

PERIPHERAL ELECTRONIC ASSEMBLY

Technical Field

[0001] This disclosure relates to a peripheral electronic assembly. In particular, this disclosure relates a peripheral electronic assembly couplable to a host electronic device such as a laptop computer, or a smart phone, etc.

Background

[0002] A peripheral electronic device, such as a headset or a headphone, etc, typically has a type-C interface for connecting with a host electronic device for charging the peripheral electronic device and/or for transmitting digital audio signals between the peripheral electronic device and the host electronic device, and a 3.5mm interface for connecting with a host electronic device for transmitting analog audio signals between the peripheral electronic device and the host electronic device.

[0003] Therefore, there exists a need for providing an improved peripheral electronic device.

Summary

[0004] According to a first aspect of the present disclosure, a peripheral electronic assembly is provided. The peripheral electronic assembly may comprise a connector comprising a first plug, wherein the first plug comprises at least one detection element; and a second plug connected to the first plug; a receptacle configured to receive the first plug, the receptacle comprising a sensor configured to detect the at least one detection element; and a controller coupled with the sensor, wherein the controller is configured to control the peripheral electronic assembly to operate in an analog-audio-signal mode when the sensor detects the at least one detection element.

[0005] According to a second aspect of the present disclosure, a peripheral electronic assembly is provided. The peripheral electronic assembly may comprise a receptacle configured to receive a first plug, the first plug comprising at least one detection element, the receptacle comprising a sensor configured to detect the at least one detection element; and a controller coupled with the sensor, wherein the controller is configured to control the peripheral electronic assembly to operate in an analog-audio-signal mode when the sensor detects the at least one detection element.

[0006] According to a third aspect of the present disclosure, a connector is provided. The connector may comprise a first plug comprising at least one detection element; and a second plug connected to the first plug, wherein the first plug is receivable in a receptacle comprised in a peripheral electronic assembly, wherein the at least one detection element is detectable by a sensor comprised in the receptacle of the peripheral electronic assembly, and wherein if the at least one detection element is detected by the sensor, the peripheral electronic assembly operates in an analog-audio-signal mode.

Brief Description of the Drawings

[0007] In the drawings, like reference characters generally refer to like parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the disclosure. In the following description, various embodiments of the disclosure are described with reference to the following drawings, in which:

[0008] FIG. 1A shows a peripheral electronic assembly in accordance with some embodiments of the present disclosure;

[0009] FIG. 1B shows the peripheral electronic assembly of FIG. 1A with the first plug received in the receptacle;

[0010] FIG. 2A shows a schematic illustration of a peripheral electronic assembly with the second plug ready to be received in a jack connector in a host electronic device and with the first plug received in the receptacle;

[0011] FIG. 2B shows a schematic illustration of a peripheral electronic assembly wherein the first plug is not received in the receptacle;

[0012] FIG. 2C shows a schematic illustration of a peripheral electronic assembly with the second plug received in a jack connector in a host electronic device and with the first plug received in the receptacle;

[0013] FIG. 3A shows a top view of an example of the first plug comprised in the connector in accordance with some embodiments of the present disclosure;

[0014] FIG. 3B shows a top view of an example of the receptacle in accordance with some embodiments of the present disclosure;

[0015] FIG. 3C shows partial terminals of the first plug in FIG. 3A and partial terminals of the receptacle in FIG. 3B, wherein the first plug is not received in or connected to the receptacle;

[0016] FIG. 3D shows partial terminals of the first plug in FIG. 3A and partial terminals of the receptacle in FIG. 3B, wherein the first plug is received in and connected to the receptacle;

[0017] FIG. 4A shows a top view of an example of the first plug comprised in the connector in accordance with some embodiments of the present disclosure;

[0018] FIG. 4B shows a top view of an example of the receptacle in accordance with some embodiments of the present disclosure;

[0019] FIG. 4C shows partial terminals of the first plug in FIG. 4A and partial terminals of the receptacle in FIG. 4B, wherein the first plug is not received in or connected to the receptacle;

[0020] FIG. 4D shows partial terminals of the first plug in FIG. 4A and partial terminals of the receptacle in FIG. 4B, wherein the first plug is received in and connected to the receptacle;

[0021] FIG. 5A shows a top view of an example of the first plug comprised in the connector in accordance with some embodiments of the present disclosure;

[0022] FIG. 5B shows a top view of an example of the receptacle in accordance with some embodiments of the present disclosure;

[0023] FIG. 5C shows partial terminals of the first plug in FIG. 5A and partial terminals of the receptacle in FIG. 5B, wherein the first plug is not received in or connected to the receptacle;

[0024] FIG. 5D shows partial terminals of the first plug in FIG. 5A and partial terminals of the receptacle in FIG. 5B, wherein the first plug is received in and connected to the receptacle;

[0025] FIG. 6A shows a top view of an example of the first plug comprised in the connector in accordance with some embodiments of the present disclosure;

[0026] FIG. 6B shows a top view of an example of the receptacle in accordance with some embodiments of the present disclosure;

[0027] FIG. 6C shows partial terminals of the first plug in FIG. 6A and partial terminals of the receptacle in FIG. 6B, wherein the first plug is not received in or connected to the receptacle;

[0028] FIG. 6D shows partial terminals of the first plug in FIG. 6A and partial terminals of the receptacle in FIG. 6B, wherein the first plug is received in and connected to the receptacle;

[0029] FIG. 7A shows a top view of an example of the first plug comprised in the connector in accordance with some embodiments of the present disclosure;

[0030] FIG. 7B shows a top view of an example of the receptacle in accordance with some embodiments of the present disclosure;

[0031] FIG. 7C shows partial terminals of the first plug in FIG. 7A and partial terminals of the receptacle in FIG. 7B, wherein the first plug is not received in or connected to the receptacle;

[0032] FIG. 7D shows partial terminals of the first plug in FIG. 7A and partial terminals of the receptacle in FIG. 7B, wherein the first plug is received in and connected to the receptacle;

[0033] FIG. 8A shows a top view of an example of the receptacle in accordance with some embodiments of the present disclosure;

[0034] FIG. 8B shows a top view of an example of the first plug in accordance with some embodiments of the present disclosure;

[0035] FIG. 8C shows a side view of an example of the second plug in accordance with some embodiments of the present disclosure;

[0036] FIG. 9A shows partial terminals of an example of the first plug and partial terminals of an example of the receptacle, wherein the first plug is not received in or connected with the receptacle;

[0037] FIG. 9B shows the partial terminals of the first plug and the partial terminals of the receptacle in FIG. 9A, wherein the first plug is received in and connected with the receptacle;

[0038] FIG. 10 shows an example of the capacitance sensor coupled with a first receptacle terminal and a second receptacle terminal in accordance with some embodiments of the present disclosure;

[0039] FIG. 11A shows a peripheral electronic assembly and a first connector in accordance with some embodiments of the present disclosure;

[0040] FIG. 11B shows the peripheral electronic assembly and the first connector in FIG. 11A, where the plug in the first connector is received in the receptacle of the peripheral electronic assembly.

Detailed Description

[0041] The following detailed description refers to the accompanying drawings that show, by way of illustration, specific details, and embodiments in which the disclosure may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the disclosure. Other embodiments may be utilized, and structural, logical, optical and electrical changes may be made without departing from the scope of the disclosure. The various embodiments are not necessarily mutually exclusive, as some embodiments can be combined with one or more other embodiments to form new embodiments.

[0042] Embodiments described in the context of one of the methods or devices are analogously valid for the other methods or devices. Similarly, embodiments described in the context of a method are analogously valid for a device, and vice versa.

[0043] Features that are described in the context of an embodiment may correspondingly be applicable to the same or similar features in the other embodiments. Features that are described in the context of an embodiment may correspondingly be applicable to the other embodiments, even if not explicitly described in these other embodiments. Furthermore, additions and/or

combinations and/or alternatives as described for a feature in the context of an embodiment may correspondingly be applicable to the same or similar feature in the other embodiments.

[0044] It should be understood that the terms “on”, “over”, “top”, “bottom”, “down”, “side”, “back”, “left”, “right”, “front”, “back”, “lateral”, “side”, “up”, “down”, “vertical”, “horizontal” etc., when used in the following description are used for convenience and to aid understanding of relative positions or directions, and not intended to limit the orientation of any device, or structure or any part of any device or structure. In addition, the singular terms “a”, “an”, and “the” include plural references unless context clearly indicates otherwise. Similarly, the “or” is intended to include “and” unless the context clearly indicates otherwise.

[0045] It will be further understood that the terms “comprise” (and any form of comprise, such as “comprises” and “comprising”), “have” (and any form of have, such as “has” and “having”), “include” (and any form of include, such as “includes” and “including”), and “contain” (and any form of contain, such as “contains” and “containing”) are open-ended linking verbs. As a result, a method or device that “comprises,” “has,” “includes” or “contains” one or more steps or elements possesses those one or more steps or elements, but is not limited to possessing only those one or more steps or elements. Likewise, a step of a method or an element of a device that “comprises,” “has,” “includes” or “contains” one or more features possesses those one or more features, but is not limited to possessing only those one or more features. Furthermore, a device or structure that is configured in a certain way is configured in at least that way, but may also be configured in ways that are not listed.

[0046] Approximating language, as used herein throughout the specification and claims, may be applied to modify any quantitative representation that could permissibly vary without resulting in a change in the basic function to which it is related. Accordingly, a value modified by a term or terms, such as “about,” “substantially”, is not limited to the precise value specified but within tolerances that are acceptable for the operation of the embodiment for an application for which it is intended. In some instances, the approximating language may correspond to the precision of an instrument for measuring the value.

[0047] The term “exemplary” may be used herein to mean “serving as an example, instance, or illustration”. Any aspect or design described herein as “exemplary” is not necessarily to be construed as preferred or advantageous over other aspects or designs.

[0048] The terms “at least one” and “one or more” may be understood to include a numerical quantity greater than or equal to one (e.g., one, two, three, four, [...], etc.). The term “a plurality” may be understood to include a numerical quantity greater than or equal to two (e.g., two, three, four, five, [...], etc.). The phrase “at least one of” with regard to a group of elements may be

used herein to mean at least one element from the group consisting of the elements. For example, the phrase “at least one of” with regard to a group of elements may be used herein to mean a selection of: one of the listed elements, a plurality of one of the listed elements, a plurality of individual listed elements, or a plurality of a multiple of listed elements.

[0049] The words “plural” and “multiple” in the description and the claims expressly refer to a quantity greater than one. Accordingly, any phrases explicitly invoking the aforementioned words (e.g., “a plurality of (objects)”, “multiple (objects)”) referring to a quantity of objects expressly refer to more than one of the said objects. The terms “group (of)”, “set (of)”, “collection (of)”, “series (of)”, “sequence (of)”, “grouping (of)”, etc., and the like in the description and in the claims, if any, refer to a quantity equal to or greater than one, i.e. one or more.

[0050] The term “first”, “second”, “third” detailed herein are used to distinguish one element from another similar element and may not necessarily denote order or relative importance, unless otherwise stated.

[0051] As used herein, the phrase of the form of “at least one of A or B” may include A or B or both A and B. Correspondingly, the phrase of the form of “at least one of A or B or C”, or including further listed items, may include any and all combinations of one or more of the associated listed items.

[0052] The following examples pertain to various aspects of the present disclosure.

[0053] Example 1 is a peripheral electronic assembly, the peripheral electronic assembly comprising: a connector comprising: a first plug, wherein the first plug comprises at least one detection element; and a second plug connected to the first plug; a receptacle configured to receive the first plug, the receptacle comprising a sensor configured to detect the at least one detection element; and a controller coupled with the sensor, wherein the controller is configured to control the peripheral electronic assembly to operate in an analog-audio-signal mode when the sensor detects the at least one detection element.

[0054] In Example 2, the subject matter of Example 1 may optionally include that the first plug further comprises: a first plug terminal; and a first plug ground terminal, wherein the at least one detection element comprises a first plug capacitor connected to the first plug terminal at one end, and connected to the first plug ground terminal at the other end, wherein the receptacle further comprises: a first receptacle terminal configured to contact with the first plug terminal when the first plug is received in the receptacle, wherein the sensor comprises a capacitance sensor coupled to the first receptacle terminal, wherein the capacitance sensor is configured to

detect a first capacitance at the first receptacle terminal so as to detect the first plug capacitor comprised in the at least one detection element.

[0055] In Example 3, the subject matter of Example 2 may optionally include that the receptacle further comprises a first receptacle ground terminal; and a first receptacle capacitor connected to the first receptacle terminal at one end, and connected to the first receptacle ground terminal at the other end.

[0056] In Example 4, the subject matter of Example 3 may optionally include that the detected first capacitance is equal to or greater than 2 times of a capacitance of the first receptacle capacitor.

[0057] In Example 5, the subject matter of Examples 2 to 4 may optionally include that the first plug further comprises: a second plug terminal, wherein the at least one detection element further comprises a second plug capacitor connected to the second plug terminal at one end, and connected to a second plug ground terminal at the other end, wherein the receptacle further comprises: a second receptacle terminal configured to contact with the second plug terminal when the first plug is received in the receptacle, and wherein the capacitance sensor is coupled to the second receptacle terminal, wherein the capacitance sensor is configured to detect a second capacitance at the second receptacle terminal so as to detect the second plug capacitor comprised in the at least one detection element.

[0058] In Example 6, the subject matter of Example 5 may optionally include that the receptacle further comprises a second receptacle capacitor connected to the second receptacle terminal at one end, and connected to the first receptacle ground terminal at the other end.

[0059] In Example 7, the subject matter of Examples 2 to 6 may optionally include that the receptacle comprises: a receptacle data minus (D-) terminal configured for transmitting left channel audio signals; a receptacle data plus (D+) terminal configured for transmitting right channel audio signals; and a receptacle sideband use (SBU) terminal configured for transmitting mic channel audio signals.

[0060] In Example 8, the subject matter of Example 7 may optionally include that the first plug comprises: a plug data minus (D-) terminal configured to contact with the receptacle data minus (D-) terminal for transmitting left channel audio signals when the first plug is received in the receptacle; a plug data plus (D+) terminal configured to contact with the receptacle data plus (D+) terminal for transmitting right channel audio signals when the first plug is received in the receptacle; and a plug sideband use (SBU) terminal configured to contact with the receptacle sideband use (SBU) terminal for transmitting mic channel audio signals when the first plug is received in the receptacle.

[0061] In Example 9, the subject matter of Example 8 may optionally include that the second plug comprises: a tip connector connected to the plug data minus (D-) terminal of the first plug and configured for transmitting left channel audio signals; a first ring connector connected to the plug data plus (D+) terminal of the first plug and configured for transmitting right channel audio signals; a second ring connector connected to the plug sideband use (SBU) terminal and configured for transmitting mic channel audio signals; and a sleeve connector connected to the first plug ground terminal.

[0062] In Example 10, the subject matter of Example 1 may optionally include that the sensor comprises a Hall sensor, and the at least one detection element comprises a magnet.

[0063] In Example 11, the subject matter of Example 1 may optionally include that the sensor comprises an NFC chip and the at least one detection element comprises a second NFC chip.

[0064] In Example 12, the subject matter of Examples 1 to 11 may optionally include that the second plug is configured to be received in and connect to a jack connector in a host electronic device for transmitting analog audio signals between the host electronic device and the peripheral electronic assembly.

[0065] Example 13 is a peripheral electronic assembly, the peripheral electronic assembly comprising: a receptacle configured to receive a first plug, the first plug comprising at least one detection element, the receptacle comprising a sensor configured to detect the at least one detection element; and a controller coupled with the sensor, wherein the controller is configured to control the peripheral electronic assembly to operate in an analog-audio-signal mode when the sensor detects the at least one detection element.

[0066] In Example 14, the subject matter of Example 13 may optionally include that the receptacle further comprises: a first receptacle terminal, wherein the first receptacle terminal is configured to contact with a first plug terminal comprised in the first plug when the first plug is received in the receptacle, wherein the sensor comprises a capacitance sensor coupled to the first receptacle terminal, wherein the capacitance sensor is configured to detect a first capacitance at the first receptacle terminal to detect a first plug capacitor comprised in the at least one detection element, wherein the first plug capacitor is connected to the first plug terminal at one end, and connected to a first plug ground terminal comprised in the first plug at the other end.

[0067] In Example 15, the subject matter of Example 14 may optionally include that the receptacle further comprises: a first receptacle ground terminal; and a first receptacle capacitor connected to the first receptacle terminal at one end, and connected to the first receptacle ground terminal at the other end.

[0068] In Example 16, the subject matter of Example 15 may optionally include that the detected first capacitance is equal to or greater than 2 times of the capacitance of the first receptacle capacitor.

[0069] In Example 17, the subject matter of Examples 14 to 16 may optionally include that the receptacle further comprises: a second receptacle terminal, wherein the second receptacle terminal is configured to contact with a second plug terminal comprised in the first plug when the first plug is received in the receptacle, wherein the capacitance sensor is coupled to the second receptacle terminal, wherein the capacitance sensor is configured to detect a second capacitance at the second receptacle terminal to detect a second plug capacitor comprised in the at least one detection element, wherein the second plug capacitor is connected to the second plug terminal at one end, and connected to a second plug ground terminal at the other end.

[0070] In Example 18, the subject matter of Example 17 may optionally include that the receptacle further comprises a second receptacle capacitor connected to the second receptacle terminal at one end, and connected to the first receptacle ground terminal at the other end.

[0071] In Example 19, the subject matter of Examples 14 to 18 may optionally include that the receptacle comprises: a receptacle data minus (D-) terminal configured for transmitting left channel audio signals; a receptacle data plus (D+) terminal configured for transmitting right channel audio signals; and a receptacle sideband use (SBU) terminal configured for transmitting mic channel audio signals.

[0072] In Example 20, the subject matter of Example 13 may optionally include that the sensor comprises a Hall sensor, and the at least one detection element comprises a magnet.

[0073] In Example 21, the subject matter of Example 13 may optionally include that each of the sensor and the at least one detection element comprises a respective NFC chip.

[0074] Example 22 is a connector, the connector comprising: a first plug comprising at least one detection element; and a second plug connected to the first plug, wherein the first plug is receivable in a receptacle comprised in a peripheral electronic assembly, wherein the at least one detection element is detectable by a sensor comprised in the receptacle of the peripheral electronic assembly, and wherein if the at least one detection element is detected by the sensor, the peripheral electronic assembly operates in an analog-audio-signal mode.

[0075] In Example 23, the subject matter of Example 22 may optionally include that the first plug further comprises: a first plug terminal configured to contact with a first receptacle terminal comprised in the receptacle when the first plug is received in the receptacle; and a first plug ground terminal, wherein the at least one detection element comprises a first plug capacitor connected to the first plug terminal at one end, and connected to the first plug ground

terminal at the other end, and wherein the sensor comprises a capacitance sensor coupled to the first receptacle terminal, wherein the capacitance sensor is configured to detect a first capacitance at the first receptacle terminal so as to detect the first plug capacitor comprised in the at least one detection element.

[0076] In Example 24, the subject matter of Example 23 may optionally include that the first plug further comprises: a second plug terminal configured to contact with a second receptacle terminal comprised in the receptacle when the first plug is received in the receptacle, wherein the at least one detection element further comprises a second plug capacitor connected to the second plug terminal at one end, and connected to a second plug ground terminal at the other end, and wherein the capacitance sensor is coupled to the second receptacle terminal, wherein the capacitance sensor is configured to detect a second capacitance at the second receptacle terminal so as to detect the second plug capacitor comprised in the at least one detection element.

[0077] In Example 25, the subject matter of Examples 22 to 24 may optionally include that the first plug comprises: a plug data minus (D-) terminal configured to contact with a receptacle data minus (D-) terminal comprised in the receptacle for transmitting left channel audio signals when the first plug is received in the receptacle; a plug data plus (D+) terminal configured to contact with a receptacle data plus (D+) terminal comprised in the receptacle for transmitting right channel audio signals when the first plug is received in the receptacle; and a plug sideband use (SBU) terminal configured to contact with a receptacle sideband use (SBU) terminal comprised in the receptacle for transmitting mic channel audio signals when the first plug is received in the receptacle.

[0078] In Example 26, the subject matter of Example 25 may optionally include that the second plug comprises: a tip connector connected to the data minus (D-) terminal of the first plug and configured for transmitting left channel audio signals; a first ring connector connected to the data plus (D+) terminal of the first plug and configured for transmitting right channel audio signals; a second ring connector connected to the second sideband use (SBU2) terminal and configured for transmitting mic channel audio signals; and a sleeve connector connected to the first plug ground terminal.

[0079] In Example 27, the subject matter of Examples 22 to 26 may optionally include that the second plug is configured to be received in and connect to a jack connector in a host electronic device for transmitting analog audio signals between the host electronic device and the peripheral electronic assembly.

[0080] In various embodiments, the peripheral electronic assembly and the connector will now be described by way of the following non-limiting examples.

[0081] FIG. 1A shows a peripheral electronic assembly 100 in accordance with some embodiments of the present disclosure. The peripheral electronic assembly 100 may comprise a peripheral electronic device such as a headset, a headphone, a speaker, a microphone, etc. The peripheral electronic assembly 100 may comprise a connector 110, a receptacle 150 and a controller 180.

[0082] The connector 110 may comprise a first plug 120 and a second plug 140 connected to the first plug 120, e.g., via a cable.

[0083] The receptacle 150 may be configured to receive the first plug 120. In the peripheral electronic assembly 100 of FIG. 1A, the first plug 120 is ready to be received in the receptacle 150. FIG. 1B shows the peripheral electronic assembly 100 of FIG. 1A with the first plug 120 received in the receptacle 150. The receptacle 150 may comprise a sensor 152 configured to detect at least one detection element 122 comprised in the first plug 120. The sensor 152 may detect the at least one detection element 122 by detecting a measure of the at least one detection element 122. For example, if the at least one detection element 122 comprises a capacitor, the sensor 152 may detect the capacitor by detecting a capacitance of the capacitor.

[0084] The controller 180 can be coupled with the sensor 152 of the receptacle 150. The controller 180 can be configured to control the peripheral electronic assembly 100 to operate in an analog-audio-signal mode when the sensor 152 detects the at least one detection element 122. The controller 180 can be configured to control the peripheral electronic assembly 100 to operate in a mode other than the analog-audio-signal mode when the sensor 152 does not detect the at least one detection element 122. For example, the controller 180 can be configured to control the peripheral electronic assembly 100 to operate in a digital-audio-signal mode and/or a charging mode when the sensor 152 does not detect the at least one detection element 122. When the sensor 152 of the receptacle 150 detects the at least one detection element 122 of the first plug 120, it may indicate that the first plug 120 of the connector 110 is received in and connected to the receptacle 150. When the sensor 152 of the receptacle 150 does not detect the at least one detection element 122 of the first plug 120, it may indicate that the first plug 120 of the connector 110 is not received in or connected to the receptacle 150.

[0085] When the peripheral electronic assembly 100 operates in an analog-audio-signal mode, the peripheral electronic assembly 100 can be configured to communicate analog audio signals with a host electronic device 10 (e.g., see FIGS. 2A to 2C) that is connected to the peripheral electronic assembly 100. For example, when the peripheral electronic assembly 100 operates

in an analog-audio-signal mode, the peripheral electronic assembly 100 (e.g., a peripheral electronic assembly comprising a microphone, or a headset, etc) can be configured to send analog audio signals to a host electronic device 10 (e.g., a laptop computer, or a smart phone, etc) that is connected to the peripheral electronic assembly 100. For another example, when the peripheral electronic assembly 100 operates in an analog-audio-signal mode, the peripheral electronic assembly 100 (e.g., a peripheral electronic assembly comprising a speaker, a headphone, or a headset, etc) can be configured to receive analog audio signals from a host electronic device 10 (e.g., a laptop computer, or a smart phone, etc) that is connected to the peripheral electronic assembly 100.

[0086] When the peripheral electronic assembly 100 operates in the digital-audio-signal mode, the peripheral electronic assembly 100 can be configured to communicate digital audio signals with a host electronic device 10 that is connected to the peripheral electronic assembly 100.

[0087] When the peripheral electronic assembly 100 operates in a charging mode, the peripheral electronic assembly 100 can be configured to be charged.

[0088] The second plug 140 may be configured to be received in and connect to the host electronic device 10 for transmitting analog audio signals between the host electronic device 10 and the peripheral electronic assembly 100. For example, the second plug 140 may be configured to be received in and connect to a jack connector 12 (e.g., see FIGS. 2A to 2C) in a host electronic device 10. The host electronic device 10 may comprise a laptop computer, a smart phone, or a mobile phone etc.

[0089] FIG. 2A shows a schematic illustration of the peripheral electronic assembly 100 with the second plug 140 ready to be received in a jack connector 12 in a host electronic device 10 and with the first plug 120 received in the receptacle 150. FIG. 2B shows a schematic illustration of the peripheral electronic assembly 100 wherein the first plug 120 is not received in the receptacle 150. FIG. 2C shows a schematic illustration of the peripheral electronic assembly 100 with the second plug 140 received in a jack connector 12 in a host electronic device 10 and with the first plug 120 received in the receptacle 150. The connector 110 connects the host electronic device 10 to the peripheral electronic device. By way of example, the connector 110 is a USB-C to 3.5mm adapter with the first plug 120 being a USB-C plug and the second plug 140 being a 3.5mm audio jack. The second plug 140 of the connector 110 is connected to the jack connector 12 of the host electronic device 10. The first plug 120 of connector 110 is connected to the receptacle 150 of the peripheral electronic device. The host electronic device 10 and the peripheral electronic device exchange signals through the connector 110.

[0090] FIG. 3A shows a top view of an example of the first plug 120 comprised in the connector 110 in accordance with some embodiments of the present disclosure. The first plug 120 can comprise a first plug terminal 124 and a first plug ground terminal 126. The at least one detection element 122 of the first plug 120 can comprise a first plug capacitor 122a connected to the first plug terminal 124 at one end, and connected to the first plug ground terminal 126 at the other end. The first plug terminal 124 as shown in FIG. 3A is a first plug sideband use (SBU1) pin 124a, but it should be appreciated that the first plug terminal 124 is not limited to the first plug sideband use (SBU1) pin 124a and can include any suitable pin such as a second plug sideband use (SBU2) pin 124b. The first plug terminal 124 may be designated as a non-signal pin.

[0091] FIG. 3B shows a top view of an example of the receptacle 150 in accordance with some embodiments of the present disclosure. The receptacle 150 may comprise a first receptacle terminal 154 configured to contact with the first plug terminal 124 when the first plug 120 is received in the receptacle 150. The sensor 152 of the receptacle 150 may comprise a capacitance sensor 152a coupled to the first receptacle terminal 154. The capacitance sensor 152a can be configured to detect a first capacitance at the first receptacle terminal 154 so as to detect the first plug capacitor 122a comprised in the at least one detection element 122 of the first plug 120 when the first plug 120 is received in the receptacle 150. The first receptacle terminal 154 as shown in FIG. 3B is a first receptacle sideband use (SBU1) pin 154a corresponding to the first plug sideband use (SBU1) pin 124a of the first plug terminal 124, but it should be appreciated that the first receptacle terminal 154 is not limited to the first receptacle sideband use (SBU1) pin 154a and can include any suitable pin such as a second receptacle sideband use (SBU2) pin 154b. The first receptacle terminal 154 may be designated as a non-signal pin.

[0092] FIG. 3C shows partial terminals of the first plug 120 in FIG. 3A and partial terminals of the receptacle 150 in FIG. 3B, wherein the first plug 120 is not received in or connected to the receptacle 150. FIG. 3D shows partial terminals of the first plug 120 in FIG. 3A and partial terminals of the receptacle 150 in FIG. 3B, wherein the first plug 120 is received in and connected to the receptacle 150.

[0093] As shown in FIG. 3C, when the first plug 120 is not received in or connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is an initial capacitance (referred to as C_0 hereinafter) at the first receptacle terminal 154 such that the capacitance sensor 152a does not detect the first plug

capacitor 122a comprised in the at least one detection element 122 and therefore the sensor 152 does not detect the at least one detection element 122.

[0094] As shown in FIG. 3D, when the first plug 120 is received in and connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is a capacitance (referred to as C_{01} hereinafter, where $C_{01}=C_0+C_1$, C_0 is the initial capacitance at the first receptacle terminal 154, C_1 is the capacitance of the first plug capacitor 122a), such that the capacitance sensor 152a detects the first plug capacitor 122a comprised in the at least one detection element 122 and therefore the sensor 152 detects the at least one detection element 122. In some embodiments, the sensor 152 can detect the at least one detection element 122 when the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is greater than the initial capacitance C_0 . In some embodiments, C_0 can be 0 Farad (F). In some embodiments, C_0 can be negligible compared to C_1 . In some embodiments, the sensor 152 can detect the at least one detection element 122 when the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a increases. In some embodiments, the detected first capacitance at the first receptacle terminal 154 can be equal to or greater than 2 times of the initial capacitance C_0 at the first receptacle terminal 154.

[0095] According to some non-limiting embodiments, FIG. 4A shows a top view of an example of the first plug 120 comprised in the connector 110 in accordance with some embodiments of the present disclosure. The first plug 120 can comprise a first plug terminal 124 and a first plug ground terminal 126. The at least one detection element 122 of the first plug 120 can comprise a first plug capacitor 122a connected to the first plug terminal 124 at one end, and connected to the first plug ground terminal 126 at the other end.

[0096] FIG. 4B shows a top view of an example of the receptacle 150 in accordance with some embodiments of the present disclosure. The receptacle 150 may comprise a first receptacle terminal 154 configured to contact with the first plug terminal 124 when the first plug 120 is received in the receptacle 150. The receptacle 150 may comprise a first receptacle ground terminal 156 and a first receptacle capacitor 170. The first receptacle capacitor 170 may be connected to the first receptacle terminal 154 at one end, and connected to the first receptacle ground terminal 156 at the other end. The sensor 152 of the receptacle 150 may comprise a capacitance sensor 152a coupled to the first receptacle terminal 154. The capacitance sensor 152a can be configured to detect a first capacitance at the first receptacle terminal 154 so as to detect the first plug capacitor 122a comprised in the at least one detection element 122 of the first plug 120 when the first plug 120 is received in the receptacle 150.

[0097] FIG. 4C shows partial terminals of the first plug 120 in FIG. 4A and partial terminals of the receptacle 150 in FIG. 4B, wherein the first plug 120 is not received in or connected to the receptacle 150. FIG. 4D shows partial terminals of the first plug 120 in FIG. 4A and partial terminals of the receptacle 150 in FIG. 4B, wherein the first plug 120 is received in and connected to the receptacle 150.

[0098] As shown in FIG. 4C, when the first plug 120 is not received in or connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is a capacitance (referred to as $C02$ hereinafter, where $C02=C0+C2$, $C0$ is the initial capacitance at the first receptacle terminal 154, $C2$ is the capacitance of the first receptacle capacitor 170), such that the capacitance sensor 152a does not detect the first plug capacitor 122a comprised in the at least one detection element 122 and therefore the sensor 152 does not detect the at least one detection element 122.

[0099] As shown in FIG. 4D, when the first plug 120 is received in and connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is a capacitance (referred to as $C012$ hereinafter, where $C012=C0+C1+C2$, $C0$ is the initial capacitance at the first receptacle terminal 154, $C1$ is the capacitance of the first plug capacitor 122a, and $C2$ is the capacitance of the first receptacle capacitor 170), such that the capacitance sensor 152a detects the first plug capacitor 122a comprised in the at least one detection element 122 and therefore the sensor 152 detects the at least one detection element 122. In some embodiments, the sensor 152 can detect the at least one detection element 122 when the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is greater than $C02$. In some embodiments, the sensor 152 can detect the at least one detection element 122 when the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a increases. In some embodiments, $C0$ can be 0 Farad (F). In some embodiments, $C0$ can be negligible compared to $C1$ or $C2$. In some embodiments, the detected first capacitance at the first receptacle terminal 154 can be equal to or greater than 2 times of the capacitance $C2$ of the first receptacle capacitor 170.

[00100] According to some non-limiting embodiments, FIG. 5A shows a top view of an example of the first plug 120 comprised in the connector 110 in accordance with some embodiments of the present disclosure. The first plug 120 can comprise a first plug terminal 124 and a first plug ground terminal 126. The at least one detection element 122 of the first plug 120 can comprise a first plug capacitor 122a connected to the first plug terminal 124 at one end, and connected to the first plug ground terminal 126 at the other end. The first plug

120 may further comprise a second plug terminal 128 and a second plug ground terminal 127. The at least one detection element 122 may comprise a second plug capacitor 122b connected to the second plug terminal 128 at one end, and connected to the second plug ground terminal 127 at the other end. The second plug terminal 128 as shown in FIG. 5A is a plug RX1+ pin 128a, but it should be appreciated that the second plug terminal 128 is not limited to the plug RX1+ pin 128a and can include any suitable pin such as a plug RX2+ pin 128b. The second plug ground terminal 127 may be the first plug ground terminal 126. The second plug terminal 128 may be designated as a non-signal pin.

[00101] FIG. 5B shows a top view of an example of the receptacle 150 in accordance with some embodiments of the present disclosure. The receptacle 150 may comprise a first receptacle terminal 154 configured to contact with the first plug terminal 124 when the first plug 120 is received in the receptacle 150. The receptacle 150 may comprise a second receptacle terminal 158 configured to contact with the second plug terminal 128 when the first plug 120 is received in the receptacle 150. The sensor 152 of the receptacle 150 may comprise a capacitance sensor 152a coupled to the first receptacle terminal 154 and the second receptacle terminal 158. The capacitance sensor 152a can be configured to detect a first capacitance at the first receptacle terminal 154 so as to detect the first plug capacitor 122a comprised in the at least one detection element 122 of the first plug 120 when the first plug 120 is received in the receptacle 150. The capacitance sensor 152a may be configured to detect a second capacitance at the second receptacle terminal 158 so as to detect the second plug capacitor 122b comprised in the at least one detection element 122 of the first plug 120 when the first plug 120 is received in the receptacle 150. The second receptacle terminal 158 as shown in FIG. 5B is a receptacle RX1+ pin 158a, but it should be appreciated that the second receptacle terminal 158 is not limited to the receptacle RX1+ pin 158a and can include any suitable pin such as a receptacle RX2+ pin 158b. The first receptacle terminal 158 may be designated as a non-signal pin.

[00102] FIG. 5C shows partial terminals of the first plug 120 in FIG. 5A and partial terminals of the receptacle 150 in FIG. 5B, wherein the first plug 120 is not received in or connected to the receptacle 150. FIG. 5D shows partial terminals of the first plug 120 in FIG. 5A and partial terminals of the receptacle 150 in FIG. 5B, wherein the first plug 120 is received in and connected to the receptacle 150.

[00103] As shown in FIG. 5C, when the first plug 120 is not received in or connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is an initial capacitance (referred to as C0 hereinafter) at the first receptacle terminal 154 such that the capacitance sensor 152a does not detect the first plug

capacitor 122a comprised in the at least one detection element 122. In addition, when the first plug 120 is not received in or connected to the receptacle 150, the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is an initial capacitance (referred to as C_0' hereinafter) at the second receptacle terminal 158 such that the capacitance sensor 152a does not detect the second plug capacitor 122b comprised in the at least one detection element 122. When the capacitance sensor 152a does not detect the first plug capacitor 122a comprised in the at least one detection element 122 or the second plug capacitor 122b comprised in the at least one detection element 122, the sensor 152 does not detect the at least one detection element 122.

[00104] As shown in FIG. 5D, when the first plug 120 is received in and connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is a capacitance (referred to as C_{01} hereinafter, where $C_{01}=C_0+C_1$, C_0 is the initial capacitance at the first receptacle terminal 154, C_1 is the capacitance of the first plug capacitor 122a), such that the capacitance sensor 152a detects the first plug capacitor 122a comprised in the at least one detection element 122. In addition, when the first plug 120 is received in and connected to the receptacle 150, the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is a capacitance (referred to as $C_{0'3}$ hereinafter, where $C_{0'3}=C_0'+C_3$, C_0' is an initial capacitance at the second receptacle terminal 158, C_3 is the capacitance of the second plug capacitor 122b), such that the capacitance sensor 152a detects the second plug capacitor 122b comprised in the at least one detection element 122. When the capacitance sensor 152a detects one or both the first plug capacitor 122a comprised in the at least one detection element 122 and the second plug capacitor 122b comprised in the at least one detection element 122, the sensor 152 detects the at least one detection element 122. That may mean that the sensor 152 detects the at least one detection element 122, when the capacitance sensor 152a detects the first plug capacitor 122a comprised in the at least one detection element 122 and simultaneously detects the second plug capacitor 122b comprised in the at least one detection element 122. In some embodiments, the sensor 152 can detect the at least one detection element 122 when the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is greater than C_0 , and the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is greater than C_0' . In some embodiments, C_0 can be 0 Farad (F). In some embodiments, C_0 can be negligible compared to C_1 . In some embodiments, C_0' can be 0 Farad (F). In some embodiments, C_0' can be negligible compared to C_3 . In some embodiments, the sensor 152 can detect the at least one detection element 122 when both the first capacitance at the first

receptacle terminal 154 detected by the capacitance sensor 152a and the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a increase. In some embodiments, the detected first capacitance at the first receptacle terminal 154 can be equal to or greater than 2 times of the initial capacitance C_0 at the first receptacle terminal 154. In some embodiments, the detected second capacitance at the second receptacle terminal 158 can be equal to or greater than 2 times of the initial capacitance C_0' at the second receptacle terminal 158.

[00105] According to some non-limiting embodiments, FIG. 6A shows a top view of an example of the first plug 120 comprised in the connector 110 in accordance with some embodiments of the present disclosure. The first plug 120 can comprise a first plug terminal 124 and a first plug ground terminal 126. The at least one detection element 122 of the first plug 120 can comprise a first plug capacitor 122a connected to the first plug terminal 124 at one end, and connected to the first plug ground terminal 126 at the other end. The first plug 120 may comprise a second plug terminal 128 and a second plug ground terminal 127. The at least one detection element 122 may comprise a second plug capacitor 122b connected to the second plug terminal 128 at one end, and connected to the second plug ground terminal 127 at the other end.

[00106] FIG. 6B shows a top view of an example of the receptacle 150 in accordance with some embodiments of the present disclosure. The receptacle 150 may comprise a first receptacle terminal 154 configured to contact with the first plug terminal 124 when the first plug 120 is received in the receptacle 150. The receptacle 150 may comprise a second receptacle terminal 158 configured to contact with the second plug terminal 128 when the first plug 120 is received in the receptacle 150. The sensor 152 of the receptacle 150 may comprise a capacitance sensor 152a coupled to the first receptacle terminal 154 and the second receptacle terminal 158. The capacitance sensor 152a can be configured to detect a first capacitance at the first receptacle terminal 154 so as to detect the first plug capacitor 122a comprised in the at least one detection element 122 of the first plug 120 when the first plug 120 is received in the receptacle 150. The capacitance sensor 152a may be configured to detect a second capacitance at the second receptacle terminal 158 so as to detect the second plug capacitor 122b comprised in the at least one detection element 122 of the first plug 120 when the first plug 120 is received in the receptacle 150. The receptacle 150 may comprise a first receptacle ground terminal 156 and a first receptacle capacitor 170. The first receptacle capacitor 170 may be connected to the first receptacle terminal 154 at one end, and connected to the first receptacle ground terminal 156 at the other end.

[00107] FIG. 6C shows partial terminals of the first plug 120 in FIG. 6A and partial terminals of the receptacle 150 in FIG. 6B, wherein the first plug 120 is not received in or connected to the receptacle 150. FIG. 6D shows partial terminals of the first plug 120 in FIG. 6A and partial terminals of the receptacle 150 in FIG. 6B, wherein the first plug 120 is received in and connected to the receptacle 150.

[00108] As shown in FIG. 6C, when the first plug 120 is not received in or connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is a capacitance (referred to as C_{02} hereinafter, where $C_{02}=C_0+C_2$, C_0 is the initial capacitance at the first receptacle terminal 154, C_2 is the capacitance of the first receptacle capacitor 170), such that the capacitance sensor 152a does not detect the first plug capacitor 122a comprised in the at least one detection element 122. In addition, when the first plug 120 is not received in or connected to the receptacle 150, the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is an initial capacitance (referred to as C_0' hereinafter) at the second receptacle terminal 158, such that the capacitance sensor 152a does not detect the second plug capacitor 122b comprised in the at least one detection element 122. When the capacitance sensor 152a does not detect the first plug capacitor 122a comprised in the at least one detection element 122 or the second plug capacitor 122b comprised in the at least one detection element 122, the sensor 152 does not detect the at least one detection element 122.

[00109] As shown FIG. 6D, when the first plug 120 is received in and connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is a capacitance (referred to as C_{012} hereinafter, where $C_{012}=C_0+C_1+C_2$, C_0 is the initial capacitance at the first receptacle terminal 154, C_1 is the capacitance of the first plug capacitor 122a, and C_2 is the capacitance of the first receptacle capacitor 170), such that the capacitance sensor 152a detects the first plug capacitor 122a comprised in the at least one detection element 122. In addition, when the first plug 120 is received in and connected to the receptacle 150, the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is a capacitance (referred to as $C_{0'3}$ hereinafter, where $C_{0'3}=C_0'+C_3$, C_0' is the initial capacitance at the second receptacle terminal 158, and C_3 is the capacitance of the second plug capacitor 122b), such that the capacitance sensor 152a detects the second plug capacitor 122b comprised in the at least one detection element 122. When the capacitance sensor 152a detects the first plug capacitor 122a comprised in the at least one detection element 122 and detects the second plug capacitor 122b comprised in the at least one detection element 122, the sensor 152 detects the at least one

detection element 122. In some embodiments, the sensor 152 can detect the at least one detection element 122 when the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is greater than $C02$ and/or the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is greater than $C0'$. In some embodiments, the sensor 152 can detect the at least one detection element 122 when both the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a and the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a increase. In some embodiments, $C0$ can be 0 Farad (F). In some embodiments, $C0$ can be negligible compared to $C1$ or $C2$. In some embodiments, $C0'$ can be 0 Farad (F). In some embodiments, $C0'$ can be negligible compared to $C3$. In some embodiments, the detected first capacitance at the first receptacle terminal 154 can be equal to or greater than 2 times of the capacitance $C2$ of the first receptacle capacitor 170. In some embodiments, the detected second capacitance at the second receptacle terminal 158 can be equal to or greater than 2 times of the initial capacitance $C0'$ at the second receptacle terminal 158.

[00110] According to some non-limiting embodiments, FIG. 7A shows a top view of an example of the first plug 120 comprised in the connector 110 in accordance with some embodiments of the present disclosure. The first plug 120 can comprise a first plug terminal 124 and a first plug ground terminal 126. The at least one detection element 122 of the first plug 120 can comprise a first plug capacitor 122a connected to the first plug terminal 124 at one end, and connected to the first plug ground terminal 126 at the other end. The first plug 120 may comprise a second plug terminal 128 and a second plug ground terminal 127. The at least one detection element 122 may comprise a second plug capacitor 122b connected to the second plug terminal 128 at one end, and connected to the second plug ground terminal 127 at the other end.

[00111] FIG. 7B shows a top view of an example of the receptacle 150 in accordance with some embodiments of the present disclosure. The receptacle 150 may comprise a first receptacle terminal 154 configured to contact with the first plug terminal 124 when the first plug 120 is received in the receptacle 150. The receptacle 150 may comprise a second receptacle terminal 158 configured to contact with the second plug terminal 128 when the first plug 120 is received in the receptacle 150. The sensor 152 of the receptacle 150 may comprise a capacitance sensor 152a coupled to the first receptacle terminal 154 and the second receptacle terminal 158. The capacitance sensor 152a can be configured to detect a first capacitance at the first receptacle terminal 154 so as to detect the first plug capacitor 122a comprised in the at least one detection element 122 of the first plug 120 when the first plug 120 is received in the

receptacle 150. The capacitance sensor 152a may be configured to detect a second capacitance at the second receptacle terminal 158 so as to detect the second plug capacitor 122b comprised in the at least one detection element 122 of the first plug 120 when the first plug 120 is received in the receptacle 150. The receptacle 150 may comprise a first receptacle ground terminal 156 and a first receptacle capacitor 170. The first receptacle capacitor 170 may be connected to the first receptacle terminal 154 at one end, and connected to the first receptacle ground terminal 156 at the other end. The receptacle 150 may comprise a second receptacle ground terminal 157 and a second receptacle capacitor 172. The second receptacle capacitor 172 may be connected to the second receptacle terminal 158 at one end, and connected to the second receptacle ground terminal 157 at the other end. The second receptacle ground terminal 157 may be the first receptacle ground terminal 156.

[00112] FIG. 7C shows partial terminals of the first plug 120 in FIG. 7A and partial terminals of the receptacle 150 in FIG. 7B, wherein the first plug 120 is not received in or connected to the receptacle 150. FIG. 7D shows partial terminals of the first plug 120 in FIG. 7A and partial terminals of the receptacle 150 in FIG. 7B, wherein the first plug 120 is received in and connected to the receptacle 150.

[00113] As shown in FIG. 7C, when the first plug 120 is not received in or connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is a capacitance (referred to as C_{02} hereinafter, where $C_{02}=C_0+C_2$, C_0 is the initial capacitance at the first receptacle terminal 154, C_2 is the capacitance of the first receptacle capacitor 170), such that the capacitance sensor 152a does not detect the first plug capacitor 122a comprised in the at least one detection element 122. In addition, when the first plug 120 is not received in or connected to the receptacle 150, the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is a capacitance (referred to as $C_{0'4}$ hereinafter, wherein $C_{0'4}=C_{0'}+C_4$, $C_{0'}$ is the initial capacitance at the second receptacle terminal 158, C_4 is the capacitance of the second receptacle capacitor 172), such that the capacitance sensor 152a does not detect the second plug capacitor 122b comprised in the at least one detection element 122. When the capacitance sensor 152a does not detect the first plug capacitor 122a comprised in the at least one detection element 122 or the second plug capacitor 122b comprised in the at least one detection element 122, the sensor 152 does not detect the at least one detection element 122.

[00114] As shown FIG. 7D, when the first plug 120 is received in and connected to the receptacle 150, the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is a capacitance (referred to as C_{012} hereinafter, where

$C_{012}=C_0+C_1+C_2$, C_0 is the initial capacitance at the first receptacle terminal 154, C_1 is the capacitance of the first plug capacitor 122a, and C_2 is the capacitance of the first receptacle capacitor 170), such that the capacitance sensor 152a detects the first plug capacitor 122a comprised in the at least one detection element 122. In addition, when the first plug 120 is received in and connected to the receptacle 150, the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is a capacitance (referred to as $C_{0'34}$ hereinafter, where $C_{0'34}=C_0'+C_3+C_4$, C_0' is the initial capacitance at the second receptacle terminal 158, C_3 is the capacitance of the second plug capacitor 122b, and C_4 is the capacitance of the second receptacle capacitor 172), such that the capacitance sensor 152a detects the second plug capacitor 122b comprised in the at least one detection element 122. When the capacitance sensor 152a detects the first plug capacitor 122a comprised in the at least one detection element 122 and detects the second plug capacitor 122b comprised in the at least one detection element 122, the sensor 152 detects the at least one detection element 122. In some embodiments, the sensor 152 can detect the at least one detection element 122 when the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a is greater than C_{02} and/or the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a is greater than $C_{0'4}$. In some embodiments, the sensor 152 can detect the at least one detection element 122 when both the first capacitance at the first receptacle terminal 154 detected by the capacitance sensor 152a and the second capacitance at the second receptacle terminal 158 detected by the capacitance sensor 152a increase. In some embodiments, C_0 can be 0 Farad (F). In some embodiments, C_0 can be negligible compared to C_1 or C_2 . In some embodiments, C_0' can be 0 Farad (F). In some embodiments, C_0' can be negligible compared to C_3 or C_4 . In some embodiments, the detected first capacitance at the first receptacle terminal 154 can be equal to or greater than 2 times of a capacitance C_2 of the first receptacle capacitor 170. In some embodiments, the detected second capacitance at the second receptacle terminal 158 can be equal to or greater than 2 times of a capacitance C_4 of the second receptacle capacitor 172.

[00115] FIG. 8A shows a top view of an example of the receptacle 150 in accordance with some embodiments of the present disclosure. The receptacle 150 may comprise a receptacle data minus (D-) terminal 160 configured for transmitting left channel audio signals. The receptacle 150 may comprise a receptacle data plus (D+) terminal 162 configured for transmitting right channel audio signals. The receptacle 150 may comprise a receptacle sideband use (SBU) terminal 164 configured for transmitting mic channel audio signals. The

receptacle sideband use (SBU) terminal 164 may be connected to a mic channel 194 for transmitting mic channel audio signals.

[00116] FIG. 8B shows a top view of an example of the first plug 120 in accordance with some embodiments of the present disclosure. The first plug 120 can comprise a plug data minus (D-) terminal 130 configured to contact with the receptacle data minus (D-) terminal 160 for transmitting left channel audio signals when the first plug 120 is received in the receptacle 150. The first plug 120 can comprise a plug data plus (D+) terminal 132 configured to contact with the receptacle data plus (D+) terminal 162 for transmitting right channel audio signals when the first plug 120 is received in the receptacle 150. The first plug 120 can comprise a plug sideband use (SBU) terminal 134 configured to contact with the receptacle sideband use (SBU) terminal 164 for transmitting mic channel audio signals when the first plug 120 is received in the receptacle 150.

[00117] FIG. 8C shows a side view of an example of the second plug 140 in accordance with some embodiments of the present disclosure. The second plug 140 can comprise a tip connector 142 connected to the plug data minus (D-) terminal 130 of the first plug 120 and configured for transmitting left channel audio signals. The second plug 140 can comprise a first ring connector 144 connected to the plug data plus (D+) terminal 132 of the first plug 120 and configured for transmitting right channel audio signals. The second plug 140 can comprise a second ring connector 146 connected to the plug sideband use (SBU) terminal 134 and configured for transmitting mic channel audio signals. The second plug 140 can comprise a sleeve connector 148 connected to the first plug ground terminal 126.

[00118] According to some non-limiting embodiments, FIG. 9A shows partial terminals of an example of the first plug 120 and partial terminals of an example of the receptacle 150, wherein the first plug 120 is not received in or connected with the receptacle 150. FIG. 8B shows the partial terminals of the first plug 120 and the partial terminals of the receptacle 150 in FIG. 9A, wherein the first plug 120 is received in and connected with the receptacle 150.

[00119] In the example of FIG. 9A and FIG. 9B, the first plug 120 comprises a first plug terminal 124, a second plug terminal 128 and a first plug ground terminal 126. The at least one detection element 122 of the first plug 120 comprises a first plug capacitor 122a connected to the first plug terminal 124 at one end, and connected to the first plug ground terminal 126 at the other end, and a second plug capacitor 122b connected to the second plug terminal 128 at one end, and connected to the second plug ground terminal 127 at the other end. The first plug 120 comprises a plug sideband use (SBU) terminal 134 connected to the first plug terminal 124. The plug sideband use (SBU) terminal 134 is configured to contact with a receptacle sideband

use (SBU) terminal 164 comprised in the receptacle 150 for transmitting mic channel audio signals when the first plug 120 is received in the receptacle 150.

[00120] The receptacle 150 comprises a first receptacle terminal 154, a first receptacle ground terminal 156 and a first receptacle capacitor 170. The first receptacle capacitor 170 is connected to the first receptacle terminal 154 at one end, and connected to the first receptacle ground terminal 156 at the other end. The receptacle 150 comprises a second receptacle terminal 158, a second receptacle ground terminal 157 and a second receptacle capacitor 172. The second receptacle capacitor 172 is connected to the second receptacle terminal 158 at one end, and connected to the second receptacle ground terminal 157 at the other end.

[00121] The first receptacle terminal 154 is configured to contact with the first plug terminal 124 when the first plug 120 is received in the receptacle 150. The second receptacle terminal 158 is configured to contact with the second plug terminal 128 when the first plug 120 is received in the receptacle 150. The sensor 152 of the receptacle 150 comprises a capacitance sensor 152a. The capacitance sensor 152a is coupled to the first receptacle terminal 154 and coupled to the second receptacle terminal 158. The capacitance sensor 152a is configured to detect a first capacitance at the first receptacle terminal 154 so as to detect the first plug capacitor 122a comprised in the at least one detection element 122 of the first plug 120. The capacitance sensor 152a is configured to detect a second capacitance at the second receptacle terminal 158 so as to detect the second plug capacitor 122b comprised in the at least one detection element 122.

[00122] The receptacle comprises a receptacle sideband use (SBU) terminal 164 configured to contact with the plug sideband use (SBU) terminal 134 comprised in the first plug 120. The receptacle sideband use (SBU) terminal 164 is connected to the mic channel 194 and configured for transmitting mic channel audio signals.

[00123] FIG. 10 shows an example of the capacitance sensor 152a coupled with a first receptacle terminal 154 and a second receptacle terminal 158 in accordance with some embodiments of the present disclosure. The first receptacle terminal 154 can comprise a first terminal pad 155. The second receptacle terminal 158 can comprise a second terminal pad 159. The capacitance sensor 152a can comprise a first sensor pad 1531 configured for coupling with the first terminal pad 155 so as to couple the capacitance sensor 152a with the first receptacle terminal 154. The capacitance sensor 152a can comprise a second sensor pad 1532 configured for coupling with the second terminal pad 159 so as to couple the capacitance sensor 152a with the second receptacle terminal 158.

[00124] In accordance with some embodiments of the present disclosure, the sensor 152 of the first receptacle 150 may comprise a Hall sensor, and the at least one detection element 122 of the first plug 120 can comprise a magnet. When the first plug 120 is not received in or connected to the receptacle 150, the Hall sensor does not detect the magnet 122c (e.g., in close proximity or in a detection range) and therefore the sensor 152 does not detect the at least one detection element 122. When the first plug 120 is received in and connected to the receptacle 150, the Hall sensor detects the magnet (e.g., in close proximity or in a detection range) and therefore the sensor 152 detects the at least one detection element 122.

[00125] FIG. 11A shows a peripheral electronic assembly 200 and a first connector 110 in accordance with some embodiments of the present disclosure. The peripheral electronic assembly 200 may comprise a peripheral electronic device such as a headset, a headphone, a speaker, a microphone, etc. The peripheral electronic assembly 200 may comprise a receptacle 150 and a controller 180.

[00126] The receptacle 150 of FIG. 11A includes all the features of the receptacle 150 as described above. The controller 180 of FIG. 11A includes all the features of the controller 180 as described above. The first connector 110 of FIG. 11A includes all the features of the first connector 110 as described above. Accordingly, all features, changes, modifications, and variations that are applicable to the receptacle 150 as described above are also applicable to the receptacle 150 of FIG. 11A. All features, changes, modifications, and variations that are applicable to the controller 180 as described above are also applicable to the controller 180 of FIG. 11A. All features, changes, modifications, and variations that are applicable to the first connector 110 as described above are also applicable to the first connector 110 of FIG. 11A. Therefore, elements which are the same as those described earlier are assigned the same reference numerals, and repetition of their explanations is omitted for brevity.

[00127] In FIG. 11A, a first plug 120 in the first connector 110 is not received in the receptacle 150 of the peripheral electronic assembly 200.

[00128] FIG. 11B shows the peripheral electronic assembly 200 and the first connector 110 in FIG. 11A, where the plug 120 in the first connector 110 is received in the receptacle 150 of the peripheral electronic assembly 200.

[00129] In accordance with some embodiments of the present disclosure, the sensor 152 of the first receptacle 150 can comprise an NFC chip and the at least one detection element 122 can comprise a second NFC chip. When the first plug 120 is not received in or connected to the receptacle 150, the NFC chip does not detect the second NFC chip and therefore the sensor 152 does not detect the at least one detection element 122. When the first plug 120 is received

in and connected to the receptacle 150, the NFC chip detects the second NFC chip and therefore the sensor 152 detects the at least one detection element 122.

[00130] When a conventional USB type C to 3.5mm connector is connected to a USB type-C interface of a powered-on conventional peripheral electronic device, the conventional peripheral electronic device is not able to detect the type C to 3.5mm connector to operate in an analog-audio-signal mode unless a voltage is applied on the terminals of the type C interface of the conventional peripheral electronic device. However, when a voltage is applied on the terminals of the type C interface of the conventional peripheral electronic device, corrosion of the charged CC pin of the type C interface is accelerated. For example, when a voltage is applied on the terminals of the type C interface of the conventional peripheral electronic device, fibers on clothes, dust and other impurities in the environment, sweat, water vapor, etc. could enter the type-C interface faster and easier, which would accelerate the corrosion of the charged CC pin. A low-impedance path would be formed between the CC pin and ground, which may affect the detection of the inserted type C to 3.5mm connector by the CC pin and may lead to misjudgment.

[00131] The peripheral electronic assembly of the present disclosure does not require application of a voltage on the terminals of the receptacle to detect a USB type C to 3.5mm connector to operate in an analog-audio-signal mode. For example, when the first connector is received in and connected to the receptacle, the sensor of the receptacle detects the at least one detection element in the first plug of the first connector, such that the controller controls the peripheral electronic assembly to operate in an analog-audio-signal mode.

[00132] In addition, a conventional peripheral electronic device, such as a headset or a headphone, etc, typically has a type-C interface for connecting with a host electronic device for charging the peripheral electronic device and/or for transmitting digital audio signals between the peripheral electronic device and the host electronic device, and a 3.5mm interface for connecting with a host electronic device for transmitting analog audio signals between the peripheral electronic device and the host electronic device. The peripheral electronic assembly of the present disclosure provide a solution which uses a single interface (i.e., a receptacle) of a peripheral electronic assembly for connecting with a type-C interface or a 3.5mm jack connector of a host electronic device. The peripheral electronic assembly of the present disclosure can use its single interface to connect with the type-C interface of the host electronic device via a connector for charging the peripheral electronic assembly, and for transmitting digital audio signals between the peripheral electronic assembly and the host electronic device. The peripheral electronic assembly of the present disclosure can use its single interface to

connect with a 3.5mm jack connector of the host electronic device via a first connector of the present disclosure for transmitting analog audio signals between the peripheral electronic assembly and the host electronic device.

[00133] While the disclosure has been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the disclosure as defined by the appended claims. The scope of the disclosure is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

CLAIMS

1. A peripheral electronic assembly comprising:
 - a connector comprising:
 - a first plug, wherein the first plug comprises at least one detection element;
 - and
 - a second plug connected to the first plug;
 - a receptacle configured to receive the first plug, the receptacle comprising a sensor configured to detect the at least one detection element; and
 - a controller coupled with the sensor, wherein the controller is configured to control the peripheral electronic assembly to operate in an analog-audio-signal mode when the sensor detects the at least one detection element.
2. The peripheral electronic assembly of claim 1,
 - wherein the first plug further comprises:
 - a first plug terminal; and
 - a first plug ground terminal,
 - wherein the at least one detection element comprises a first plug capacitor connected to the first plug terminal at one end, and connected to the first plug ground terminal at the other end,
 - wherein the receptacle further comprises:
 - a first receptacle terminal configured to contact with the first plug terminal when the first plug is received in the receptacle,
 - wherein the sensor comprises a capacitance sensor coupled to the first receptacle terminal, wherein the capacitance sensor is configured to detect a first capacitance at the first receptacle terminal so as to detect the first plug capacitor comprised in the at least one detection element.
3. The peripheral electronic assembly of claim 2, wherein the receptacle further comprises:
 - a first receptacle ground terminal; and
 - a first receptacle capacitor connected to the first receptacle terminal at one end, and connected to the first receptacle ground terminal at the other end.

4. The peripheral electronic assembly of claim 3, wherein the detected first capacitance is equal to or greater than 2 times of a capacitance of the first receptacle capacitor.
5. The peripheral electronic assembly of any of claims 2 to 4,
wherein the first plug further comprises:
 a second plug terminal,
 wherein the at least one detection element further comprises a second plug capacitor connected to the second plug terminal at one end, and connected to a second plug ground terminal at the other end,
 wherein the receptacle further comprises:
 a second receptacle terminal configured to contact with the second plug terminal when the first plug is received in the receptacle, and
 wherein the capacitance sensor is coupled to the second receptacle terminal,
 wherein the capacitance sensor is configured to detect a second capacitance at the second receptacle terminal so as to detect the second plug capacitor comprised in the at least one detection element.
6. The peripheral electronic assembly of claim 5, wherein the receptacle further comprises a second receptacle capacitor connected to the second receptacle terminal at one end, and connected to the first receptacle ground terminal at the other end.
7. The peripheral electronic assembly of any of claims 2 to 4, wherein the receptacle comprises:
 a receptacle data minus (D-) terminal configured for transmitting left channel audio signals;
 a receptacle data plus (D+) terminal configured for transmitting right channel audio signals; and
 a receptacle sideband use (SBU) terminal configured for transmitting mic channel audio signals.
8. The peripheral electronic assembly of claim 7, wherein the first plug comprises:

a plug data minus (D-) terminal configured to contact with the receptacle data minus (D-) terminal for transmitting left channel audio signals when the first plug is received in the receptacle;

a plug data plus (D+) terminal configured to contact with the receptacle data plus (D+) terminal for transmitting right channel audio signals when the first plug is received in the receptacle; and

a plug sideband use (SBU) terminal configured to contact with the receptacle sideband use (SBU) terminal for transmitting mic channel audio signals when the first plug is received in the receptacle.

9. The peripheral electronic assembly of claim 8, wherein the second plug comprises:
 - a tip connector connected to the plug data minus (D-) terminal of the first plug and configured for transmitting left channel audio signals;
 - a first ring connector connected to the plug data plus (D+) terminal of the first plug and configured for transmitting right channel audio signals;
 - a second ring connector connected to the plug sideband use (SBU) terminal and configured for transmitting mic channel audio signals; and
 - a sleeve connector connected to the first plug ground terminal.
10. The peripheral electronic assembly of claim 1, wherein the sensor comprises a Hall sensor, and the at least one detection element comprises a magnet.
11. The peripheral electronic assembly of claim 1, wherein the sensor comprises an NFC chip and the at least one detection element comprises a second NFC chip.
12. The peripheral electronic assembly of any of claims 1 to 4, wherein the second plug is configured to be received in and connect to a jack connector in a host electronic device for transmitting analog audio signals between the host electronic device and the peripheral electronic assembly.
13. A peripheral electronic assembly comprising:

a receptacle configured to receive a first plug, the first plug comprising at least one detection element, the receptacle comprising a sensor configured to detect the at least one detection element; and

a controller coupled with the sensor, wherein the controller is configured to control the peripheral electronic assembly to operate in an analog-audio-signal mode when the sensor detects the at least one detection element.

14. The peripheral electronic assembly of claim 13,

wherein the receptacle further comprises:

a first receptacle terminal, wherein the first receptacle terminal is configured to contact with a first plug terminal comprised in the first plug when the first plug is received in the receptacle,

wherein the sensor comprises a capacitance sensor coupled to the first receptacle terminal, wherein the capacitance sensor is configured to detect a first capacitance at the first receptacle terminal to detect a first plug capacitor comprised in the at least one detection element, wherein the first plug capacitor is connected to the first plug terminal at one end, and connected to a first plug ground terminal comprised in the first plug at the other end.

15. The peripheral electronic assembly of claim 14, wherein the receptacle further comprises:

a first receptacle ground terminal; and

a first receptacle capacitor connected to the first receptacle terminal at one end, and connected to the first receptacle ground terminal at the other end.

16. The peripheral electronic assembly of claim 15, wherein the detected first capacitance is equal to or greater than 2 times of the capacitance of the first receptacle capacitor.

17. The peripheral electronic assembly of any of claims 14 to 16,

wherein the receptacle further comprises:

a second receptacle terminal, wherein the second receptacle terminal is configured to contact with a second plug terminal comprised in the first plug when the first plug is received in the receptacle,

wherein the capacitance sensor is coupled to the second receptacle terminal, wherein the capacitance sensor is configured to detect a second capacitance at the second receptacle terminal to detect a second plug capacitor comprised in the at least one detection element, wherein the second plug capacitor is connected to the second plug terminal at one end, and connected to a second plug ground terminal at the other end.

18. The peripheral electronic assembly of claim 17, wherein the receptacle further comprises a second receptacle capacitor connected to the second receptacle terminal at one end, and connected to the first receptacle ground terminal at the other end.
19. The peripheral electronic assembly of any of claims 14 to 16, wherein the receptacle comprises:
 - a receptacle data minus (D-) terminal configured for transmitting left channel audio signals;
 - a receptacle data plus (D+) terminal configured for transmitting right channel audio signals; and
 - a receptacle sideband use (SBU) terminal configured for transmitting mic channel audio signals.
20. The peripheral electronic assembly of claim 13, wherein the sensor comprises a Hall sensor, and the at least one detection element comprises a magnet.
21. The peripheral electronic assembly of claim 13, wherein each of the sensor and the at least one detection element comprises a respective NFC chip.
22. A connector comprising:
 - a first plug comprising at least one detection element; and
 - a second plug connected to the first plug,wherein the first plug is receivable in a receptacle comprised in a peripheral electronic assembly,
 - wherein the at least one detection element is detectable by a sensor comprised in the receptacle of the peripheral electronic assembly, and

wherein if the at least one detection element is detected by the sensor, the peripheral electronic assembly operates in an analog-audio-signal mode.

23. The connector of claim 22, wherein the first plug further comprises:

a first plug terminal configured to contact with a first receptacle terminal comprised in the receptacle when the first plug is received in the receptacle; and

a first plug ground terminal,

wherein the at least one detection element comprises a first plug capacitor connected to the first plug terminal at one end, and connected to the first plug ground terminal at the other end, and

wherein the sensor comprises a capacitance sensor coupled to the first receptacle terminal, wherein the capacitance sensor is configured to detect a first capacitance at the first receptacle terminal so as to detect the first plug capacitor comprised in the at least one detection element.

24. The connector of claim 23, wherein the first plug further comprises:

a second plug terminal configured to contact with a second receptacle terminal comprised in the receptacle when the first plug is received in the receptacle,

wherein the at least one detection element further comprises a second plug capacitor connected to the second plug terminal at one end, and connected to a second plug ground terminal at the other end, and

wherein the capacitance sensor is coupled to the second receptacle terminal, wherein the capacitance sensor is configured to detect a second capacitance at the second receptacle terminal so as to detect the second plug capacitor comprised in the at least one detection element.

25. The connector of any of claims 22 to 24, wherein the first plug comprises:

a plug data minus (D-) terminal configured to contact with a receptacle data minus (D-) terminal comprised in the receptacle for transmitting left channel audio signals when the first plug is received in the receptacle;

a plug data plus (D+) terminal configured to contact with a receptacle data plus (D+) terminal comprised in the receptacle for transmitting right channel audio signals when the first plug is received in the receptacle; and

a plug sideband use (SBU) terminal configured to contact with a receptacle sideband use (SBU) terminal comprised in the receptacle for transmitting mic channel audio signals when the first plug is received in the receptacle.

26. The connector of claim 25, wherein the second plug comprises:

- a tip connector connected to the data minus (D-) terminal of the first plug and configured for transmitting left channel audio signals;
- a first ring connector connected to the data plus (D+) terminal of the first plug and configured for transmitting right channel audio signals;
- a second ring connector connected to the second sideband use (SBU2) terminal and configured for transmitting mic channel audio signals; and
- a sleeve connector connected to the first plug ground terminal.

27. The connector of any of claims 22 to 24, wherein the second plug is configured to be received in and connect to a jack connector in a host electronic device for transmitting analog audio signals between the host electronic device and the peripheral electronic assembly.