welding portion 10212' of the terminal 1021'. However, in this embodiment of this application, an avoidance opening 1012 may be provided on the housing 101, so that a part or all of the welding portion 10212 overlaps the housing 101. In addition, the welding plate 103 only functions to press the tongue 102 tightly on the housing 101, and a thickness of the welding plate 102 may be as small as possible on a basis that stiffness of the welding plate 103 meets a requirement. Finally, even if compared with the length L3' of the first welding area 13' of the conventional connector receptacle 1', the length L2 of the welding area 12 of the connector receptacle 1 in this embodiment of this application is relatively large, the conventional connector receptacle 1' further has the limiting area 12'. Because the stop point 1011' and the bending point 1012' need to be used to implement the stop and fastening functions of the tongue 102', to meet a strong stiffness requirement, the stop point 1011' and the bending point 1012' cannot be very small. In addition, the length L2' of

the limiting area 12' is mainly determined by the lengths of the stop point 1011' and the bending point 1012', and the length L2' of the limiting area 12' cannot be excessively small. Therefore, compared with the length L' (6.55 mm) of the conventional connector receptacle 1', the length L (5.1 mm) of the connector receptacle 1 in this embodiment of this application may be designed to be relatively small.

[0050] In addition, in a width direction, refer to both FIG. 10 and FIG. 13. The width D of the connector receptacle 1 in this embodiment of this application is a sum of the width D1 of the contact area 11 and the width D2 of wall thickness areas 13 that are of the housing 101 and that are located on two sides of the contact area 11. The width D' of the conventional connector receptacle 1' is a sum of the width D1' of the contact area 11', the widths D2' of the two pin areas 14', and the width D3' of the second welding area 15' formed by the second positioning pin 1013' expanding outward to the housing 101'. First, to enable the connector receptacle 1 in this embodiment of this application to adapt to most standardized connector plugs, the width D1 of the contact area 11 of the connector receptacle 1 in this embodiment of this application is equal to the width D1' of the contact area 11' of the conventional connector receptacle 1'. In addition, the widths D2 of the wall thickness areas 13 on the two sides of the contact area 11 of the housing 101 of the connector receptacle 1 in this embodiment of this application are mainly determined by the wall thickness of the housing, and are far less than the sum of the widths D2' of the two pin areas 14' of the conventional connector receptacle 1' and the widths D3' of the two second welding areas 15' (including the wall thickness of the housing). Finally, compared with the quantity (18) of terminals 1021' of the conventional connector receptacle 1', the quantity (12) of terminals 1021 in this embodiment of this application is relatively small, and a width of welding portions 10212 that are arranged side by side and that are of the terminals 1021 does not affect an overall width of the connector receptacle 1. In addition, in this embodiment of this application, the first positioning pin 1013 overlaps the contact area 11, without affecting the overall width of the connector receptacle 1. Therefore, compared with the width D' of the conventional connector receptacle 1', the width D of the connector receptacle 1 in this embodiment of this application may be designed to be relatively small. It can be learned from the foregoing analysis that, compared with the conventional standardized connector receptacle 1', the connector receptacle 1 in this embodiment of this application can implement a miniaturization design.

[0051] Refer to FIG. 14. When the conventional connector receptacle 1' is disposed in an electronic device, to prevent the connector receptacle 1' from shaking in the entire electronic device, a first mechanical part 2' and a second mechanical part 3' need to be used to hold the connector receptacle 1'. The first mechanical part 2' and the second mechanical part 3' may respectively press

against two opposite surfaces of the connector receptacle 1', and both the first mechanical part 2' and the second mechanical part 3' are fixedly connected to the entire electronic device.

[0052] When the connector receptacle 1 in this embodiment of this application is disposed in the electronic device 0, as shown in FIG. 2 and FIG. 15, a second limiting structure 1016 may be further disposed on the housing 101 of the connector receptacle 1, and a third limiting structure (not shown in the figure) is disposed on the casing 01 of the electronic device 0. The second limiting structure 1016 and the third limiting structure may be clamped through limiting, to pre-position the connector receptacle 1. The second limiting structure 1016 may be a protrusion structure, and the third limiting structure may be a groove structure; or the second limiting structure 1016 may be a protrusion structure, and the third limiting structure may be a groove structure. It may be understood that the second limiting structure 1016 and the third limiting structure may also use a solution other than the foregoing disposing manner, provided that a function of pre-limiting the connector receptacle 1 can be implemented, which is not listed one by one herein.

[0053] In addition, to prevent the connector receptacle 1 from shaking in the electronic device 0, as shown in FIG. 16, a gap on a peripheral side of the connector receptacle 1 may be further used as a filling area 3, so that the connector receptacle 1 is fixedly connected to the casing 01 of the electronic device 0 in a bonding manner by filling the filling area 3 with an adhesive. This implements protection and waterproofing for the structure of the connector receptacle 1. The connector receptacle 1 is secured to the casing 01 of the electronic device 0 by pre-limiting and filling the adhesive, so that the connector receptacle 1 occupies relatively small space in the electronic device 0, thereby facilitating the miniaturization design of the electronic device 0, meeting use requirements of more consumers, and expanding an application scope of the electronic device. In addition, by enabling the connector receptacle 1 to occupy relatively small space in the electronic device 0, more functional modules may be further integrated in the electronic device 0, to implement a function diversity design of the electronic device 0.

[0054] In some possible embodiments, as shown in FIG. 15, a contour-imitating hole may be further provided on the casing, and a hole wall contour of the contour-imitating hole is consistent with an external contour of the connector receptacle 1. In this way, the connector receptacle 1 can be plugged into and secured to the contour-imitating hole. It may be understood that, to limit a depth of plugging the connector receptacle 1 into the contour-imitating hole after the connector receptacle 1 is inserted into the contour-imitating hole, the third limiting structure may be disposed on a hole wall of the contour-imitating hole, and the second limiting structure 1016 and the third limiting structure are clamped through limiting. After the connector receptacle 1 is plugged into the contour-imitating hole, an adhesive may also be put in a

gap between the connector receptacle 1 and the casing 01, to improve reliability of a connection between the connector receptacle 1 and the casing 01.

[0055] In addition, refer to FIG. 9 and FIG. 12 together. On a basis that a length of the contact area 11 of the connector receptacle 1 in this embodiment of this application is far less than a length of the contact area 11' of the conventional connector receptacle, in a possible embodiment of this application, as shown in FIG. 17, when the connector plug 4 is plugged into the connector receptacle 1, a length of a contact area between a terminal 401 of the connector plug 4 and a terminal 1021 of the connector receptacle 1 is called a contact length between the two. The contact length is $C=A-B=(3.25\pm0.10)-(2.64\pm0.10)=0.61\pm0.20$ mm, where A is a length from a point, closest to a front end of the tongue 102 (an end that is of the tongue 102 and that is away from the welding plate), on a part that is of the terminal 1021 of the connector receptacle 1 and that is exposed from the tongue 102 to the stop part 1011 of the housing 101; and B is a length from a clamping point between the terminal 401 of the connector plug 4 and the terminal 1021 of the connector receptacle 1 to the stop part 1011 of the connector receptacle 1. Therefore, the contact length C between the terminal 401 of the connector plug 4 and the terminal 1021 of the connector receptacle 1 ranges from 0.41 mm to 0.81 mm. This can implement reliable contact between the connector plug 4 and the connector receptacle 1. When the connector plug 4 is plugged into the connector receptacle 1, it can be learned from simulation of a temperature rise of the connector receptacle 1 that, within a sufficiently long working time, the maximum simulated temperature rise of the connector receptacle 1 is 9.3°C, which meets a requirement of the specifications of the association: $\Delta T \leq 30^\circ\text{C}$.

[0056] In addition, through simulation analysis of plug-in and removal force between the connector plug 4 and the connector receptacle 1, it can be learned that both force for plugging the connector plug 4 into the connector receptacle 1 and force for removing the connector plug 4 from the connector receptacle 1 range from 10N to 15N, which can meet the requirements of the association for the insertion force of 5N to 20N and the removal force of 8N to 20N.

[0057] The foregoing descriptions are merely specific implementations of this application, but are not intended to limit the protection scope of this application. Any variation or replacement readily figured out by a person skilled in the art within the technical scope disclosed in this application shall fall within the protection scope of this application. Therefore, the protection scope of this application shall be subject to the protection scope of the claims.

Claims

1. A connector receptacle, wherein the connector re-

ceptacle comprises a housing, a tongue, and a welding plate, wherein

the housing is provided with a stop part;
the tongue is inserted into the housing and presses against the stop part through limiting,
the tongue is provided with a plurality of terminals, the terminal comprises a contact portion,
a welding portion, and a connection portion, the welding portion is formed by bending an end of
the terminal, welding portions of the plurality of terminals are arranged in one row, the contact
portion is connected to the welding portion by using the connection portion, and the connection
portion is a once-bent structure; and
the welding plate is fixedly connected to the housing and presses against the tongue, and
the tongue is accommodated in a cavity formed between the welding plate and the housing.

2. The connector receptacle according to claim 1, wherein the welding plate is provided with a notch, and the welding portion extends from the notch to the outside of the cavity.
3. The connector receptacle according to claim 1 or 2, wherein a positioning pin is further disposed on a surface of the housing, the positioning pin is located within a contour range of a bottom surface of the housing, and the positioning pin and the welding portion are disposed on a same side of the connector receptacle.
4. The connector receptacle according to claim 3, wherein the housing is further provided with a support pin, the support pin and the positioning pin are disposed on a same surface of the housing, and the support pin is higher than the same surface by a height by which the welding portion is higher than the same surface.
5. The connector receptacle according to any one of claims 1 to 4, wherein the housing is provided with an avoidance opening, the avoidance opening and the welding portion are disposed on a same side of the connector receptacle, and a part or all of the welding portion is inserted into the avoidance opening.
6. The connector receptacle according to any one of claims 1 to 5, wherein the housing is provided with a first positioning structure, the welding plate is provided with a second positioning structure, and the first positioning structure and the second positioning structure are connected in a matched manner.
7. The connector receptacle according to any one of claims 1 to 6, wherein the welding plate is welded to the housing by using a welding spot.

8. The connector receptacle according to any one of claims 1 to 7, wherein the plurality of terminals comprise a signal transmission terminal, a power terminal, and a ground terminal; and
the tongue is further provided with a spacer part, the spacer part is disposed between the ground terminal and the power terminal, and the spacer part is made of an insulation material.
9. The connector receptacle according to any one of claims 1 to 8, wherein the tongue is provided with 12 terminals, contact portions of the 12 terminals are arranged in two rows, and welding portions of the 12 terminals are arranged in one row.
10. The connector receptacle according to any one of claims 1 to 9, wherein a protrusion is further disposed on a surface that is of the tongue and that faces the welding plate, and the welding plate presses against the protrusion.
11. A connector, comprising a connector plug and the connector receptacle according to any one of claims 1 to 10, wherein the connector plug and the connector receptacle are pluggable.
12. An electronic device, comprising a casing and the connector receptacle according to any one of claims 1 to 10 that is disposed on the casing.
13. The electronic device according to claim 12, wherein a first limiting structure is disposed on a housing of the connector receptacle, a second limiting structure is disposed on the casing, and the first limiting structure is clamped to the second limiting structure through limiting.
14. The electronic device according to claim 12 or 13, wherein a contour-imitating hole is further provided on the casing, and the connector receptacle is inserted into and secured to the contour-imitating hole.
15. The electronic device according to any one of claims 12 to 14, wherein an adhesive is further put between the connector receptacle and the casing.

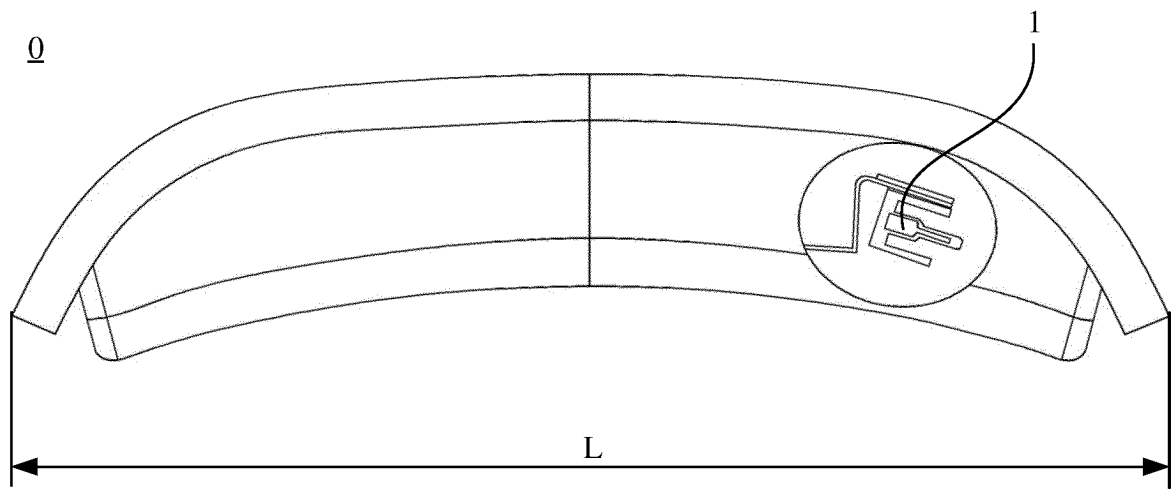


FIG. 1

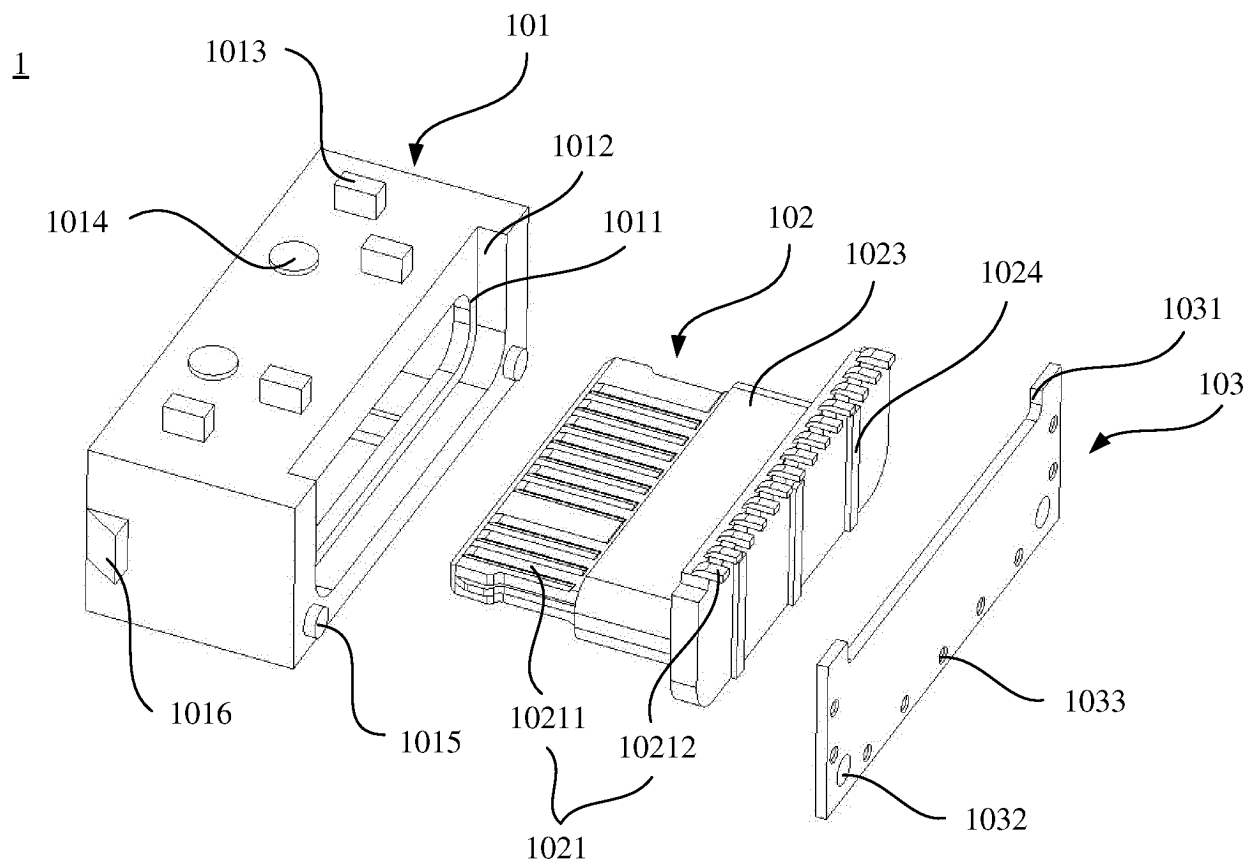


FIG. 2

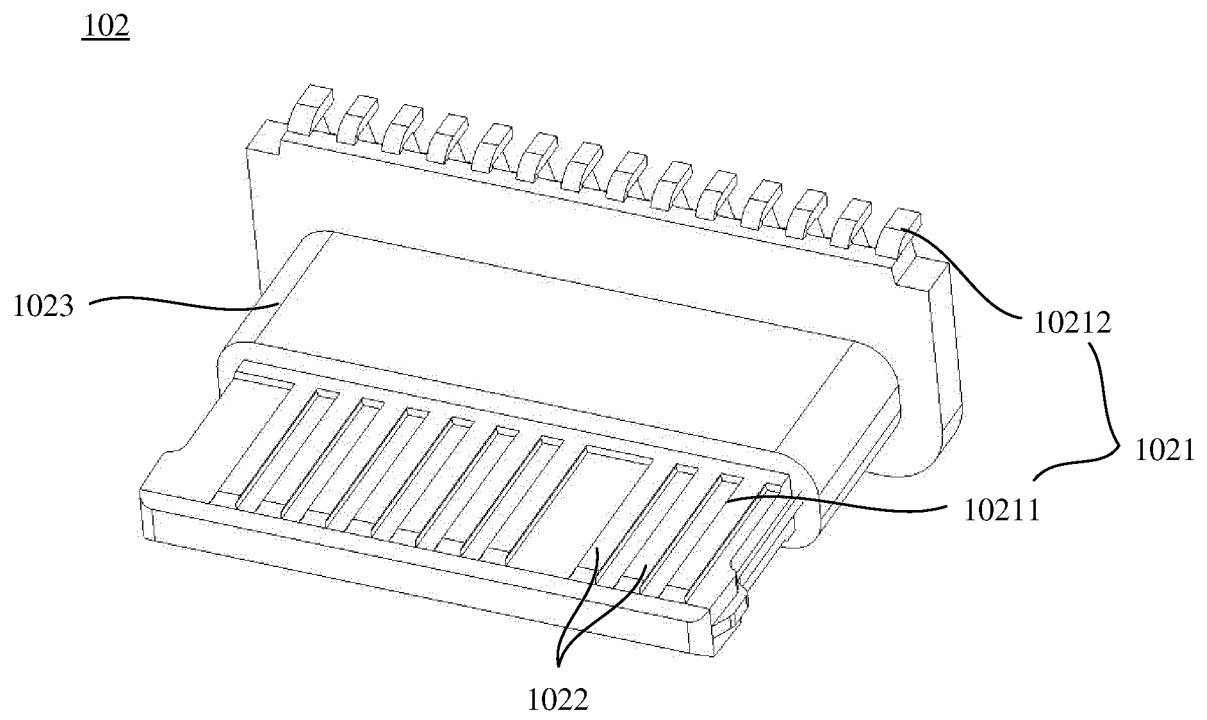


FIG. 3

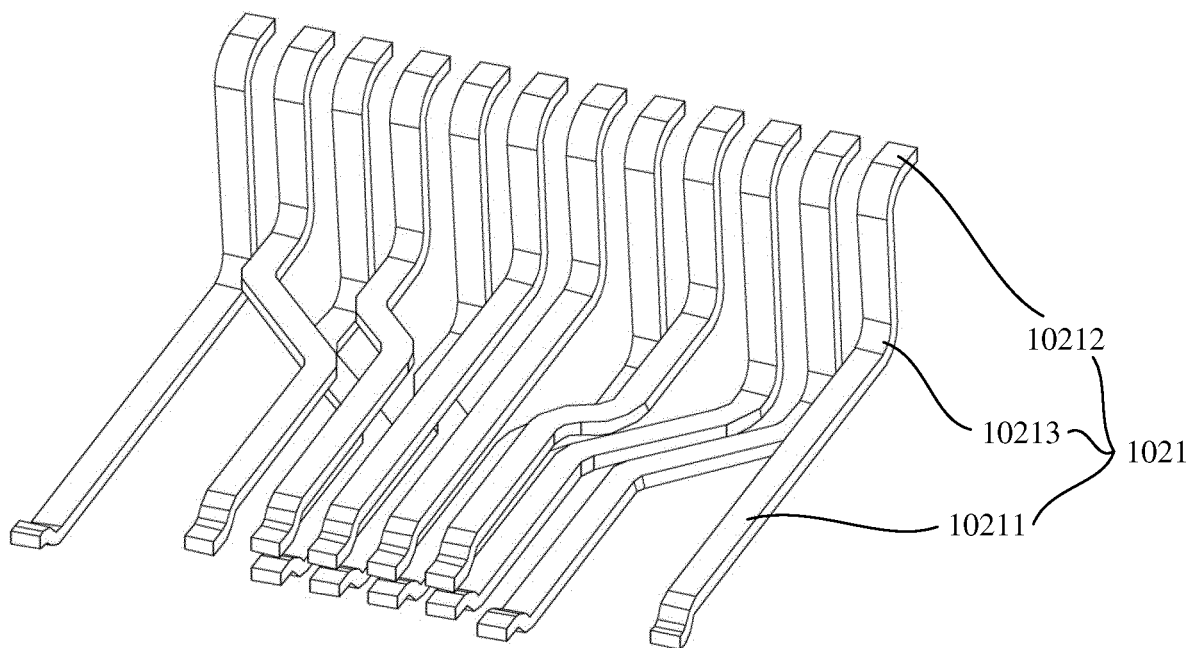


FIG. 4

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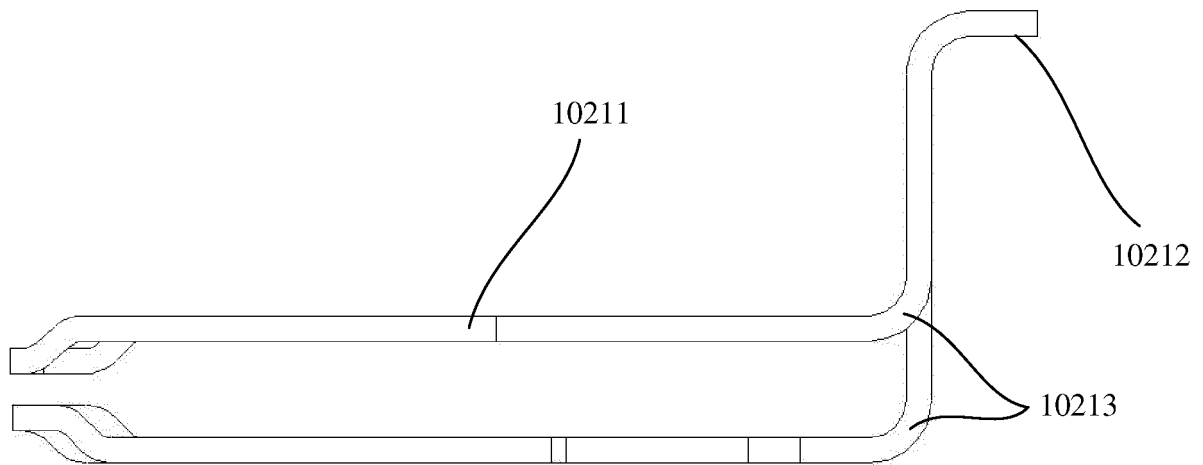


FIG. 5

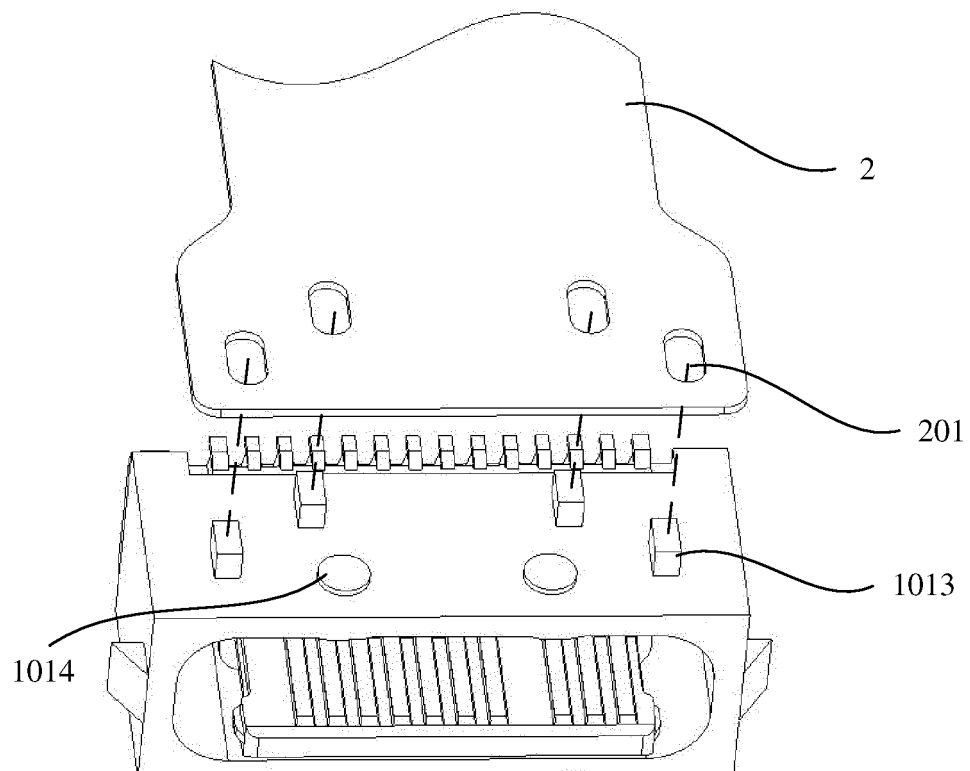


FIG. 6

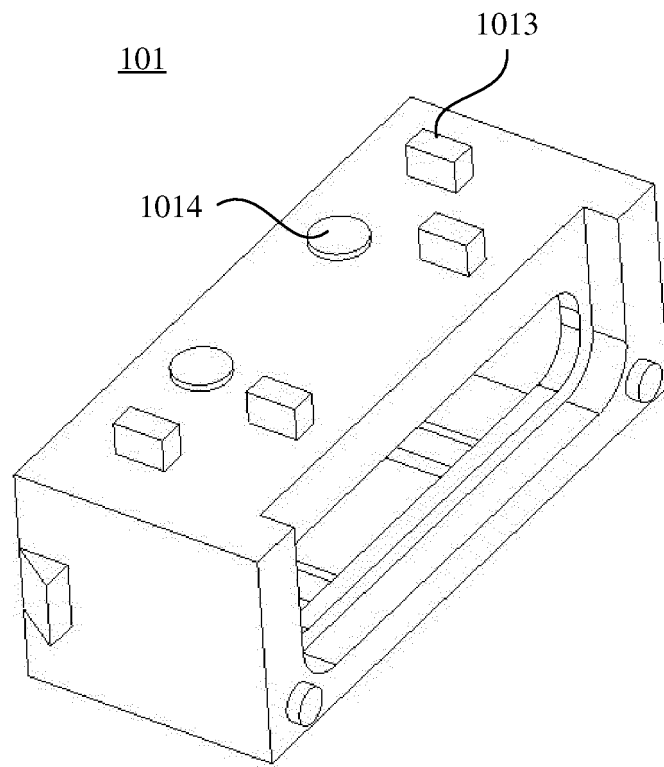


FIG. 7A

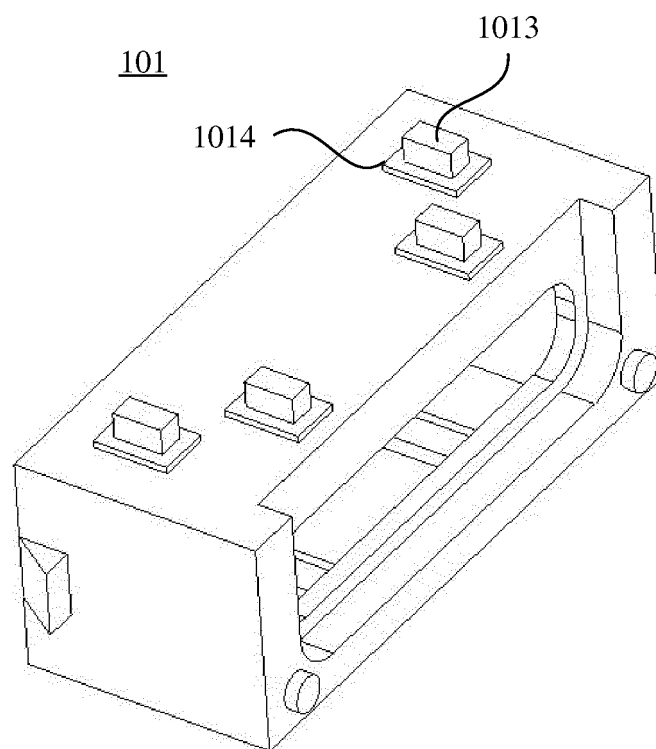


FIG. 7B

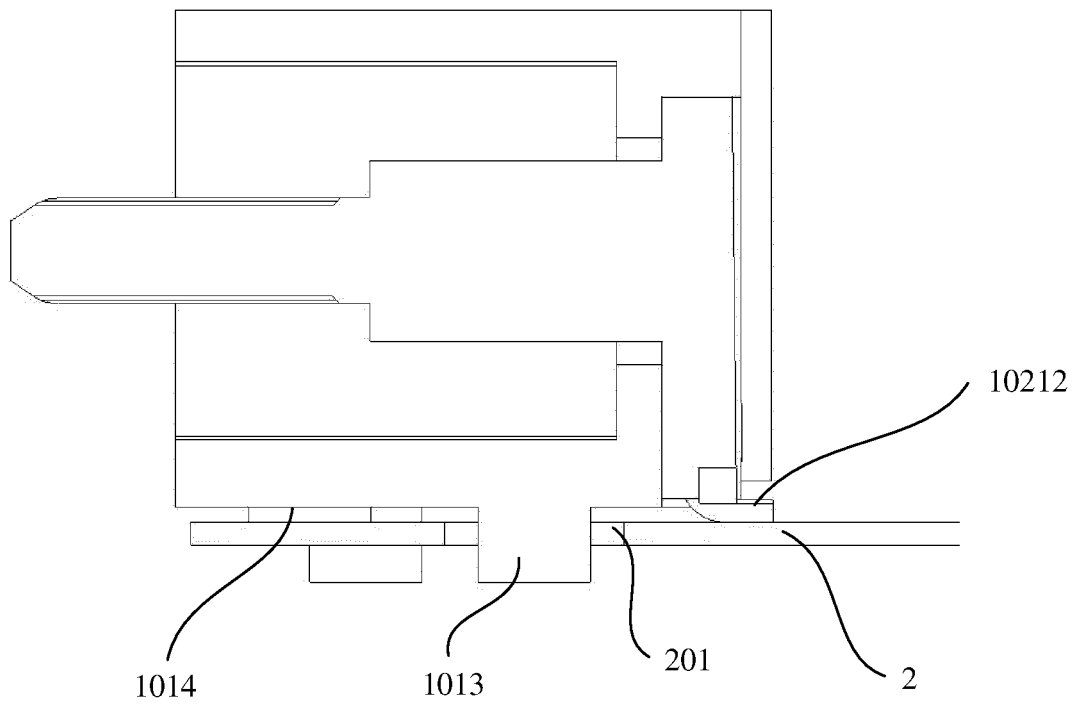


FIG. 8

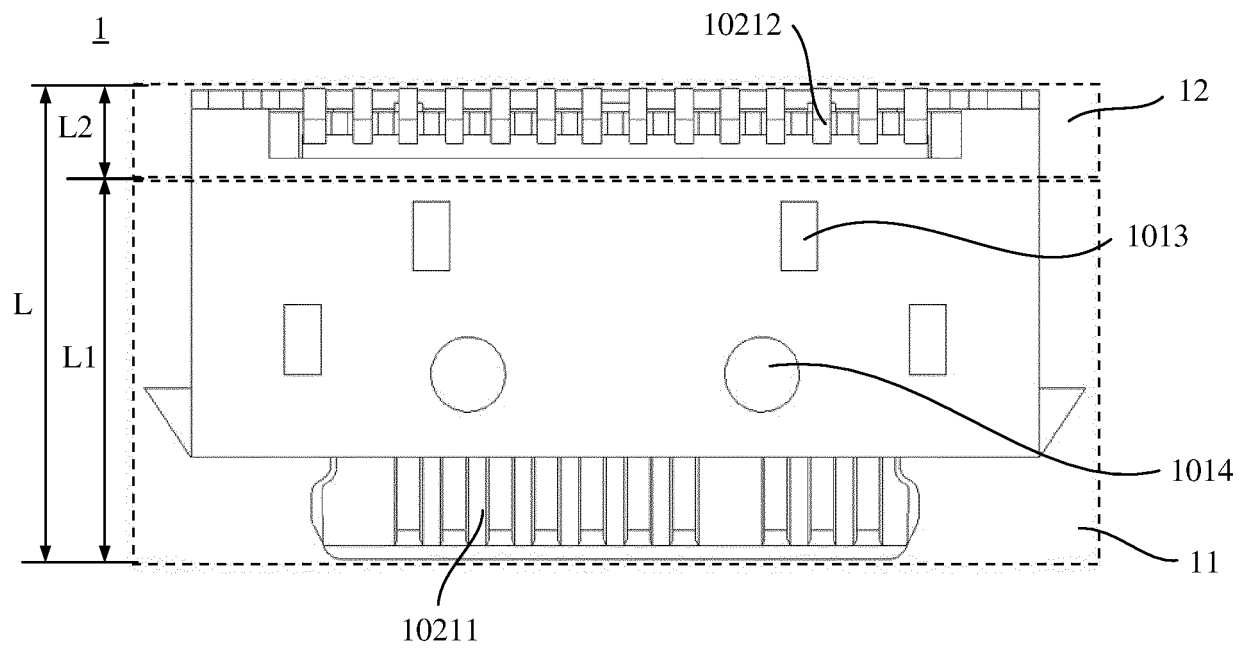


FIG. 9

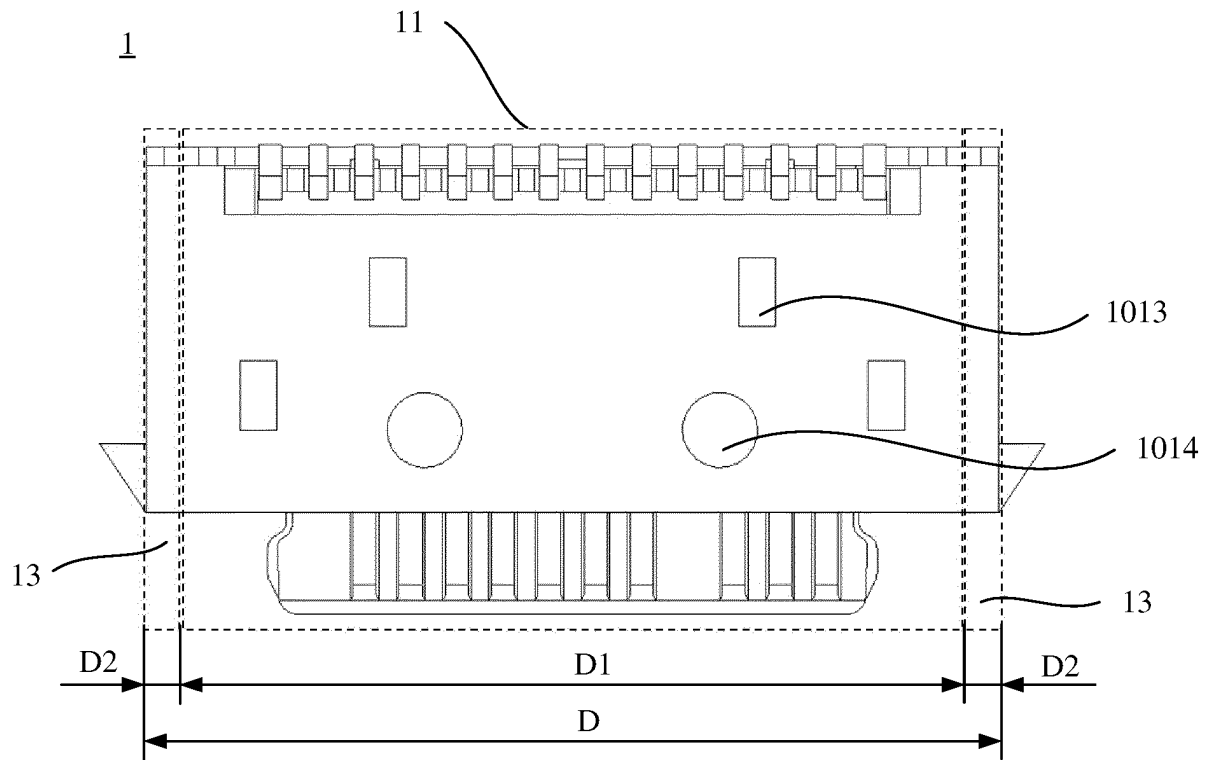


FIG. 10

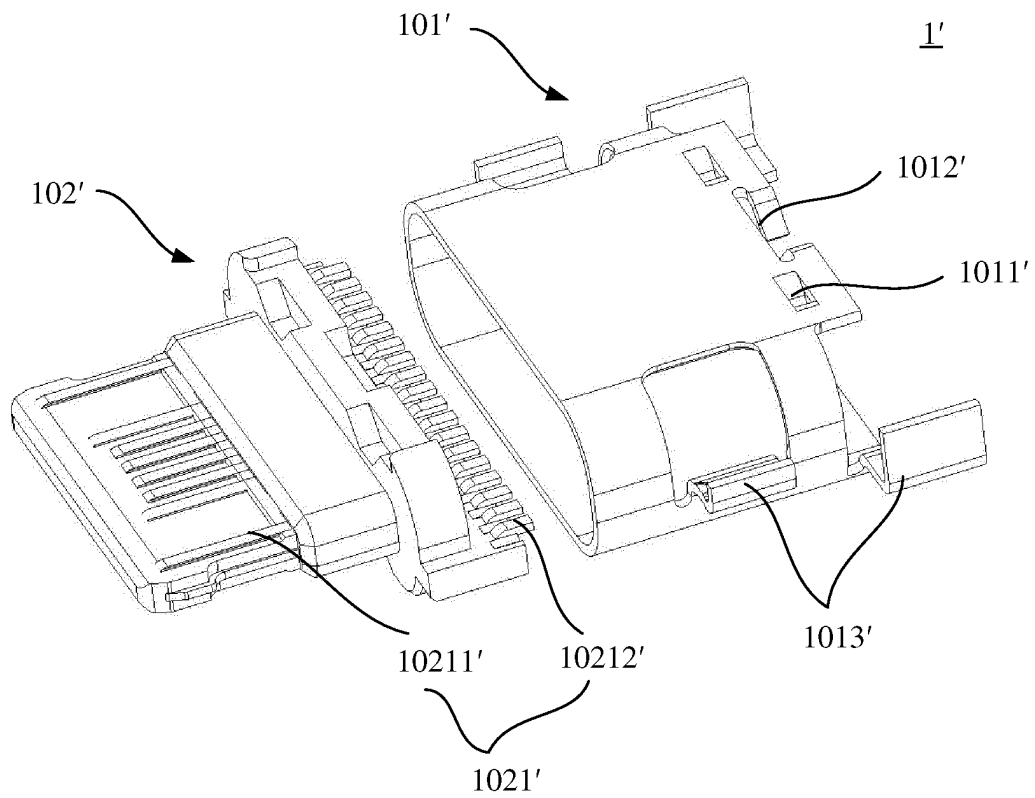


FIG. 11

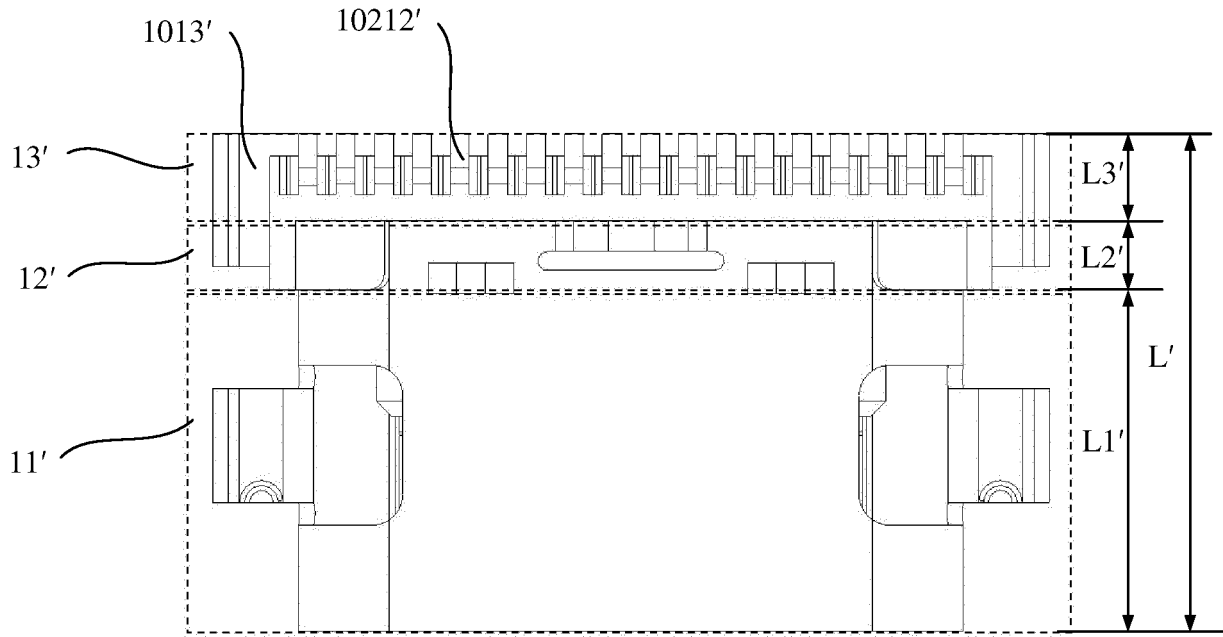


FIG. 12

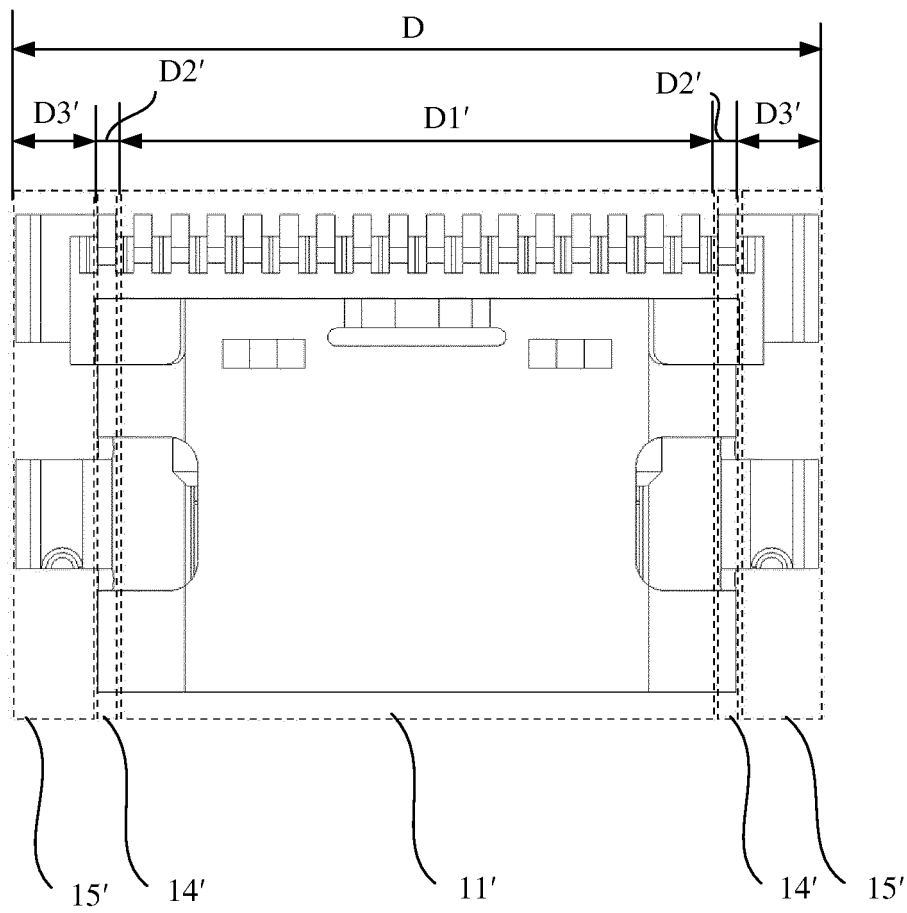


FIG. 13

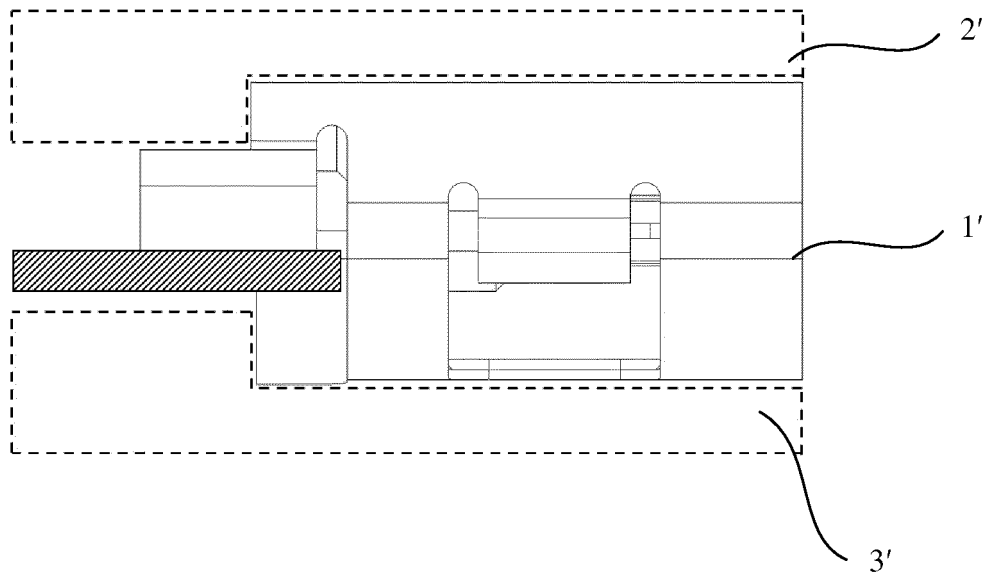


FIG. 14

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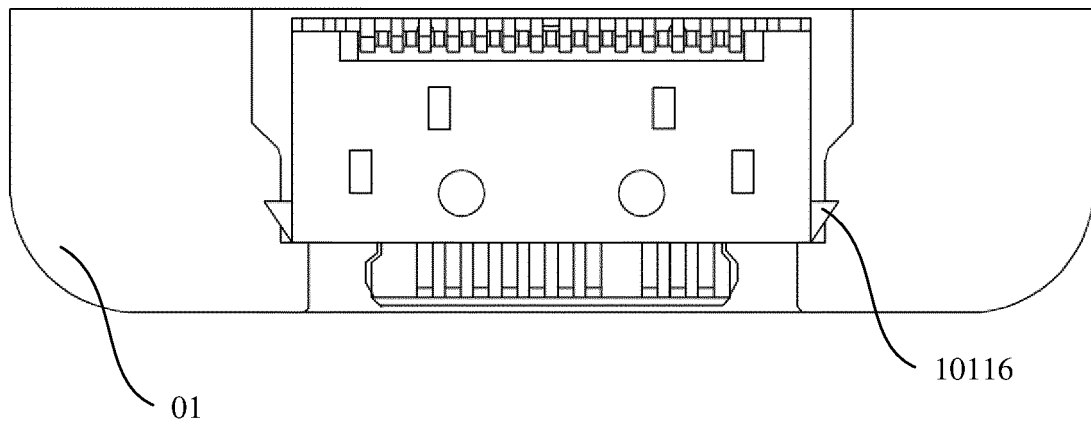


FIG. 15

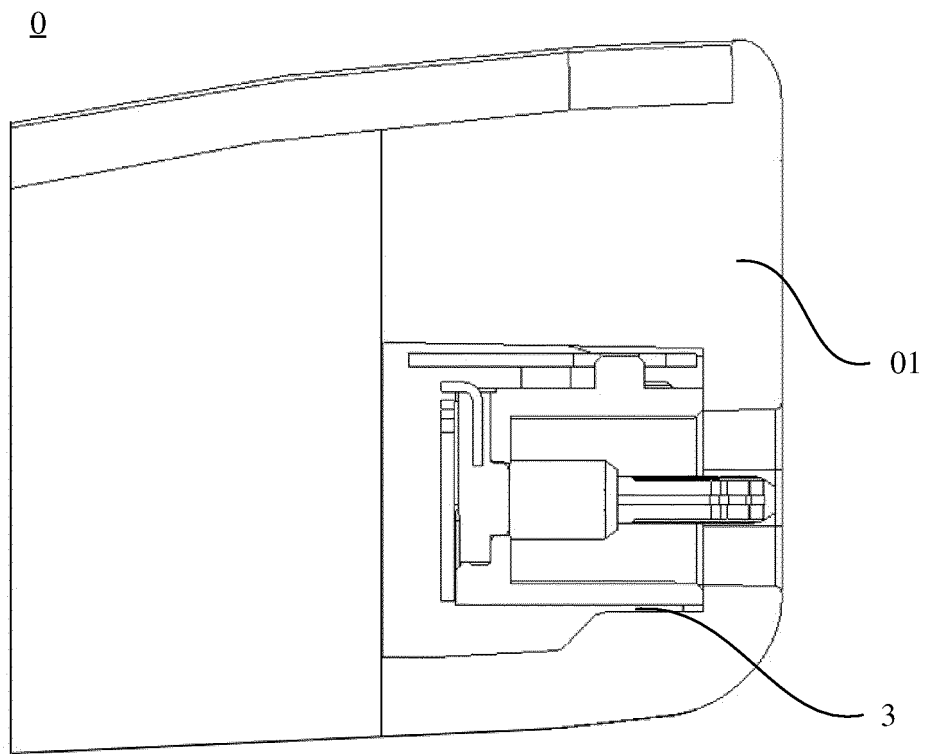


FIG. 16

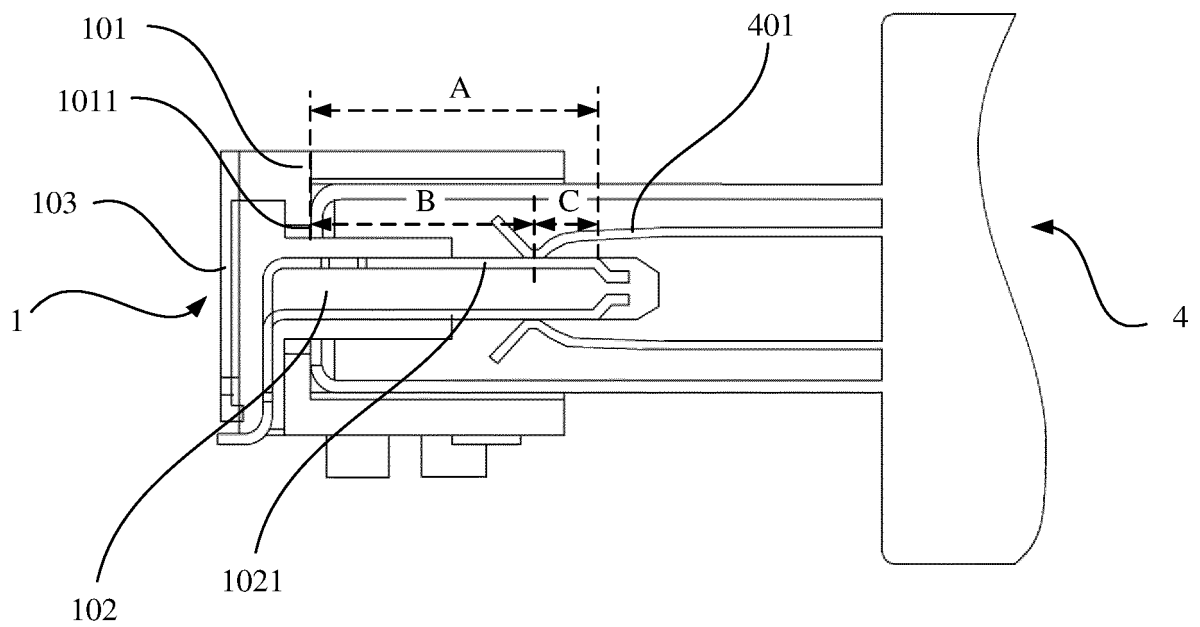


FIG. 17

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/082121

A. CLASSIFICATION OF SUBJECT MATTER H01R 13/42(2006.01)i; H01R 12/50(2011.01)i; H01R 24/76(2011.01)i According to International Patent Classification (IPC) or to both national classification and IPC																					
B. FIELDS SEARCHED																					
Minimum documentation searched (classification system followed by classification symbols) H01R																					
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																					
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNPAT, CNKI, EPODOC, WPI: 连接器, 母座, 插座, 壳体, 外壳, 板, 盖, 舌片, 舌板, 焊接, connector, socket, housing, board, cover, lid, tongue, solder, weld																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT																					
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>CN 202888447 U (CAI, Tianqing) 17 April 2013 (2013-04-17) description, paragraphs 27-31, and figures 1-5</td> <td>1-15</td> </tr> <tr> <td>X</td> <td>CN 201113071 Y (MOLEX INCORPORATED) 10 September 2008 (2008-09-10) description, page 5 line 3 to page 7 line 23, figures 1-9</td> <td>1-15</td> </tr> <tr> <td>X</td> <td>CN 201838867 U (PENG, Tianding) 18 May 2011 (2011-05-18) description, paragraphs 26-36, and figures 1-8</td> <td>1-15</td> </tr> <tr> <td>X</td> <td>CN 202930583 U (FU-CHAN ELECTRONICS (DONGGUAN) CO., LTD. et al.) 08 May 2013 (2013-05-08) description, paragraphs 37-47, and figures 1-6</td> <td>1-15</td> </tr> <tr> <td>A</td> <td>CN 208127476 U (DONGGUAN POLIXIN ELECTRIC CO., LTD.) 20 November 2018 (2018-11-20) entire document</td> <td>1-15</td> </tr> <tr> <td>A</td> <td>US 2015056855 A1 (HON HAI PRECISION INDUSTRY CO., LTD.) 26 February 2015 (2015-02-26) entire document</td> <td>1-15</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	CN 202888447 U (CAI, Tianqing) 17 April 2013 (2013-04-17) description, paragraphs 27-31, and figures 1-5	1-15	X	CN 201113071 Y (MOLEX INCORPORATED) 10 September 2008 (2008-09-10) description, page 5 line 3 to page 7 line 23, figures 1-9	1-15	X	CN 201838867 U (PENG, Tianding) 18 May 2011 (2011-05-18) description, paragraphs 26-36, and figures 1-8	1-15	X	CN 202930583 U (FU-CHAN ELECTRONICS (DONGGUAN) CO., LTD. et al.) 08 May 2013 (2013-05-08) description, paragraphs 37-47, and figures 1-6	1-15	A	CN 208127476 U (DONGGUAN POLIXIN ELECTRIC CO., LTD.) 20 November 2018 (2018-11-20) entire document	1-15	A	US 2015056855 A1 (HON HAI PRECISION INDUSTRY CO., LTD.) 26 February 2015 (2015-02-26) entire document	1-15
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Date of the actual completion of the international search 03 June 2021	Date of mailing of the international search report 21 June 2021																				
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 China	Authorized officer																				
Facsimile No. (86-10)62019451	Telephone No.																				

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2021/082121

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 202888447 U	17 April 2013	None	
CN 201113071 Y	10 September 2008	None	
CN 201838867 U	18 May 2011	None	
CN 202930583 U	08 May 2013	None	
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US 2015056855 A1	26 February 2015	CN 104425949 A	18 March 2015

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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