(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 046 183 A1

(12) EUROPEAN PATENT APPLICATION

published in accordance with Art. 153(4) EPC

(43) Date of publication:
20.07.2016 Bulletin 2016/29

(21) Application number: **14859020.1**

(22) Date of filing: **29.10.2014**

(51) Int Cl.:
H01Q 1/44 *(2006.01)*

(86) International application number:
PCT/CN2014/089796

(87) International publication number:
WO 2015/062508 (07.05.2015 Gazette 2015/18)

(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

(30) Priority: **30.10.2013 CN 201310529528**

(71) Applicant: **Huawei Device Co., Ltd.**
Shenzhen, Guangdong 518129 (CN)

(72) Inventors:
- **LAN, Yao**
  Shenzhen,
  Guangdong 518129 (CN)
- **TU, Dongxing**
  Shenzhen,
  Guangdong 518129 (CN)

(74) Representative: **Pfenning, Meinig & Partner mbB**
Patent- und Rechtsanwälte
Theresienhöhe 11a
80339 München (DE)

(54) USB COMMUNICATION TERMINAL

(57) The present invention relates to a USB communications terminal, and in particular, to a data card. The USB communications terminal includes a USB connector and a printed circuit board PCB, where the USB connector includes a metal housing, a radio-frequency signal feedpoint is disposed on the PCB, and the radio-frequency signal feedpoint is electrically coupled with the metal housing. According to the USB communications terminal in the present invention, a radio-frequency signal feedpoint is electrically coupled with a metal housing of a USB connector, so that the metal housing of the USB connector is used as an antenna or a part of an antenna of the USB communications. Therefore, no antenna needs to be additionally designed on the USB communications terminal, thereby saving space of the USB communications terminal and also reducing costs.

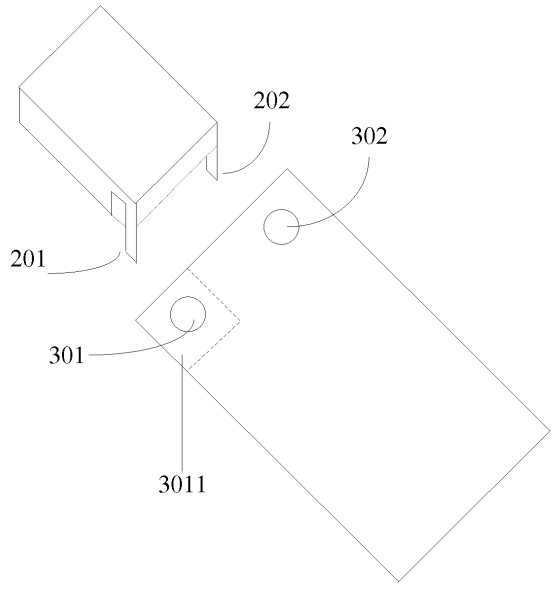

FIG. 2a

EP 3 046 183 A1

Description

[0001] This application claims priority to Chinese Patent Application No. 201310529528.3, filed with the Chinese Patent Office on October 30, 2013 and entitled "USB COMMUNICATIONS TERMINAL", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention belongs to the field of communications, and in particular, to a USB communications terminal.

BACKGROUND

[0003] Built-in antennas or external antennas in monopole, IFA (inverted F antenna), and PIFA (planar inverted-F antenna) forms are widely used in existing wireless communications devices. In the prior art, a housing, a USB connector, a PCB, and one or more other necessary parts are connected and combined together in a mechanical or soldering manner to form a complete USB wireless communications terminal. FIG. 1a shows a USB connector of a common USB communications terminal. A basic structure of the USB connector includes a metal housing, where four metal wires fixed to a plastic support are an anode and a cathode of power supply and an anode and a cathode of a USB signal cable, and the four metal wires and the housing are all insulated from one another. When used, the four wires are respectively connected to an anode and a cathode of power supply and an anode and a cathode of a USB signal cable that are on a PCB. Two grounding legs are disposed at one end of the metal housing, and when used, are soldered on a metal ground of the printed circuit board PCB to implement grounding and fastening functions, as shown in FIG. 1b. Built-in antennas or external antennas in monopole, IFA, and PIFA forms are widely used in existing wireless communications devices. FIG. 1c shows a location relationship among a USB connector, a PCB, and an antenna where the USB connector, the PCB, and the antenna are disposed on a USB communications terminal, 3 represents the USB connector, 1 represents the PCB, 2 represents an antenna carrier, and both a low frequency antenna 21 and a high frequency antenna 22 are disposed in the antenna carrier 2. The USB connector includes a metal housing.

[0004] If the antennas are close to the USB connector, the USB connector interferes with the antennas, and affects performance of the antennas. Therefore, the antennas are designed to be as far as possible from the USB connector. As shown in FIG. 1c, the USB connector and the antennas are disposed at two opposite ends of the PCB. It can be seen from the figure that antennas in these forms are generally used as an independent device and occupy separate space. A physical dimension of an antenna cannot be reduced unlimitedly, which restricts a miniaturization design of a wireless communications device.

SUMMARY

[0005] An objective of embodiments of the present invention is to provide a USB communications terminal, so as to resolve a problem that a miniaturization design of a wireless communications device is restricted because an antenna of the USB communications terminal occupies separate space.

[0006] According to a first aspect, the present invention provides a USB communications terminal, where the USB communications terminal includes a USB connector and a printed circuit board PCB, the USB connector includes a metal housing, a radio-frequency signal feedpoint is disposed on the PCB, and the radio-frequency signal feedpoint is electrically coupled with the USB metal housing.

[0007] In a first possible implementation manner of the first aspect, a first soldering pin for being soldered on the PCB is provided on the metal housing, the first soldering pin is not connected to a ground of the PCB, and that the radio-frequency signal feedpoint is electrically coupled with the USB metal housing is specifically: the radio-frequency signal feedpoint is disposed on the PCB and is electrically connected to the first soldering pin.

[0008] With reference to the first possible implementation manner of the first aspect, in a second possible implementation manner, a second soldering pin for being soldered on the PCB is provided on the metal housing, and the second soldering pin is not connected to the ground of the PCB.

[0009] With reference to the first possible implementation manner of the first aspect, in a third possible implementation manner, the metal housing includes a first part and a second part, where the first part is not connected to the second part, the first soldering pin is disposed on the first part, the second soldering pin is disposed on the second part, and the second soldering pin is connected to the ground of the PCB.

[0010] With reference to the first aspect, the first possible implementation manner of the first aspect, the second possible implementation manner of the first aspect, or the third possible implementation manner of the first aspect, in a fourth possible implementation manner, the radio-frequency signal feedpoint is connected to a metal body, and the metal body is electrically connected to the metal housing.

[0011] With reference to the first aspect, the first possible implementation manner of the first aspect, the second possible implementation manner of the first aspect, the third possible implementation manner of the first aspect, or the fourth possible implementation manner of the first aspect, in a fourth possible implementation manner, the USB communications terminal is a data card.

[0012] According to the USB communications terminal in the embodiments of the present invention, a radio-

frequency signal feedpoint is electrically coupled with a metal housing of a USB connector, so that the metal housing of the USB connector is used as an antenna or a part of an antenna of the USB communications. Therefore, no antenna needs to be additionally designed on the USB communications terminal, thereby saving space of the USB communications terminal and also reducing costs.

BRIEF DESCRIPTION OF DRAWINGS

[0013] To describe the technical solutions in the embodiments of the present invention or in the prior art more clearly, the following briefly introduces the accompanying drawings required for describing the embodiments or the prior art. Apparently, the accompanying drawings in the following description show merely some embodiments of the present invention, and a person of ordinary skill in the art may still derive other drawings from these accompanying drawings without creative efforts. In the drawings:

FIG. 1a shows a USB connector of a USB communications terminal in the prior art;
FIG. 1b is a corresponding schematic diagram of soldering between a USB connector and a PCB of the USB communications terminal in the prior art;
FIG. 1c is a diagram of a location relationship among a USB connector, a PCB, and an antenna where the USB connector, the PCB, and the antenna are disposed on a USB communications terminal in the prior art;
FIG. 2a and FIG. 2b are structural diagrams of a USB communications terminal according to Embodiment 1 of the present invention;
FIG. 2c is a schematic diagram of an antenna of a USB communications terminal according to Embodiment 1 of the present invention;
FIG. 3a is a structural diagram of a USB communications terminal according to Embodiment 2 of the present invention;
FIG. 3b is a schematic diagram of an antenna of a USB communications terminal according to Embodiment 2 of the present invention;
FIG. 4a and FIG. 4b are structural diagrams of a USB communications terminal according to Embodiment 3 of the present invention; and
FIG. 5a and FIG. 5b are structural diagrams of a USB communications terminal according to Embodiment 4 of the present invention.

DESCRIPTION OF EMBODIMENTS

[0014] To make the objectives, technical solutions, and advantages of the present invention clearer and more comprehensible, the following further describes the present invention in detail with reference to the accompanying drawings and embodiments. It should be understood that the specific embodiments described herein are merely used to explain the present invention but are not intended to limit the present invention.

[0015] According to the embodiments of the present invention, designing is performed based on an existing USB connector, so that a USB connector in the present invention can be used as an antenna or a part of an antenna. Therefore, no independent antenna needs to be additionally used on a USB communications terminal, thereby saving space of the USB communications terminal and also reducing costs.

[0016] The following describes specific implementation of the present invention in detail with reference to specific embodiments.

Embodiment 1

[0017] FIG. 2a and FIG. 2b show a USB communications terminal provided in Embodiment 1 of the present invention, and for ease of description, only parts related to this embodiment of the present invention are shown. The USB communications terminal includes a USB connector and a printed circuit board PCB. The USB connector includes a metal housing, and two metal soldering pins 201 and 202 are provided at one end of the metal housing, where the soldering pins 201 and 202 are soldered on the PCB. Soldering holes 301 and 302 that are respectively used for soldering the two metal soldering pins 201 and 202 are provided on the PCB. A radio-frequency signal feedpoint is further disposed on the PCB, where the radio-frequency signal feedpoint is disposed near one of the soldering holes 301 and 302, so as to be electrically connected to the corresponding soldering pin 201 or 202. The radio-frequency signal feedpoint is not connected to a ground of the PCB.

[0018] Specifically, as shown in FIG. 2a, that the radio-frequency signal feedpoint is disposed near one of the soldering holes 301 and 302 may be: the radio-frequency signal feedpoint is disposed near the soldering hole 301 and is not connected to a metal ground of the PCB. For example, the radio-frequency signal feedpoint is disposed within an area 3011, and no metal ground is clad within the area 3011; therefore, after being soldered on the PCB, the soldering pin 201 of the USB connector is electrically connected to the radio-frequency signal feedpoint but is not connected to the ground of the PCB. A metal ground is clad around the soldering hole 302, and after the soldering pin 202 is soldered on the PCB, the soldering pin 202 is connected to the metal ground of the PCB.

[0019] Alternatively, as shown in FIG. 2b, that the radio-frequency signal feedpoint is disposed near one of the soldering holes 301 and 302 may be: the radio-frequency signal feedpoint is disposed near the soldering hole 302 and is not connected to a metal ground of the PCB. For example, the radio-frequency signal feedpoint is disposed within an area 3022, and no metal ground is clad within the area 3011; therefore, after being soldered

on the PCB, the soldering pin 202 of the USB connector is electrically connected to the radio-frequency signal feedpoint but is not connected to the ground of the PCB. A metal ground is clad around the soldering hole 301, and after the soldering pin 201 is soldered on the PCB, the soldering pin 201 is connected to the metal ground of the PCB.

[0020] In this way, when the USB communications terminal works, the metal housing of the USB connector and the PCB form a slot antenna of the USB communications terminal, as shown in FIG. 2c.

[0021] The USB communications terminal in this embodiment of the present invention is a data card.

[0022] According to the USB communications terminal provided in this embodiment of the present invention, a first soldering pin of a USB connector connected to a PCB is disconnected from a ground of the PCB, and a radio-frequency signal is fed from the first soldering pin, so that the USB connector and the PCB form a slot antenna. Therefore, no space used for disposing an antenna needs to be additionally reserved on the USB communications terminal that adopts this structure, thereby saving space of the USB communications terminal.

Embodiment 2

[0023] FIG. 3a shows a USB communications terminal provided in Embodiment 2 of the present invention, and for ease of description, shows only parts related to this embodiment of the present invention. The USB communications terminal includes a USB connector and a printed circuit board PCB. The USB connector includes a metal housing, and two metal soldering pins 201 and 202 are provided at one end of the metal housing, where the soldering pins 201 and 202 are soldered on the PCB. Soldering holes 301 and 302 that are respectively used for soldering the two metal soldering pins 201 and 202 are provided on the PCB. A radio-frequency signal feedpoint is further disposed on the PCB, where the radio-frequency signal feedpoint is disposed near one of the soldering holes 301 and 302, so as to be electrically connected to the corresponding soldering pin 201 or 202. The radio-frequency signal feedpoint is not connected to a ground of the PCB.

[0024] Specifically, that the radio-frequency signal feedpoint is disposed near one of the soldering holes 301 and 302 is: the radio-frequency signal feedpoint is disposed near the soldering hole 301 and is not connected to a metal ground of the PCB. For example, the radio-frequency signal feedpoint is disposed within an area 3011, and no metal ground is clad within the area 3011; therefore, after being soldered on the PCB, the soldering pin 201 of the USB connector is electrically connected to the radio-frequency signal feedpoint but is not connected to the ground of the PCB. No metal ground is clad around the soldering hole 302 either. For example, no metal ground is clad within an area 3022, and after the soldering pin 202 is soldered on the PCB, the soldering pin 202 is not connected to the metal ground of the PCB.

[0025] Alternatively and optionally, that the radio-frequency signal feedpoint is disposed near one of the soldering holes 301 and 302 is: the radio-frequency signal feedpoint is disposed near the soldering hole 302 and is not connected to a metal ground of the PCB. For example, the radio-frequency signal feedpoint is disposed within an area 3022, and no metal ground is clad within the area 3022; therefore, after being soldered on the PCB, the soldering pin 202 of the USB connector is electrically connected to the radio-frequency signal feedpoint but is not connected to the ground of the PCB. No metal ground is clad around the soldering hole 301 either. For example, no metal ground is clad within an area 3011, and after the soldering pin 201 is soldered on the PCB, the soldering pin 201 is not connected to the metal ground of the PCB.

[0026] In this way, when the USB communications terminal works, the metal housing of the USB connector forms an antenna of the USB communications terminal, as shown in FIG. 3b.

[0027] The USB communications terminal in this embodiment of the present invention is a data card.

[0028] According to the USB communications terminal provided in this embodiment of the present invention, grounding legs of a USB connector connected to a PCB are disconnected from a ground of the PCB, and a radio-frequency signal is fed from either of the grounding legs, so that the USB connector becomes an antenna of the USB communications terminal. Therefore, no space used for disposing an antenna needs to be additionally reserved on the USB communications terminal that adopts this structure, thereby saving space of the USB communications terminal.

Embodiment 3

[0029] FIG. 4 shows a USB communications terminal provided in Embodiment 3 of the present invention, and for ease of description, shows only parts related to this embodiment of the present invention. The USB communications terminal includes a USB connector and a printed circuit board PCB. The USB connector includes a metal housing, the metal housing includes a first part 2010 and a second part 2020, the first part 2010 is not connected to the second part 2020, a first soldering pin 201 is disposed on the first part 2010, and a soldering pin 202 is disposed on the second part 2020. Soldering holes 301 and 302 that are respectively used for soldering the soldering pins 201 and 202 are disposed on the PCB. A radio-frequency signal feedpoint is further disposed on the PCB, where the radio-frequency signal feedpoint is disposed near one of the soldering holes 301 and 302, so as to be electrically connected to the corresponding soldering pin 201 or 202. The radio-frequency signal feedpoint is not connected to a ground of the PCB.

[0030] Specifically, as shown in FIG. 4a, that the radio-frequency signal feedpoint is disposed near one of the

soldering holes 301 and 302 may be: the radio-frequency signal feedpoint is disposed within an area 3011, and no metal ground is clad within the area 3011; therefore, after being soldered on the PCB, the soldering pin 201 of the USB connector is electrically connected to the radio-frequency signal feedpoint but is not connected to the ground of the PCB. A metal ground is clad around the soldering hole 302, and after the soldering pin 202 is soldered on the PCB, the soldering pin 202 is connected to the metal ground of the PCB. In this way, when the USB communications terminal works, the first part 2010 of the USB connector forms a monopole antenna.

[0031] Alternatively and optionally, as shown in FIG. 4b, that the radio-frequency signal feedpoint is disposed near one of the soldering holes 301 and 302 may be: the radio-frequency signal feedpoint is disposed near the soldering hole 302 and is not connected to a metal ground of the PCB. For example, the radio-frequency signal feedpoint is disposed within an area 3022, and no metal ground is clad within the area 3011; therefore, after being soldered on the PCB, the soldering pin 202 of the USB connector is electrically connected to the radio-frequency signal feedpoint but is not connected to the ground of the PCB. A metal ground is clad around the soldering hole 301, and after the soldering pin 201 is soldered on the PCB, the soldering pin 201 is connected to the metal ground of the PCB. In this way, when the USB communications terminal works, the second part 2020 of the USB connector forms a monopole antenna.

[0032] The USB communications terminal in this embodiment of the present invention is a data card.

[0033] According to the USB communications terminal provided in this embodiment of the present invention, a first soldering pin of a USB connector connected to a PCB is disconnected from a ground of the PCB, and a radio-frequency signal is fed from the first soldering pin; in addition, a metal housing of the USB connector is cut, so as to separate a part, of the metal housing, connected to the first soldering pin from the remaining part; in this case, this part of metal housing forms a monopole antenna and becomes an antenna of the USB communications terminal. Therefore, no space used for disposing an antenna needs to be additionally reserved on the USB communications terminal that adopts this structure, thereby saving space of the USB communications terminal.

Embodiment 4

[0034] A USB communications terminal provided in Embodiment 4 of the present invention includes a USB connector and a printed circuit board PCB. The USB connector includes a metal housing, the USB connector includes one metal housing, and two metal soldering pins, a first soldering pin and a second soldering pin, are provided at one end of the metal housing. The PCB includes a first part and a second part, where the first part is connected to the second part by using a radio-frequency signal feedpoint, the radio-frequency signal feedpoint is not connected to a ground of the PCB, the first part is a metal body, and the first part is electrically connected to the first soldering pin. FIG. 5a shows one case: The first part 401 of the PCB is connected to the second part 402 by using the radio-frequency signal feedpoint, the radio-frequency signal feedpoint is not connected to a ground of the second part 402 of the PCB, and the first part is connected to the first soldering pin of the metal housing. The second soldering pin is soldered on the second part 402 of the PCB, and the second soldering pin is connected to or not connected to the ground of the second part 402 of the PCB. When the second soldering pin is connected to the ground of the second part 402 of the PCB, the first part 401 of the PCB, the metal housing of the USB connector, and the second part 402 of the PCB form a slot antenna, which is similar to the antenna shown in FIG. 2c. When the second soldering pin is not connected to the ground of the second part 402 of the PCB, the first part 401 of the PCB and the metal housing of the USB connector form an antenna of the USB communications terminal, which is similar to the antenna shown in FIG. 3b.

[0035] In addition, the metal housing of the USB connector may also include two separate parts. FIG. 5b shows a case in which a USB includes two parts. The first part 401 of the PCB is connected to the second part 402 by using the radio-frequency signal feedpoint, the radio-frequency signal feedpoint is not connected to a ground of the second part 402 of the PCB, and the first part is connected to the first soldering pin of the metal housing. The USB connector includes a metal housing, where the metal housing includes a first part 2010 and a second part 2020, the first part 2010 is not connected to the second part 2020, a first soldering pin 201 is disposed on the first part 2010, a soldering pin 202 is disposed on the second part 2020, the first soldering pin 201 is soldered on the first part 401, the second soldering pin 202 is soldered on the second part 402 of the PCB, and the second soldering pin is connected to a ground of the second part 402 of the PCB. The first part 401 of the PCB and the first part 2010 of the metal housing of the USB connector form a monopole antenna.

[0036] The USB communications terminal in this embodiment of the present invention is a data card.

[0037] According to the USB communications terminal in this embodiment of the present invention, a radio-frequency signal is fed into a metal body, the metal body is connected to a first soldering pin of the USB connector, and a second soldering pin of the USB connector is connected to or not connected to a ground of a PCB, so that a metal housing of the USB connector and a second part of the PCB form a slot antenna, or a first part of the PCB and a metal housing of the USB connector form an antenna of the USB communications terminal.

[0038] Alternatively, a metal housing is divided into a first part and a second part, so that a first part of a PCB and a metal housing connected to the first part of the PCB form an antenna of the USB communications ter-

minal.

[0039] In the foregoing specific implementation manners, the objective, technical solutions, and benefits of the present invention are further described in detail. It should be understood that the foregoing descriptions are merely specific implementation manners of the present invention, but are not intended to limit the protection scope of the present invention. Any modification, equivalent replacement, or improvement made without departing from the spirit and principle of the present invention shall fall within the protection scope of the present invention.

Claims

1. A USB communications terminal, comprising a USB connector and a printed circuit board PCB, wherein the USB connector comprises a metal housing, a radio-frequency signal feedpoint is disposed on the PCB, and the radio-frequency signal feedpoint is electrically coupled with the metal housing.

2. The USB communications terminal according to claim 1, wherein a first soldering pin for being soldered on the PCB is provided on the metal housing, the first soldering pin is not connected to a ground of the PCB, and that the radio-frequency signal feedpoint is electrically coupled with the metal housing is specifically: the radio-frequency signal feedpoint is disposed on the PCB and is electrically connected to the first soldering pin.

3. The USB communications terminal according to claim 2, wherein a second soldering pin for being soldered on the PCB is provided on the metal housing, and the second soldering pin is not connected to the ground of the PCB.

4. The USB communications terminal according to claim 2, wherein the metal housing comprises a first part and a second part, the first part is not connected to the second part, the first soldering pin is disposed on the first part, the second soldering pin is disposed on the second part, and the second soldering pin is connected to the ground of the PCB.

5. The USB communications terminal according to any one of claims 1 to 4, wherein the PCB comprises a first part and a second part, the first part is connected to the second part by using the radio-frequency signal feedpoint, the first part is a metal body, and the first part is electrically connected to the first soldering pin.

6. The USB communications terminal according to any one of claims 1 to 5, wherein the USB communications terminal is a data card.

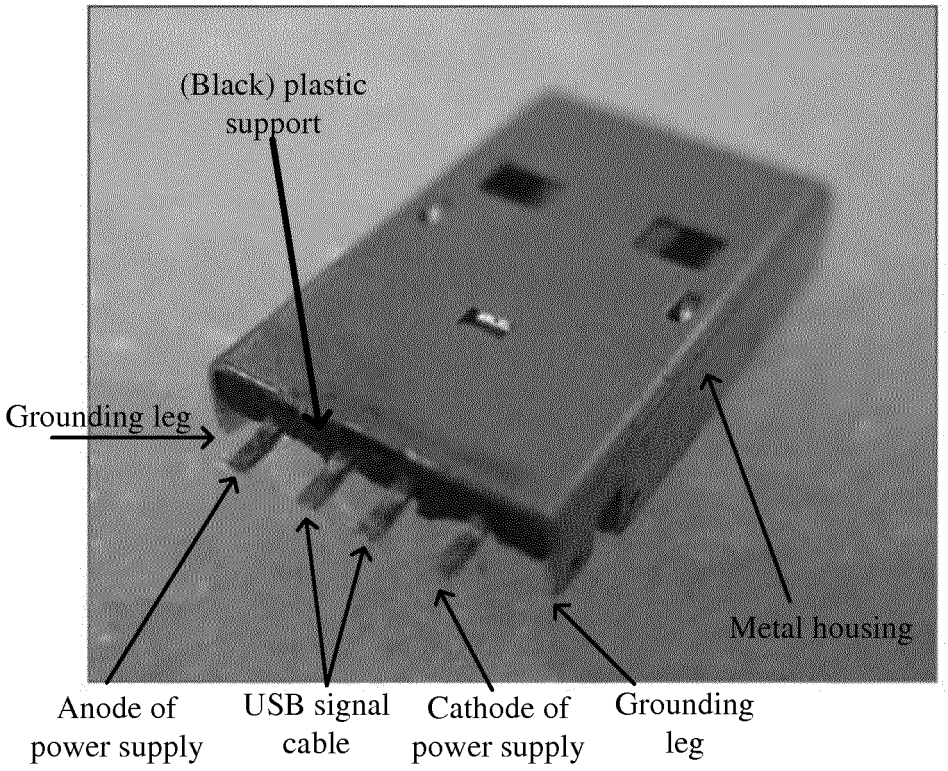
(Black) plastic support
Grounding leg
Metal housing
Anode of power supply
USB signal cable
Cathode of power supply
Grounding leg

FIG. 1a

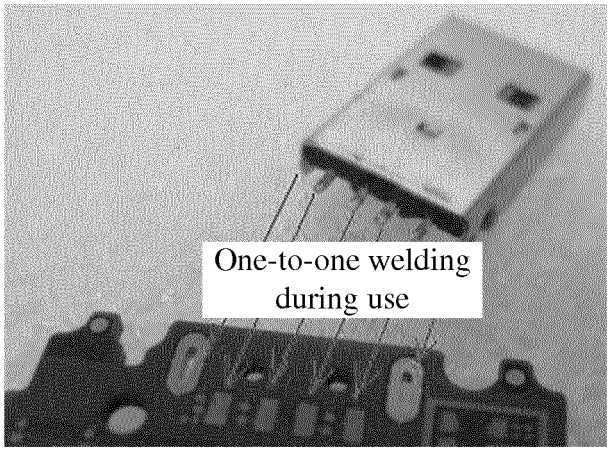
One-to-one welding during use

FIG. 1b

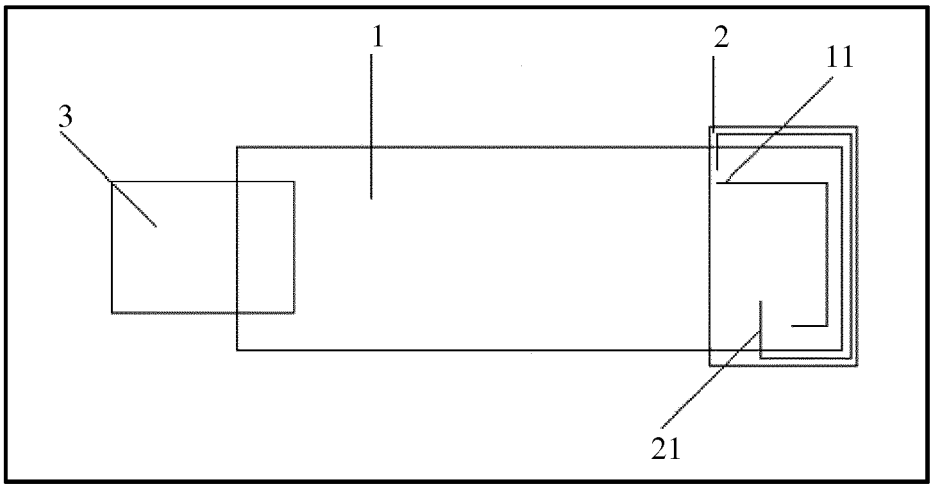

FIG. 1c

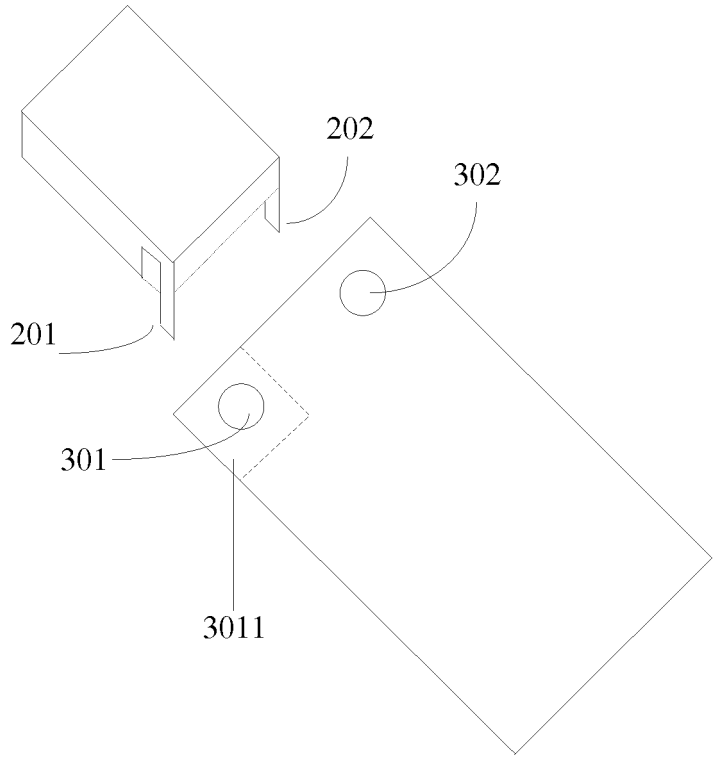

FIG. 2a

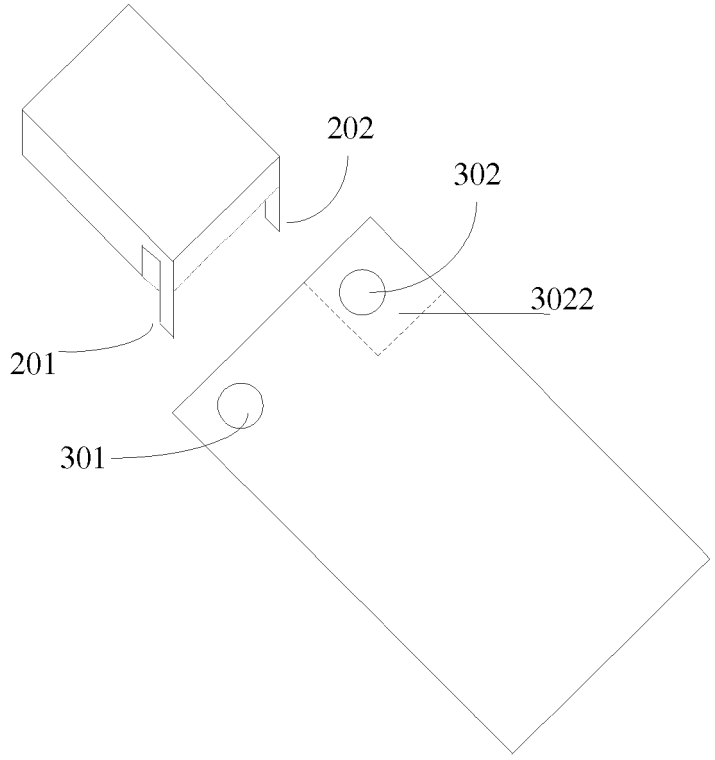
202
302
3022
201
301

FIG. 2b

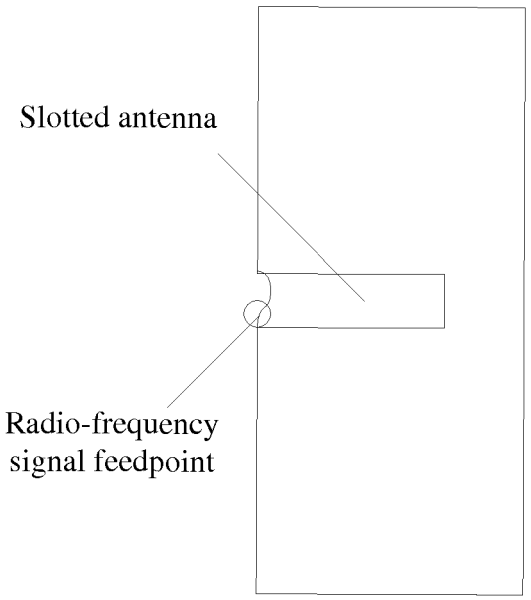
Slotted antenna
Radio-frequency
signal feedpoint

FIG. 2c

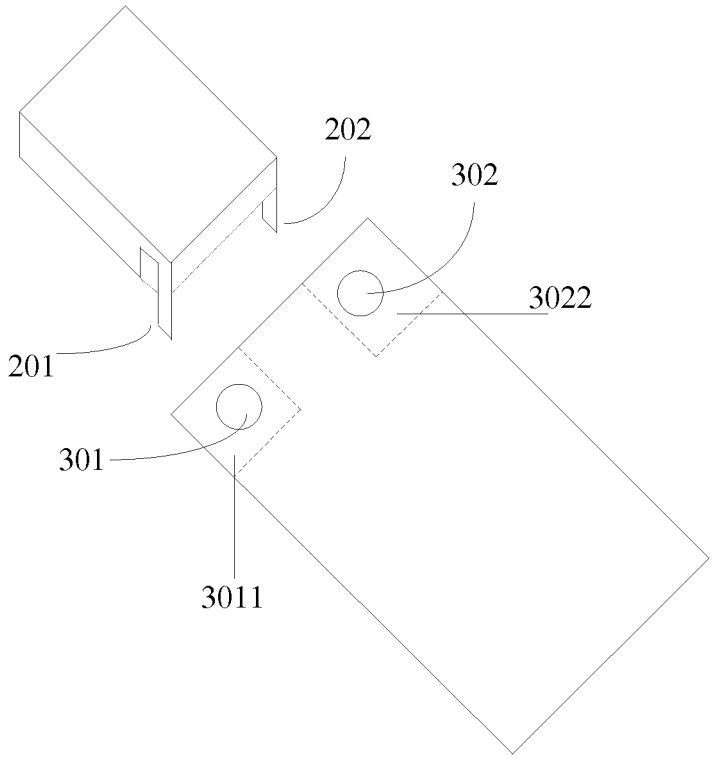
202
302
3022
201
301
3011

FIG. 3a

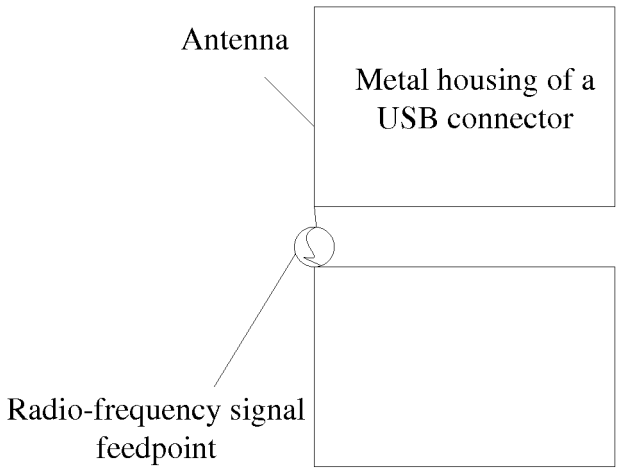
Antenna
Metal housing of a USB connector
Radio-frequency signal feedpoint

FIG. 3b

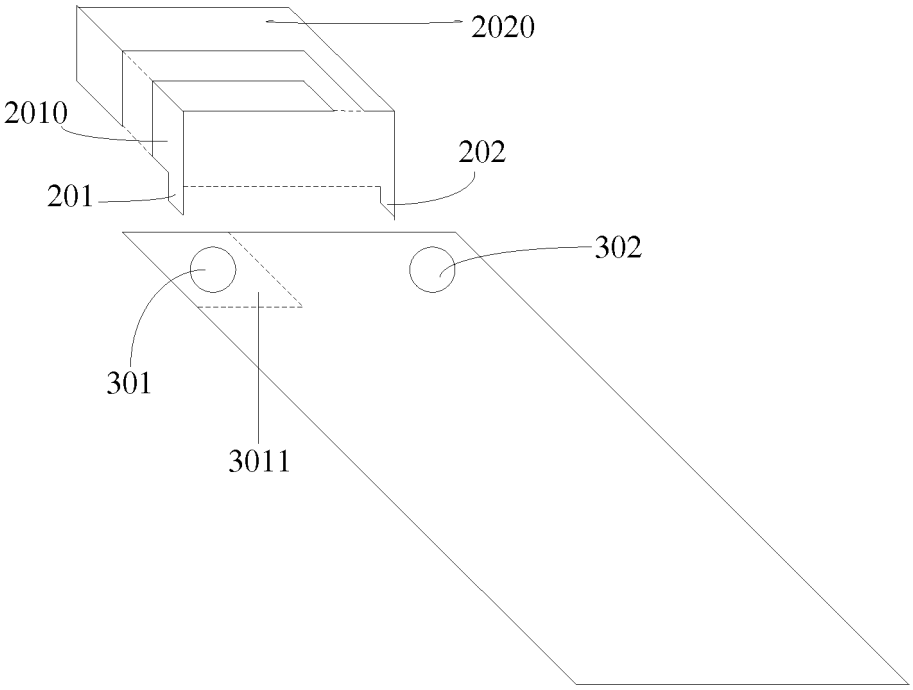

FIG. 4a

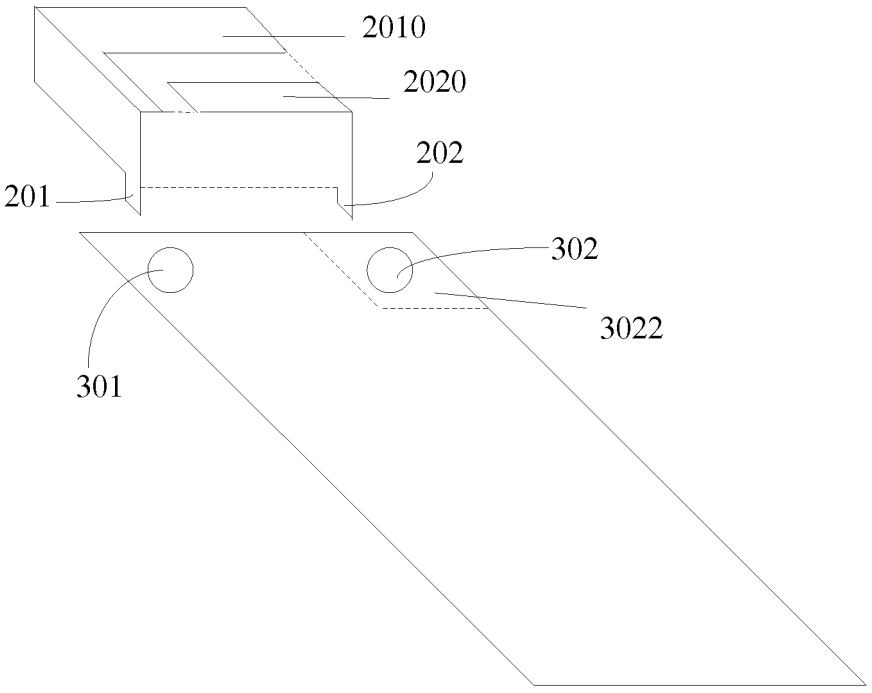

FIG. 4b

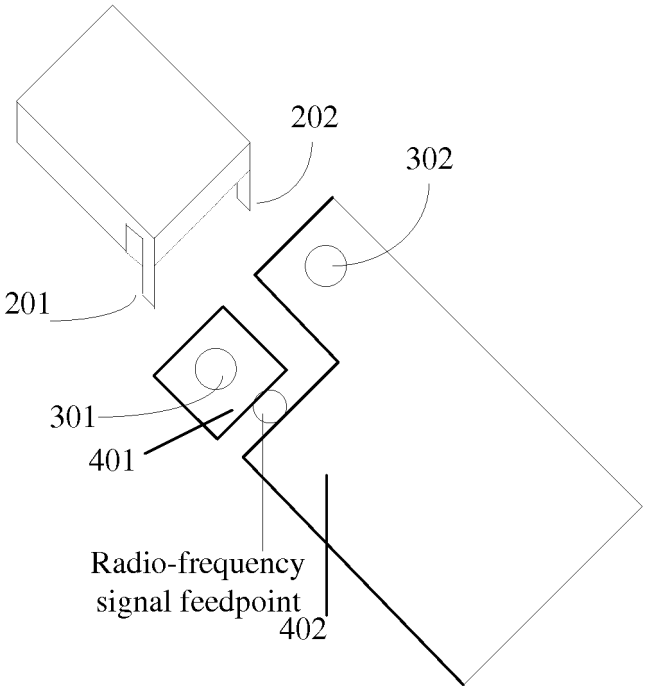
202
302
201
301
401
Radio-frequency
signal feedpoint
402

FIG. 5a

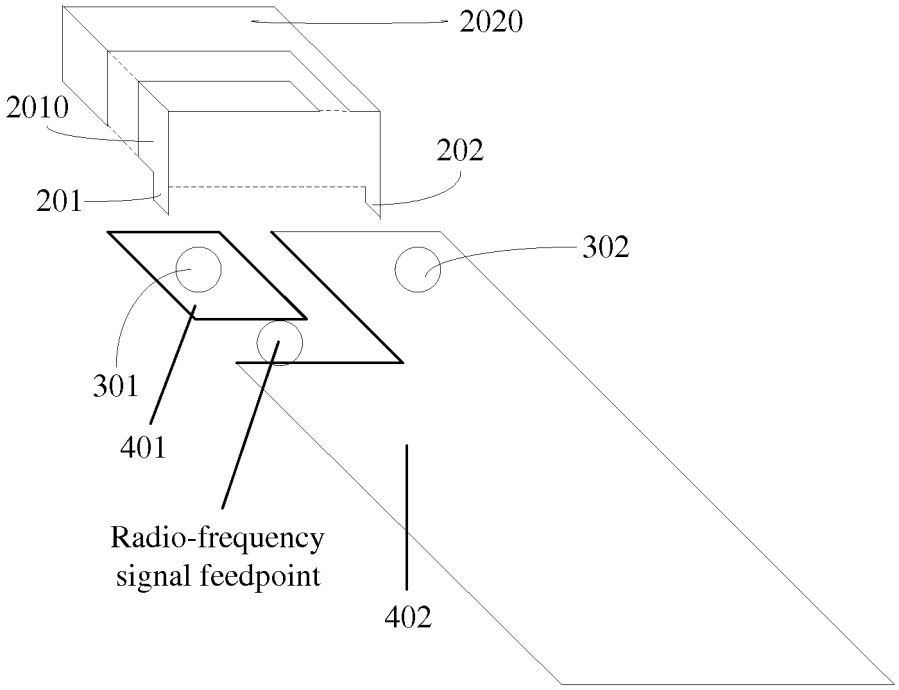
2020
2010
202
201
302
301
401
Radio-frequency
signal feedpoint
402

FIG. 5b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/089796

A. CLASSIFICATION OF SUBJECT MATTER

H01Q 1/44 (2006.01) 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)

IPC: H01Q; H04L; 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)

CNTXT; CNABS; CNKI: network card, data card, shell, linker, plug, metal, antenna, radio frequency, feed point, circuit board, welding leg, pin, weld

VEN; DWPI: USB, network w card, data, shell, linker, pin, metal, antenna, RF, PCB, jointing

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101964475 A (EDIMAX TECHNOLOGY CO., LTD.), 02 February 2011 (02.02.2011), description, paragraphs [0023]-[0026], and figures 1-2	1-6
A	CN 102176560 A (HUAWEI DEVICE CO., LTD.), 07 September 2011 (07.09.2011), the whole document	1-6
A	CN 102983875 A (ZTE CORP.), 20 March 2013 (20.03.2013), the whole document	1-6
A	CN 201114118 Y (ZTE CORP.), 10 September 2008 (10.09.2008), the whole document	1-6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 January 2015 (21.01.2015)	**28 January 2015 (28.01.2015)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **DENG, Qian** Telephone No.: (86-10) **62411449**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/089796

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101964475 A	02 February 2011	None	
CN 102176560 A	07 September 2011	CN 102176560 B	24 April 2013
CN 102983875 A	20 March 2013	WO 2013167048 A2	14 November 2013
		WO 2013167048 A3	09 January 2014
CN 201114118 Y	10 September 2008	None	

Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 201310529528 **[0001]**