



US 20180212311A1

(19) **United States**(12) **Patent Application Publication**
HWANG et al.(10) **Pub. No.: US 2018/0212311 A1**(43) **Pub. Date: Jul. 26, 2018**(54) **BROADBAND ANTENNA MODULE FOR LTE****H01Q 9/04** (2006.01)**H01Q 5/335** (2006.01)(71) Applicant: **AMOTECH CO., LTD.**, Incheon (KR)(72) Inventors: **Chul HWANG**, Incheon (KR); **In-Jo JEONG**, Incheon (KR); **Sang-O KIM**, Incheon (KR); **Dong-Hwan KOH**, Seoul (KR)(52) **U.S. Cl.**CPC **H01Q 1/243** (2013.01); **H01Q 1/38** (2013.01); **H01Q 9/0421** (2013.01); **H01Q 5/335** (2015.01); **H01Q 9/045** (2013.01)(21) Appl. No.: **15/746,195**

(57)

ABSTRACT(22) PCT Filed: **Jul. 22, 2016**(86) PCT No.: **PCT/KR2016/008045**

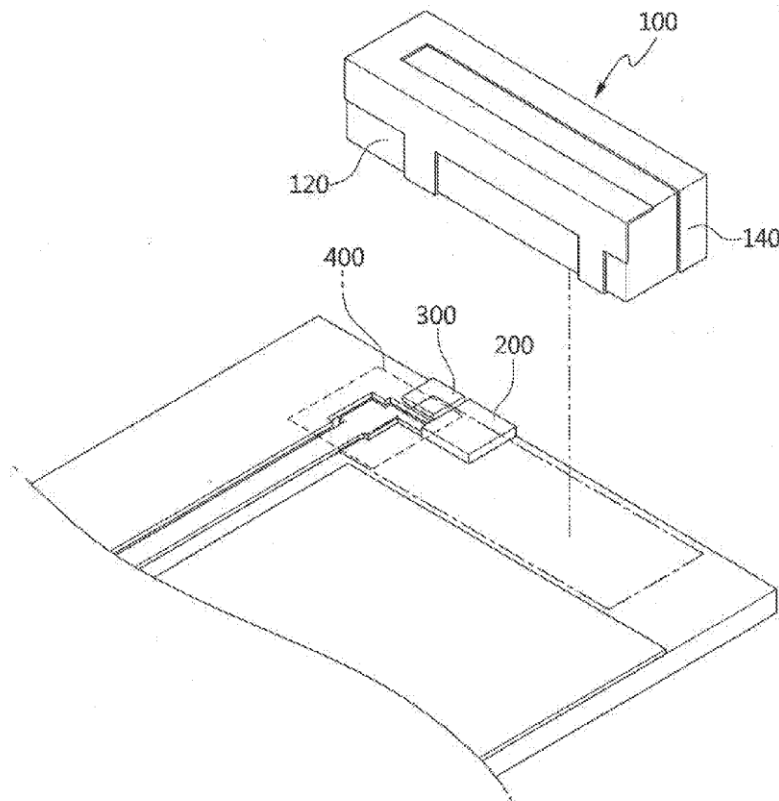
§ 371 (c)(1),

(2) Date: **Jan. 19, 2018**(30) **Foreign Application Priority Data**

Jul. 22, 2015 (KR) 10-2015-0103917

Publication Classification(51) **Int. Cl.****H01Q 1/24** (2006.01)**H01Q 1/38** (2006.01)

The disclosed broadband antenna module for LTE includes: a feeding pin and a direct short pin that are spaced apart from each other on one surface of a printed circuit board; a coupling short pin formed of a conductive material on the other surface of the printed circuit board and connected to a ground plane; and a radiation patch antenna including a dielectric and a radiation pattern formed on an outer circumference of the dielectric and mounted on one surface of the printed circuit board, in which the radiation pattern of the radiation patch antenna is directly connected to the feeding pin and direct short pin and coupled to the coupling short pin in an overlapping manner.





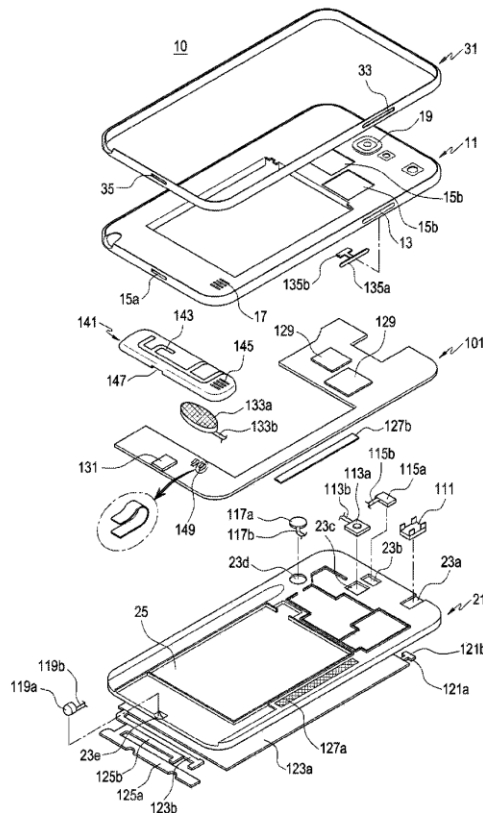
US 20180212312A1

(19) **United States**(12) **Patent Application Publication**
HWANG et al.(10) **Pub. No.: US 2018/0212312 A1**(43) **Pub. Date: Jul. 26, 2018**(54) **ANTENNA DEVICE FOR PORTABLE
TERMINAL****Publication Classification**(71) Applicant: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR)(72) Inventors: **Soon-Ho HWANG**, Seoul (KR);
Sung-Koo PARK, Suwon-si (KR);
Kyung-Jae LEE, Seoul (KR); **Joon-Ho
BYUN**, Yongin-si (KR)(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 13/10 (2006.01)
H01Q 1/44 (2006.01)
H01Q 1/48 (2006.01)
H01Q 1/50 (2006.01)(52) **U.S. Cl.**
CPC **H01Q 1/243** (2013.01); **H01Q 13/10**
(2013.01); **H01Q 1/50** (2013.01); **H01Q 1/48**
(2013.01); **H01Q 1/44** (2013.01)(21) Appl. No.: **15/937,017**(22) Filed: **Mar. 27, 2018****Related U.S. Application Data**(63) Continuation of application No. 15/185,738, filed on
Jun. 17, 2016, which is a continuation of application
No. 13/937,725, filed on Jul. 9, 2013, now Pat. No.
9,373,883.(30) **Foreign Application Priority Data**

Jan. 30, 2013 (KR) 10-2013-0010477

(57) **ABSTRACT**

An antenna device of a portable terminal including conductive components is provided. The antenna device includes a first radiator connected to a power feeding unit of the portable terminal and a second radiator connected to each of the power feeding unit and a ground part of the portable terminal. At least one of the conductive components is connected to at least one the first radiator and the second radiator. The conductive components may be used as a radiator of the antenna device such that the antenna device may be easily installed within an inner space of a miniaturized and lightened portable terminal and the inner space of the portable terminal may be efficiently used.





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(19) **United States**

(12) **Patent Application Publication**
Yang et al.

(10) **Pub. No.: US 2018/0212321 A1**

(43) **Pub. Date: Jul. 26, 2018**

(54) **MIMO ANTENNA DEVICE AND MOBILE COMMUNICATION DEVICE**

H01Q 13/10 (2006.01)

H01Q 1/24 (2006.01)

H04B 7/0413 (2006.01)

(71) Applicants: **Molex Interconnect (Shanghai) Co., Ltd.**, Pudong (CN); **Shanghai University**, Shanghai City (CN)

(52) **U.S. Cl.**

CPC *H01Q 1/52* (2013.01); *H01Q 21/0006*

(2013.01); *H04B 1/38* (2013.01); *H01Q 1/241*

(2013.01); *H04B 7/0413* (2013.01); *H01Q*

13/103 (2013.01)

(72) Inventors: **Guang Li Yang**, Shanghai (CN); **Yi Xin Li**, Shanghai (CN); **Yu Mei Yu**, Shanghai (CN); **Xiao Jun Tang**, Shanghai (CN); **Hua Feng Shen**, Shanghai (CN)

(57)

ABSTRACT

The present disclosure provides a MIMO antenna device and a mobile communication device which comprises a metal shell and a metal piece, the metal shell comprises a metal back plate and a metal frame which are integrally formed, the metal frame surrounds the metal back plate, the metal piece and the metal shell enclose to form a metal cavity, the metal cavity comprises a battery region used to place a battery assembly and a non-battery region outside the battery region; a metal isolate wall is provided between the metal shell and the metal piece, the metal isolate wall partitions the metal cavity into a first cavity and a second cavity, the first cavity contains the battery region; a first feed unit feeds toward the first cavity to form a first antenna; and a second feed unit feeds toward the second cavity to form a second antenna. The MIMO antenna device and the mobile communication device in the present disclosure form a MIMO antenna device with high isolation through the first antenna and the second antenna, so as to achieve communication in the case of a full-metal outer shell.

(73) Assignees: **Molex Interconnect (Shanghai) Co., Ltd.**, Pudong (CN); **Shanghai University**, Shanghai City (CN)

(21) Appl. No.: **15/860,723**

(22) Filed: **Jan. 3, 2018**

(30) **Foreign Application Priority Data**

Jan. 20, 2017 (CN) 201710048013.X

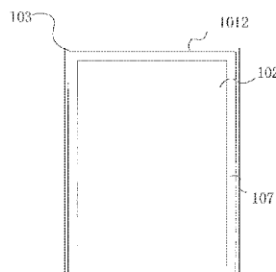
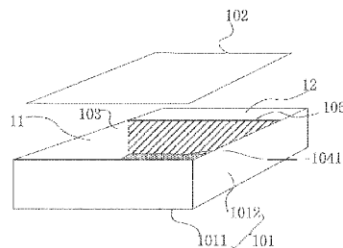
Publication Classification

(51) **Int. Cl.**

H01Q 1/52 (2006.01)

H01Q 21/00 (2006.01)

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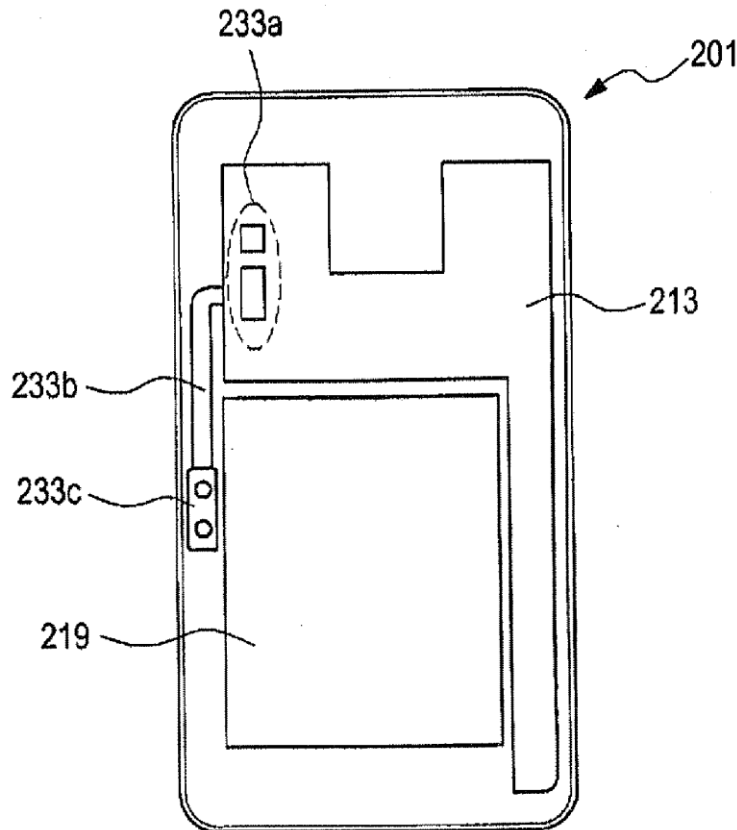
US 20180212473A1

(19) **United States**(12) **Patent Application Publication**
KIM et al.(10) **Pub. No.: US 2018/0212473 A1**(43) **Pub. Date: Jul. 26, 2018**(54) **PORTABLE TERMINAL HAVING WIRELESS CHARGING MODULE****Publication Classification**(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)(51) **Int. Cl.**
H02J 50/12 (2006.01)
H02J 50/70 (2006.01)(72) Inventors: **Ki-Hyun KIM**, Suwon-si (KR);
Jin-Hyoung PARK, Wonju-si (KR);
Ki-Ho KIM, Seoul (KR); **Se-Ho PARK**, Suwon-si (KR); **Young-Min LEE**, Yongin-si (KR)(52) **U.S. Cl.**
CPC **H02J 50/12** (2016.02); **H02J 50/70** (2016.02); **H02J 5/005** (2013.01); **H02J 17/00** (2013.01)(21) Appl. No.: **15/925,627**(57) **ABSTRACT**(22) Filed: **Mar. 19, 2018****Related U.S. Application Data**

(63) Continuation of application No. 14/234,912, filed on Jan. 24, 2014, now Pat. No. 9,948,126, filed as application No. PCT/KR2012/007492 on Sep. 19, 2012.

(30) **Foreign Application Priority Data**Sep. 30, 2011 (KR) 10-2011-0099865
Sep. 12, 2012 (KR) 10-2012-0101541

A portable terminal is provided, including a cover member which is detachably provided at a rear surface of a main body of a terminal, a resonant antenna for a reception unit provided inside of the cover member, a reception circuit unit provided inside of the main body, and a connection unit for connecting the resonant antenna for a reception unit with the reception circuit unit. The portable terminal efficiently receives the signal power provided from a charger by arranging the resonant antenna inside of the cover member, and minimizes the thickness of the portable terminal by providing the reception circuit unit inside of the main body of the terminal.





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(19) **United States**

(12) **Patent Application Publication**
WANG et al.

(10) **Pub. No.: US 2018/0219274 A1**

(43) **Pub. Date: Aug. 2, 2018**

(54) **ANTENNA DEVICE AND MOBILE
TERMINAL**

Publication Classification

(71) Applicant: **GUANGDONG OPPO MOBILE
TELECOMMUNICATIONS CORP.,
LTD.**, Dongguan (CN)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H04B 1/48 (2006.01)
H01Q 1/38 (2006.01)
H01Q 1/50 (2006.01)
H01Q 23/00 (2006.01)

(72) Inventors: **Xinbao WANG**, Dongguan (CN); **Ning
ZHAO**, Dongguan (CN); **Shengzhao
XIANG**, Dongguan (CN)

(52) **U.S. Cl.**
CPC *H01Q 1/243* (2013.01); *H04B 1/48*
(2013.01); *H01Q 23/00* (2013.01); *H01Q 1/50*
(2013.01); *H01Q 1/38* (2013.01)

(73) Assignee: **GUANGDONG OPPO MOBILE
TELECOMMUNICATIONS CORP.,
LTD.**, Dongguan (CN)

(57) **ABSTRACT**

The present disclosure provides an antenna device including a radio frequency transceiving circuit; a matching circuit, electrically coupled to the radio frequency transceiving circuit; and a metal housing, the edge of the metal housing including an arc-shaped section, the metal housing being provided with at least one micro-seam band, the at least one micro-seam band including an arc-shaped part, said arc-shaped part matching the arc-shaped section of the metal housing, the radio frequency transceiving circuit being electrically coupled to the metal housing by means of the matching circuit, such that the metal housing is used as a radiating body of the antenna device, the metal housing being grounded by means of a grounding wire, the grounding wire being provided with an on-off switch configured to control the grounding wire. The present disclosure further provides a mobile terminal.

(21) Appl. No.: **15/749,047**

(22) PCT Filed: **Mar. 18, 2017**

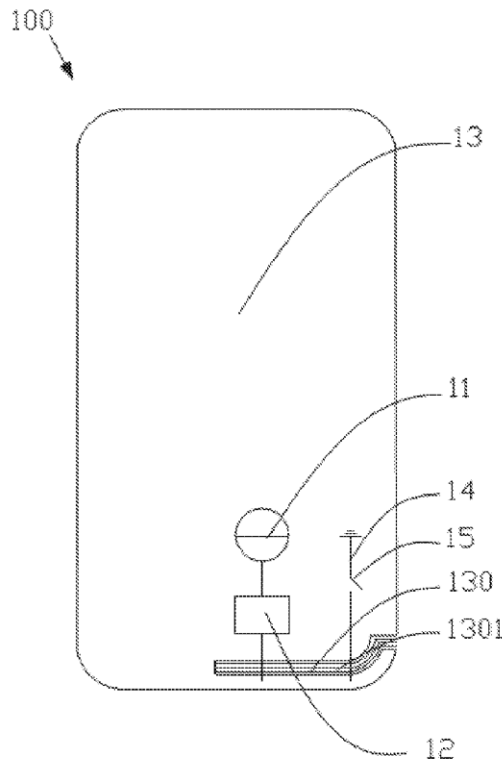
(86) PCT No.: **PCT/CN2017/077163**

§ 371 (c)(1),

(2) Date: **Jan. 30, 2018**

(30) **Foreign Application Priority Data**

Mar. 18, 2016 (CN) 201610161254.0





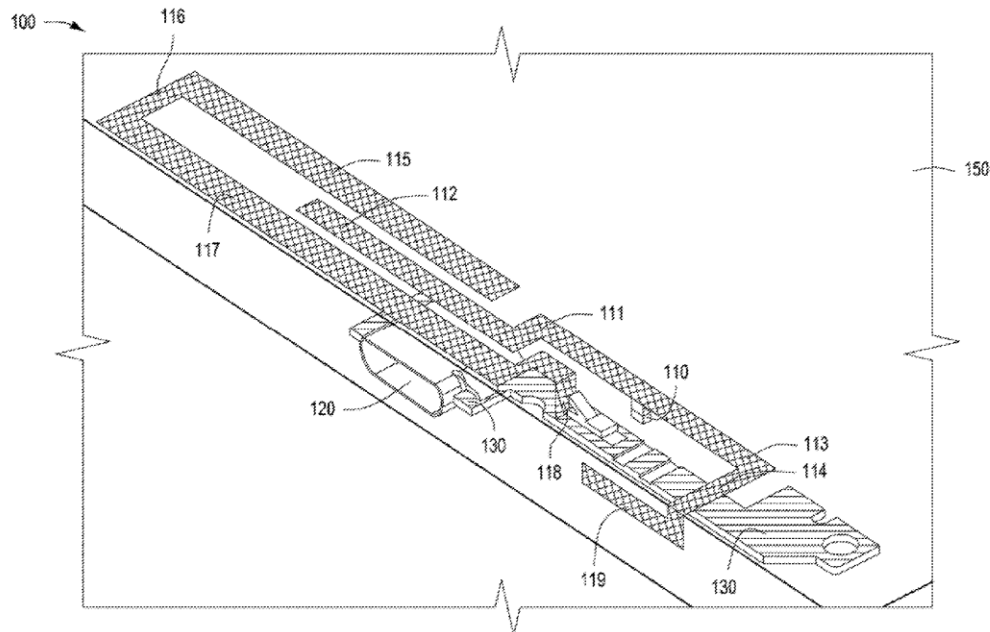
US 20180219294A1

(19) **United States**(12) **Patent Application Publication**
OH et al.(10) **Pub. No.: US 2018/0219294 A1**(43) **Pub. Date: Aug. 2, 2018**(54) **WIDEBAND ANTENNAS****Publication Classification**(71) Applicant: **HEWLETT-PACKARD
DEVELOPMENT COMPANY, L.P.,
HOUSTON, TX (US)**(51) **Int. Cl.**
H01Q 9/42 (2006.01)
H01Q 5/378 (2006.01)
(52) **U.S. Cl.**
CPC **H01Q 9/42** (2013.01); **H01Q 1/243**
(2013.01); **H01Q 5/378** (2015.01)(72) Inventors: **SUNG OH, PALO ALTO, CA (US);
PHILIP WRIGHT, SAN DIEGO, CA
(US)**(57) **ABSTRACT**

Examples described herein include examples of an antenna that includes a planar conductive body disposed in a first plane, a signal source, connection disposed on the planar conductive body, a direct feed antenna arm coupled to the signal source connection and disposed in a second plane parallel to the first plane, a coupled antenna arm disposed in the second plane and in proximity to a portion of the direct feed antenna arm, and a conductive interconnect element coupled to a region of the planar conductive body disposed in the first plane and the coupled antenna arm disposed in the second plane,

(21) Appl. No.: **15/747,216**(22) PCT Filed: **Sep. 29, 2015**(86) PCT No.: **PCT/US2015/052958**

§ 371 (c)(1),

(2) Date: **Jan. 24, 2018**



(19) **United States**

(12) **Patent Application Publication**
TSAI et al.

(10) Pub. No.: US 2018/0226712 A1

(43) **Pub. Date:** **Aug. 9, 2018**

(54) **MOBILE DEVICE AND ANTENNA STRUCTURE**

(71) Applicant: **HTC Corporation**, Taoyuan City (TW)

(72) Inventors: **Tiao-Hsing TSAI**, Taoyuan City (TW);
Chien-Pin CHIU, Taoyuan City (TW);
Hsiao-Wei WU, Taoyuan City (TW);
Ying-Chih WANG, Taoyuan City (TW)

(73) Assignee: **HTC Corporation**, Taoyuan City (TW)

(21) Appl. No.: 15/943,067

(22) Filed: **Apr. 2, 2018**

Related U.S. Application Data

(63) Continuation of application No. 13/598,317, filed on Aug. 29, 2012, now Pat. No. 10,003,121.

Publication Classification

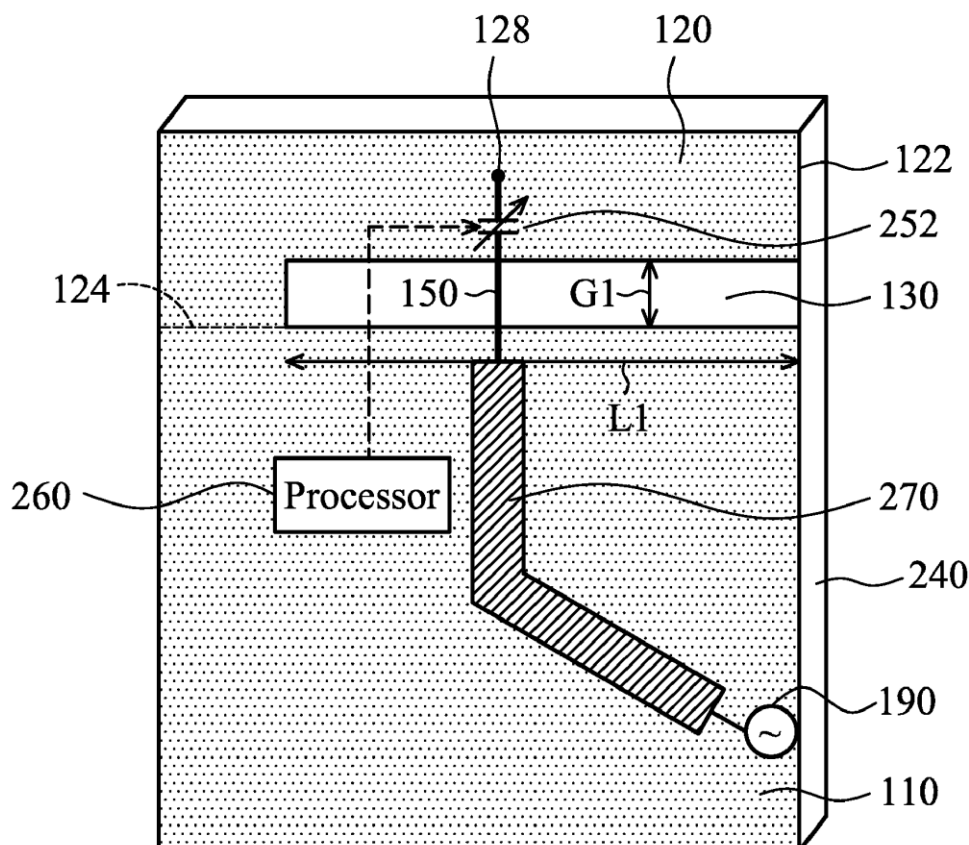
(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 9/42 (2006.01)
H01Q 5/335 (2006.01)
H01Q 5/378 (2006.01)

(52) **U.S. Cl.**
 CPC *H01Q 1/243* (2013.01); *H01Q 9/42*
 (2013.01); *H01Q 5/378* (2015.01); *H01Q*
5/335 (2015.01)

(57) **ABSTRACT**

A mobile device including a ground plane, a grounding branch, wherein a slot is formed between the ground plane and the grounding branch, a connecting element, wherein the grounding branch is electrically coupled through the connecting element to the ground plane and a feeding element, extending across the slot, and electrically coupled between the grounding branch and a signal source, wherein an antenna structure is formed by the grounding branch and the feeding element.

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US 20180233807A1

(19) **United States**(12) **Patent Application Publication**
MA et al.(10) **Pub. No.: US 2018/0233807 A1**(43) **Pub. Date: Aug. 16, 2018**(54) **ANTENNA ARRANGEMENT FOR AN
ELECTRONIC DEVICE**(71) Applicant: **Microsoft Technology Licensing, LLC**,
Redmond, WA (US)(72) Inventors: **Guozhong MA**, Redmond, WA (US);
Anrong ZHANG, Redmond, WA (US);
Jie ZHANG, Redmond, WA (US); **Wei**
WANG, Redmond, WA (US)**H01Q 1/48** (2006.01)**H01Q 21/00** (2006.01)(52) **U.S. Cl.**CPC **H01Q 1/243** (2013.01); **H01Q 1/523**
(2013.01); **H01Q 21/0087** (2013.01); **H01Q**
21/0075 (2013.01); **H01Q 1/48** (2013.01)

(57)

ABSTRACT(21) Appl. No.: **15/751,149**(22) PCT Filed: **Jul. 18, 2016**(86) PCT No.: **PCT/US2016/042698**

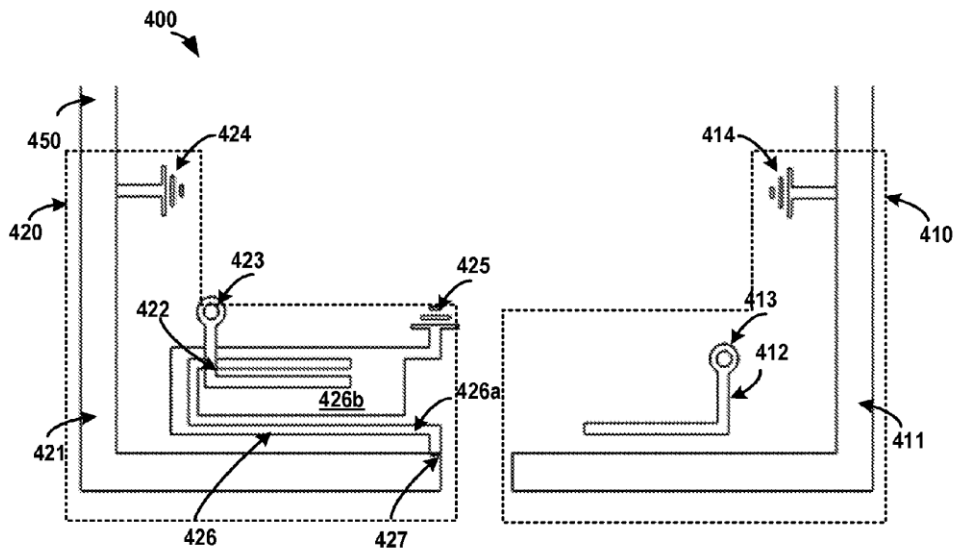
§ 371 (c)(1),

(2) Date: **Feb. 7, 2018**(30) **Foreign Application Priority Data**

Aug. 7, 2015 (CN) 201510484994.3

Publication Classification(51) **Int. Cl.****H01Q 1/24** (2006.01)**H01Q 1/52** (2006.01)

The subject matter described herein relates to an antenna arrangement, an electronic device and a method for manufacturing the antenna arrangement. In one implementation, the antenna arrangement comprises a first antenna and a second antenna. The first antenna includes a first metal section connected to a first grounding point and a first initial radiator for feeding first radiations to the first metal section. The second antenna includes a second metal section connected to a second grounding point and a second initial radiator for feeding second radiations to the second metal section. The first and second metal sections are integral parts of a housing of the electronic device and separated by an opening. The second metal section is further connected to a third grounding point to provide isolation between the two antennae. Thus, a pair of antennae with a good antenna performance can be built with the same one structure.

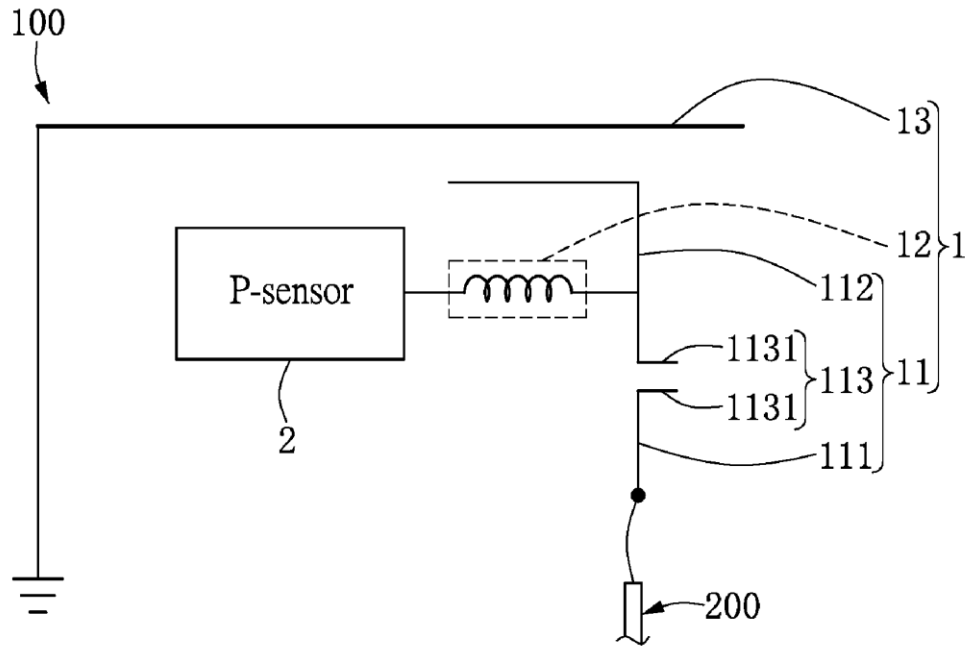




US 20180233822A1

(19) **United States**(12) **Patent Application Publication**
TANG et al.(10) **Pub. No.: US 2018/0233822 A1**(43) **Pub. Date: Aug. 16, 2018**(54) **PROXIMITY SENSOR ANTENNA DEVICE
AND ANTENNA STRUCTURE THEREOF**(71) Applicant: **AUDEN TECHNO CORP.,
TAOYUAN COUNTY (TW)**(72) Inventors: **CHIA-LUN TANG, MIAOLI
COUNTY (TW); CHI-MING
CHIANG, TAOYUAN COUNTY
(TW); CHUN-CHUAN CHANG,
KEELUNG CITY (TW)**(21) Appl. No.: **15/433,132**(22) Filed: **Feb. 15, 2017****Publication Classification**(51) **Int. Cl.**
H01Q 5/328 (2006.01)
H01Q 1/22 (2006.01)
H01Q 1/48 (2006.01)(52) **U.S. Cl.**CPC **H01Q 5/328** (2015.01); **H01Q 1/48**
(2013.01); **H01Q 1/2291** (2013.01)(57) **ABSTRACT**

An antenna structure includes a first conductor, a high-frequency blocking unit, and a second conductor. The first conductor includes a feeding segment, a coupling segment spaced apart from the feeding segment, and a DC blocking unit connected between the feeding segment and the coupling segment. The high-frequency blocking unit is connected to the coupling segment. The second conductor is spaced apart from the first conductor and couples with the coupling segment. An end of the second conductor is connected to a ground, and the second conductor is provided without connecting any capacitance member and any inductance member. The coupling segment is used as a capacitor electrode for detecting an external object. When the coupling segment is in a capacitor electrode mode, a capacitance value between the coupling segment and the external object is variable according to a distance between the coupling segment and the external object.





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(19) **United States**

(12) **Patent Application Publication**
Pak et al.

(10) **Pub. No.: US 2018/0233825 A1**

(43) **Pub. Date: Aug. 16, 2018**

(54) **COMMUNICATION APPARATUS**

(71) Applicant: **Sony Interactive Entertainment Inc.**,
Tokyo (JP)

(72) Inventors: **Masayuki Pak**, Kanagawa (JP);
Tetsufumi Nozawa, Chiba (JP)

(73) Assignee: **Sony Interactive Entertainment Inc.**,
Tokyo (JP)

(21) Appl. No.: **15/887,413**

(22) Filed: **Feb. 2, 2018**

(30) **Foreign Application Priority Data**

Feb. 16, 2017 (JP) 2017-027025

Publication Classification

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/48 (2006.01)
H05K 1/02 (2006.01)
H05K 1/11 (2006.01)
H05K 1/18 (2006.01)

H05K 3/34 (2006.01)

H01P 11/00 (2006.01)

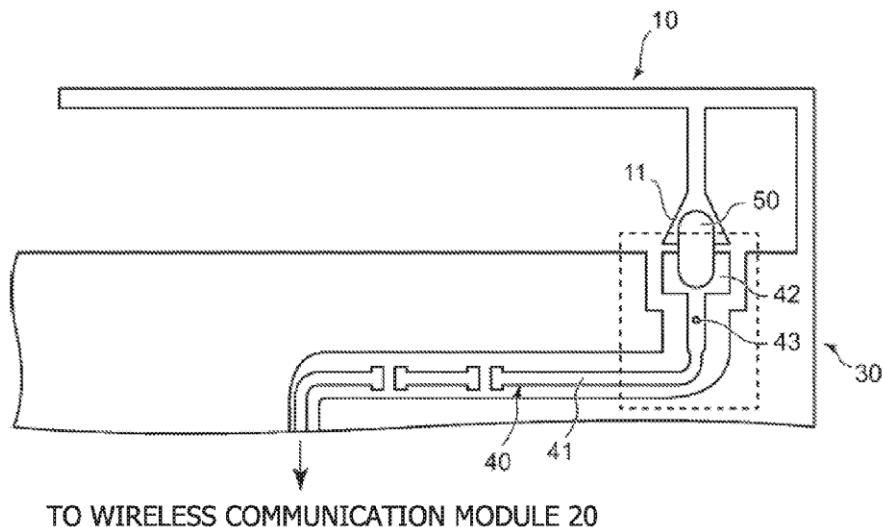
(52) **U.S. Cl.**

CPC **H01Q 9/045** (2013.01); **H01Q 1/48**
(2013.01); **H05K 1/0237** (2013.01); **H05K**
1/115 (2013.01); **H05K 2201/10098** (2013.01);
H05K 3/34 (2013.01); **H01P 11/001**
(2013.01); **H05K 1/0268** (2013.01); **H05K**
1/18 (2013.01)

(57)

ABSTRACT

A communication apparatus includes a signal line that connects an antenna and a wireless communication module to each other, the signal line having a portion where the signal line is divided in part into sections, with an adjacent portion adjacent to the divided portion of the signal line being greater in line width than a main body portion of the signal line; a first ground pattern disposed to face the main body portion; and a second ground pattern disposed to face the adjacent portion. The distance from the adjacent portion to the second ground pattern is longer than the distance from the main body portion to the first ground pattern. The antenna and the wireless communication module are connected to each other through the signal line and a solder adhered to the adjacent portion.





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(19) **United States**

(12) **Patent Application Publication**
Chang et al.

(10) **Pub. No.: US 2018/0234528 A1**

(43) **Pub. Date: Aug. 16, 2018**

(54) **COMMUNICATION DEVICE**

(71) Applicant: **Acer Incorporated**, New Taipei City (TW)

(72) Inventors: **Kun-Sheng Chang**, New Taipei City (TW); **Shih-Ting Huang**, New Taipei City (TW); **Ching-Chi Lin**, New Taipei City (TW)

(73) Assignee: **Acer Incorporated**, New Taipei City (TW)

(21) Appl. No.: **15/951,148**

(22) Filed: **Apr. 11, 2018**

Related U.S. Application Data

(62) Division of application No. 14/951,511, filed on Nov. 25, 2015.

Foreign Application Priority Data

Aug. 26, 2015 (TW) 104127828

Publication Classification

(51) **Int. Cl.**
H04M 1/02 (2006.01)
H01Q 5/364 (2015.01)

H04B 1/3827 (2015.01)

H01Q 9/42 (2006.01)

H01Q 1/38 (2006.01)

H01Q 1/24 (2006.01)

H01Q 7/00 (2006.01)

(52) **U.S. Cl.**

CPC **H04M 1/026** (2013.01); **H01Q 5/364**

(2015.01); **H04B 1/3827** (2013.01); **H01Q**

7/00 (2013.01); **H01Q 1/38** (2013.01); **H01Q**

1/243 (2013.01); **H01Q 9/42** (2013.01)

(57)

ABSTRACT

A communication device including a ground plane and an antenna element is provided. The antenna element includes a feeding portion, a first radiation portion, a second radiation portion and an adjusting portion. The first radiation portion and the feeding portion form a first resonant path, and the first radiation portion includes a first portion and a second portion. The first portion faces a first edge of the ground plane and the second portion, and the second portion extends from a second edge of the ground plane. The second radiation portion and the feeding portion form a second resonant path. The antenna element operates in a first band and a second band through the first resonant path and the second resonant path. The adjusting portion and part of the first radiation portion form a current-dividing path to adjust impedance of the antenna element operating in the second band.

