



US 20140375506A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0375506 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **WIRELESS COMMUNICATION DEVICE**

**Publication Classification**

(71) Applicant: **FIH (Hong Kong) Limited**, Kowloon (HK)

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

(72) Inventors: **CHENG-HUNG KO**, Shindian (TW);  
**CHAO-WEI HO**, New Taipei (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/38** (2013.01)  
USPC ..... **343/700 MS**

(73) Assignee: **FIH (HONG KONG) LIMITED**, Kowloon (HK)

(57) **ABSTRACT**

(21) Appl. No.: **14/132,488**

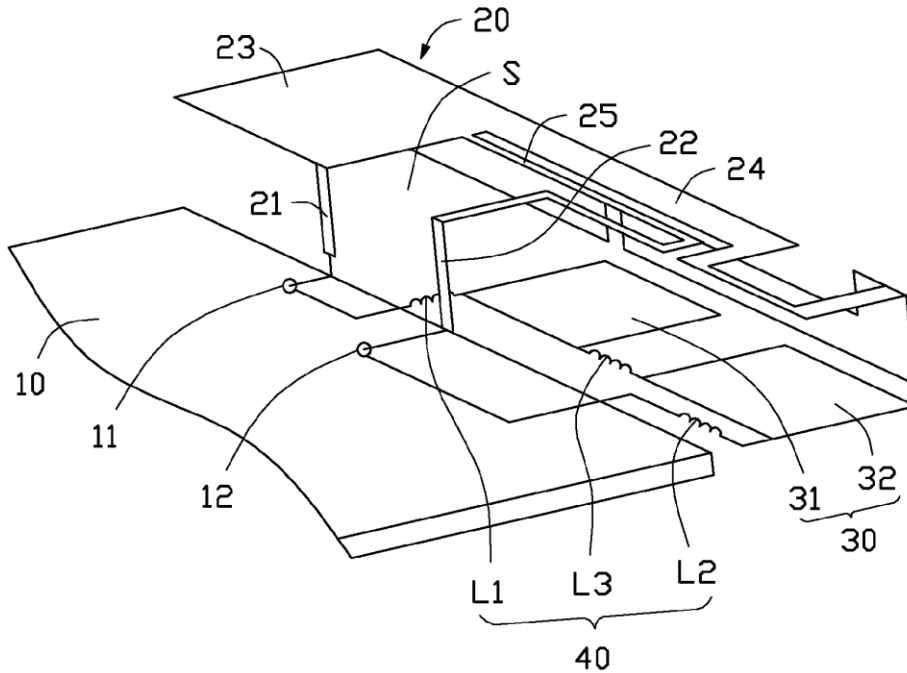
A wireless communication device includes a base board, an antenna, a metal assembly, and a conductive assembly. The base board includes a feed portion and a ground portion, and defines a keep-out-zone. The antenna is located above the keep-out-zone, and is electronically connected to the feed portion and the ground portion. The metal assembly is located at the keep-out-zone, and is spaced from the antenna. The metal assembly is electronically connected to the feed portion and the ground portion through the conductive assembly.

(22) Filed: **Dec. 18, 2013**

(30) **Foreign Application Priority Data**

Jun. 24, 2013 (TW) ..... 102122425

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US 20140375507A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0375507 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **BROADBAND ANTENNA AND WIRELESS COMMUNICATION DEVICE EMPLOYING SAME**

(52) **U.S. Cl.**  
CPC ..... *H01Q 5/0093* (2013.01)  
USPC ..... **343/700 MS; 343/860**

(71) Applicant: **Chiun Mai Communication Systems, Inc.**, New Taipei (TW)

(57) **ABSTRACT**

(72) Inventors: **YEN-HUI LIN**, Tu-Cheng (TW);  
**GENG-HONG LIOU**, Tu-Cheng (TW)

(21) Appl. No.: **14/306,481**

(22) Filed: **Jun. 17, 2014**

(30) **Foreign Application Priority Data**

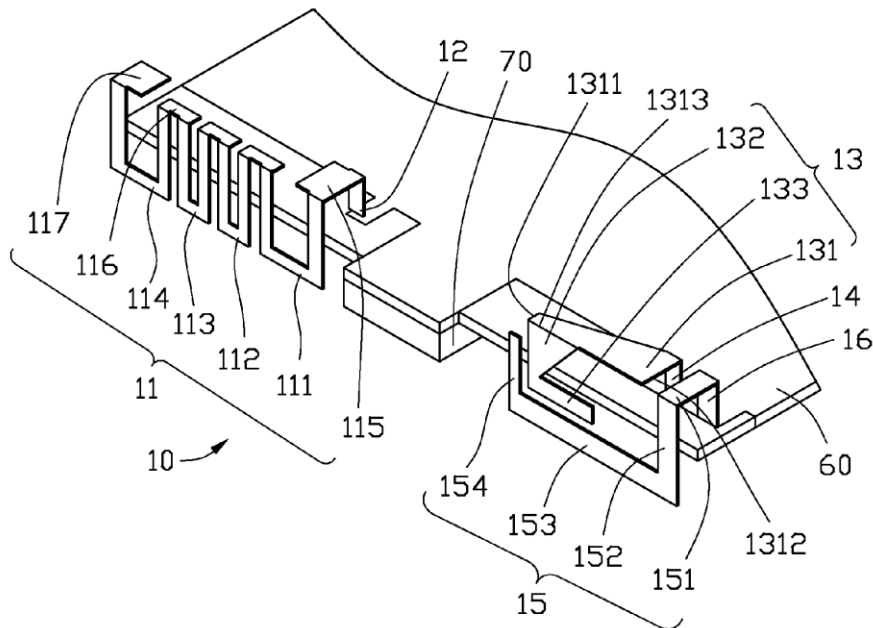
Jun. 19, 2013 (TW) ..... 102121645

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 5/00* (2006.01)

A broadband antenna for a wireless communication device includes a first feeding portion, a second feeding portion, a grounding portion, a low band radiating unit, a high band radiating unit, and a resonating unit. The low band radiating unit is connected to the first feeding portion and establishing a first current path to generate a low band frequency. The high band radiating unit is connected to the second feeding portion and establishing a second current path to generate a first high band frequency. The resonating unit is connected to the grounding portion and establishing a third current path to generate a second high band frequency. The resonating unit resonates with the high band radiating unit to generate a third high band frequency.

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US 20140375508A1

(19) **United States**

(12) **Patent Application Publication**  
**Miyake**

(10) **Pub. No.: US 2014/0375508 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **ANTENNA DEVICE AND COMMUNICATION EQUIPMENT**

**Publication Classification**

(71) Applicant: **Funai Electric Co., Ltd.**, Daito-shi, Osaka (JP)

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)

(72) Inventor: **Yasunari Miyake**, Daito-shi (JP)

(52) **U.S. Cl.**  
CPC ..... **H01Q 9/045** (2013.01); **H01Q 9/0414** (2013.01)

(21) Appl. No.: **14/370,667**

USPC ..... **343/700 MS**

(22) PCT Filed: **Dec. 10, 2012**

(57) **ABSTRACT**

(86) PCT No.: **PCT/JP2012/081920**

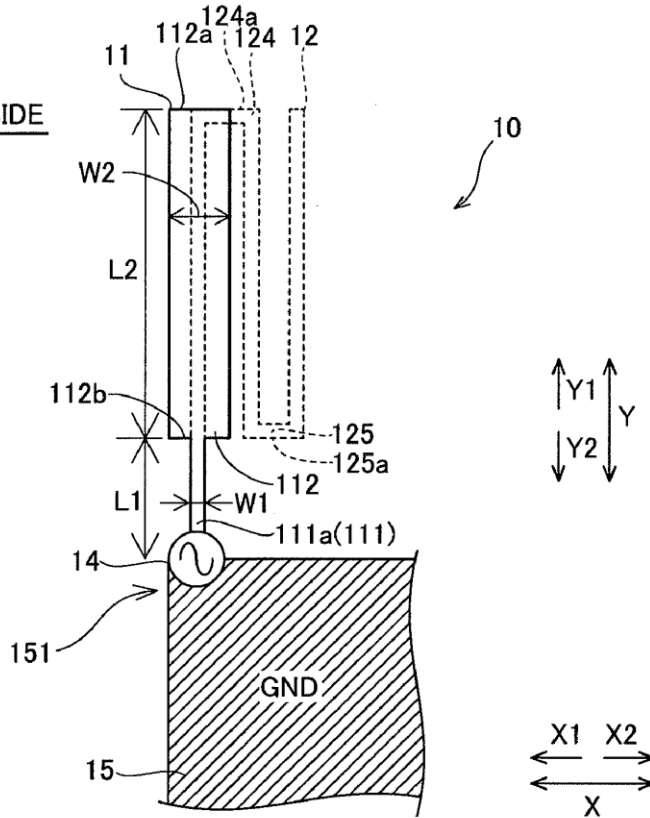
§ 371 (c)(1),  
(2), (4) Date: **Jul. 3, 2014**

An antenna device (10) includes a feed element (11) including a first portion (111) and a second portion (112) and a non-feed element (12) including a plurality of folded back portions (121 to 125). The width (W2) of the second portion of the feed element is rendered larger than the width (W3) of the non-feed element, and at least the second portion of the feed element is configured to be coupled to the plurality of folded back portions of the non-feed element.

(30) **Foreign Application Priority Data**

Jan. 5, 2012 (JP) ..... 2012-000525

FRONT SURFACE SIDE





US 20140375510A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0375510 A1**  
(43) **Pub. Date: Dec. 25, 2014**

(54) **ANTENNA DEVICE AND ELECTRONIC DEVICE HAVING THE SAME**

**Publication Classification**

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, SUWON-SI (KR)

(51) **Int. Cl.**  
*H01Q 1/36* (2006.01)  
*H01Q 1/24* (2006.01)

(72) Inventors: **Sung-Hyup LEE**, Gumi-si (KR);  
**Soon-Sang PARK**, Daegu (KR)

(52) **U.S. Cl.**  
CPC . *H01Q 1/36* (2013.01); *H01Q 1/243* (2013.01)  
USPC ..... **343/702**; 343/720; 343/700 MS

(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**, SUWON-SI (KR)

(57) **ABSTRACT**

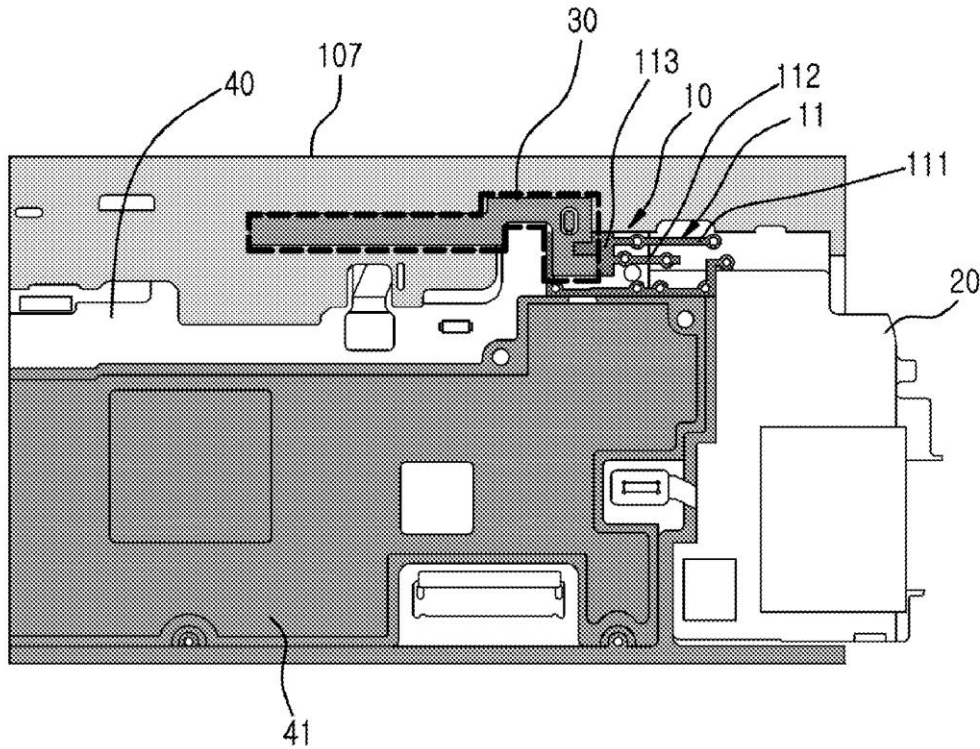
(21) Appl. No.: **14/291,419**

(22) Filed: **May 30, 2014**

(30) **Foreign Application Priority Data**

Jun. 21, 2013 (KR) ..... 10-2013-0071325

An electronic device is provided. The electronic device includes a first antenna radiator operating in at least one frequency band, and at least one second antenna radiator disposed proximate to the first antenna radiator coupled to at least one radiation pattern of the first antenna radiator, and to operate as a parasitic resonator.





US 20140375514A1

(19) **United States**

(12) **Patent Application Publication**  
**Bakalski**

(10) **Pub. No.: US 2014/0375514 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **ANTENNA TUNING CIRCUIT, METHOD FOR TUNING AN ANTENNA, ANTENNA ARRANGEMENT AND METHOD FOR OPERATING THE SAME**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 3/22** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 3/22** (2013.01)  
USPC ..... **343/745; 343/700 MS**

(71) Applicant: **Infineon Technologies AG**, Neubiberg (DE)

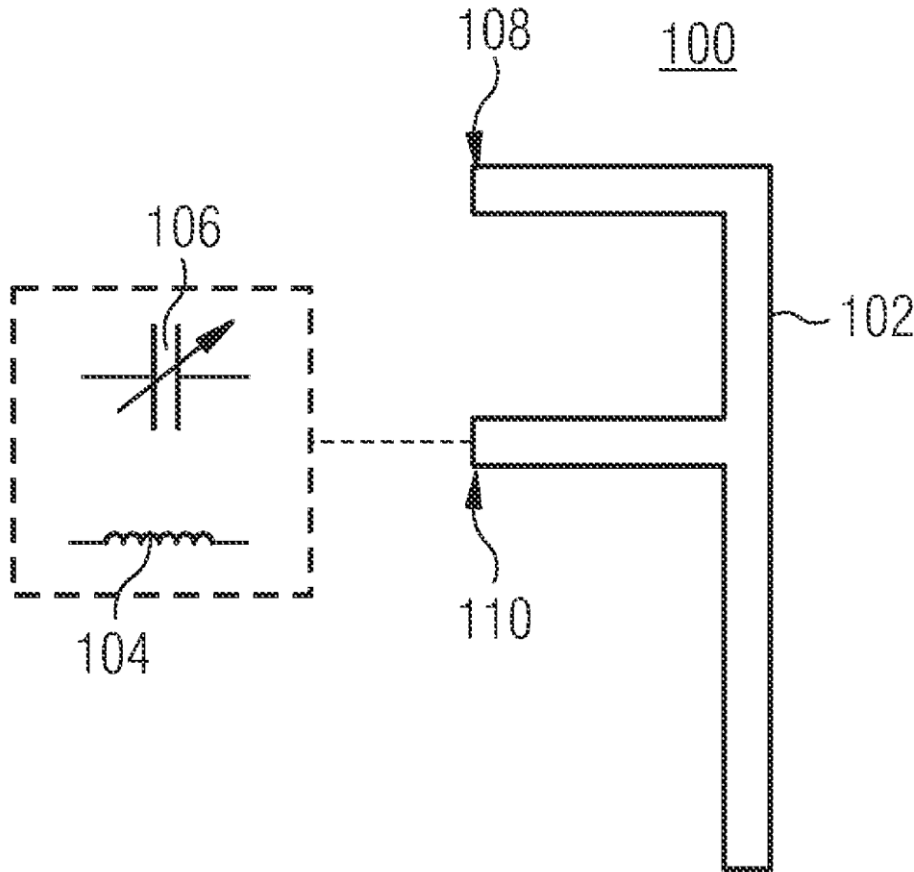
(72) Inventor: **Winfried Bakalski**, Muenchen (DE)

(57) **ABSTRACT**

An antenna tuning circuit is provided. The antenna tuning circuit includes an antenna, an inductor and a variable capacitance. The antenna includes a first terminal, which serves as a feed terminal, and a second terminal, which is separate from the first terminal. The inductor and the variable capacitance are coupled to the second terminal, to tune the antenna.

(21) Appl. No.: **13/922,080**

(22) Filed: **Jun. 19, 2013**





US 20140375515A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0375515 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **FREQUENCY TUNABLE ANTENNA**

(71) Applicant: **BlackBerry Limited**, Waterloo (CA)

(72) Inventors: **Meide QIU**, Ottawa (CA); **Qinjiang RAO**, Kanata (CA)

(73) Assignee: **BlackBerry Limited**, Waterloo (CA)

(21) Appl. No.: **13/922,355**

(22) Filed: **Jun. 20, 2013**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/36** (2006.01)

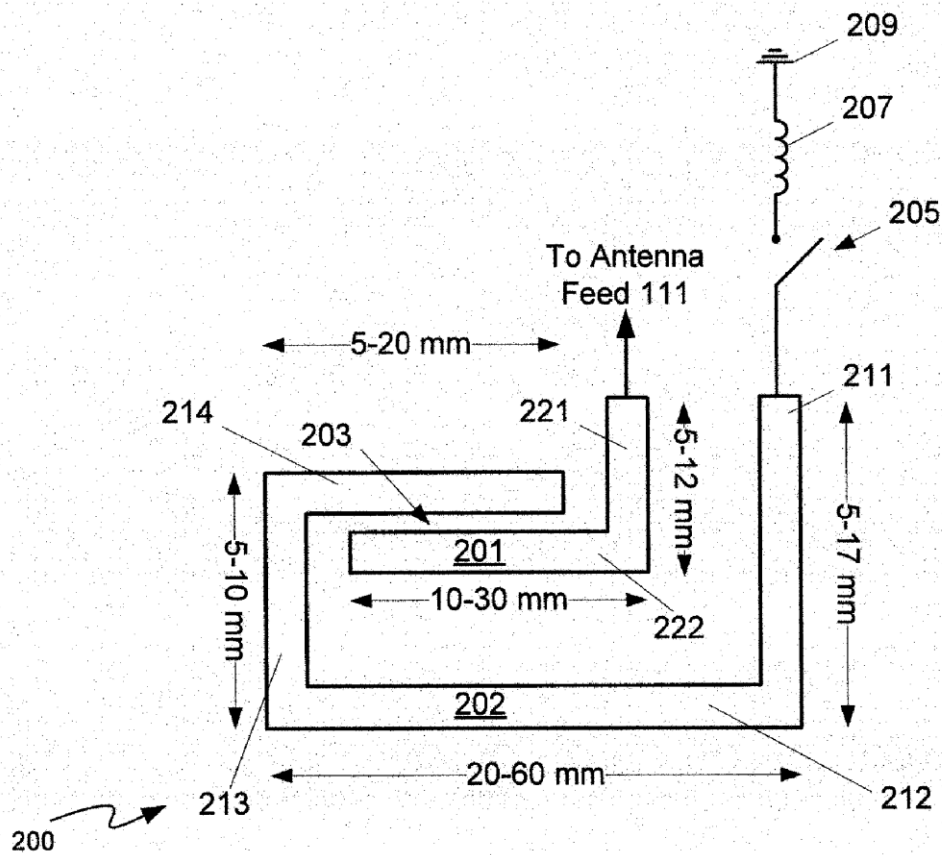
(52) **U.S. Cl.**

CPC ..... **H01Q 1/36** (2013.01)

USPC ..... **343/745**

(57) **ABSTRACT**

A frequency tunable antenna is provided. Specifically, a device is provided that includes: a ground; an antenna feed; a first radiating arm connected to the antenna feed; a second radiating arm capacitively coupled to the first radiating arm; a switch connected to the second radiating arm, the switch having an open position and a closed position; an inductor connected to the switch on one side and the ground on an opposite side, and, a processor in communication with the switch, the processor configured to open and close the switch to tune a resonance frequency of at least the second radiating arm thereby changing a resonant length of the second radiating arm depending on whether the inductor is connected thereto.





US 20140375520A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0375520 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **RADIO-FREQUENCY TRANSCEIVER  
DEVICE CAPABLE OF REDUCING SPECIFIC  
ABSORPTION RATE**

**Publication Classification**

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

(71) Applicant: **Wistron NeWeb Corporation**, Hsinchu  
(TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/52** (2013.01)  
USPC ..... **343/841**

(72) Inventors: **Yi-Feng Wu**, Hsinchu (TW);  
**Cheng-Wei Chang**, Hsinchu (TW);  
**Wei-Shan Chang**, Hsinchu (TW);  
**Chia-Tien Li**, Hsinchu (TW)

(57) **ABSTRACT**

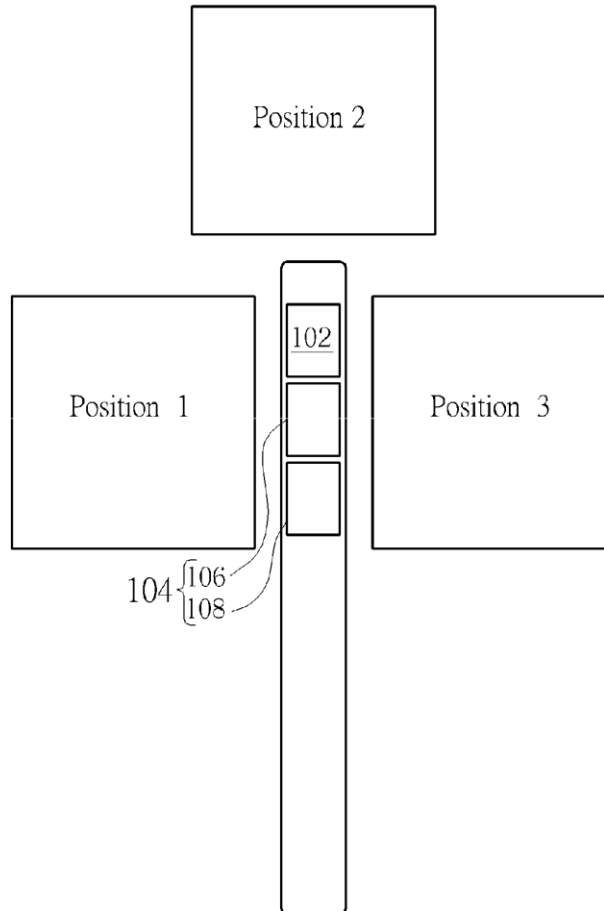
A radio-frequency transceiver device capable of reducing a specific absorption rate (SAR) includes an antenna including a radiating element and a grounding element, wherein the radiating element substantially extends along a first direction on a first plane; and a SAR suppression unit, substantially extending along the first direction and an edge of the radiating element of the antenna on the first plane and apart from the edge of the radiating element by a gap, for reducing the SAR of the antenna.

(21) Appl. No.: **14/308,718**

(22) Filed: **Jun. 19, 2014**

**Related U.S. Application Data**

(60) Provisional application No. 61/837,181, filed on Jun. 20, 2013.





US 20140375521A1

(19) **United States**

(12) **Patent Application Publication**  
**Andujar Linares et al.**

(10) **Pub. No.: US 2014/0375521 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **SCATTERED VIRTUAL ANTENNA  
TECHNOLOGY FOR WIRELESS DEVICES**

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

CPC ..... *H01Q 21/0006* (2013.01); *H01Q 21/30*  
(2013.01)

(71) Applicant: **Fractus, S.A.**, Barcelona (ES)

USPC ..... **343/843**; 343/852

(72) Inventors: **Aurora Andujar Linares**, Barcelona  
(ES); **Jaume Anguera Pros**, Vinaros  
(ES)

(57)

**ABSTRACT**

(21) Appl. No.: **14/308,175**

(22) Filed: **Jun. 18, 2014**

**Related U.S. Application Data**

(60) Provisional application No. 61/837,265, filed on Jun. 20, 2013.

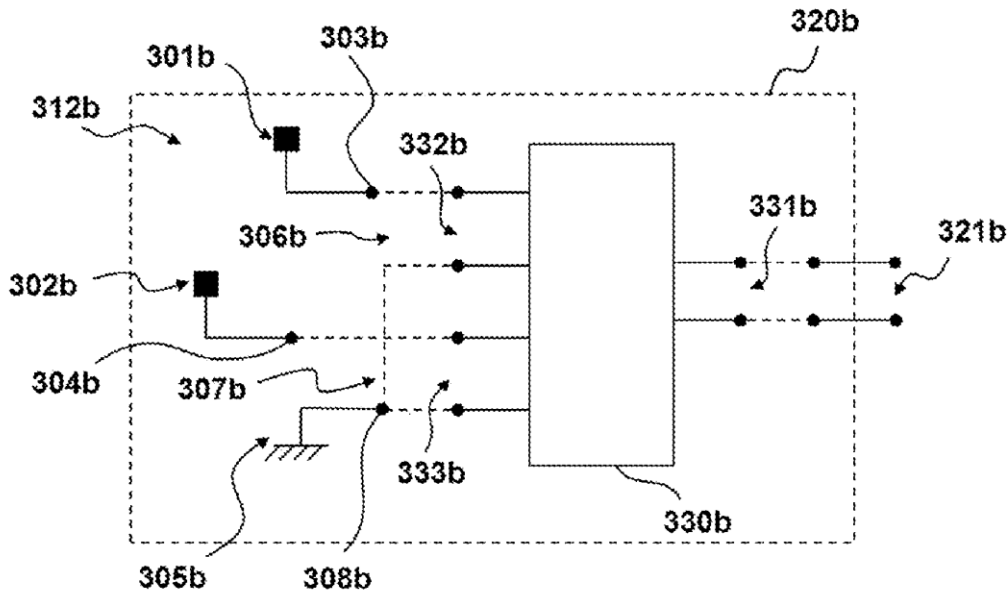
**Publication Classification**

(51) **Int. Cl.**

*H01Q 21/00* (2006.01)

*H01Q 21/30* (2006.01)

A wireless device includes at least one radiating system having a redundancy system and a combining system. The redundancy system includes two or more radiation boosters. The radiating system is characterized by its simplicity that facilitates its integration within the wireless device and achieves enhanced radio-electric performance in at least one frequency region of the electromagnetic spectrum, which may include multiple wireless services. The combining system enables a substantially balanced power distribution among the radiation boosters of the redundancy system, and the radiating system provides an increased robustness to human loading effects in at least one frequency region of operation.







US 2014037522A1

(19) **United States**

(12) **Patent Application Publication**  
**LIN**

(10) **Pub. No.: US 2014/037522 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **ANTENNA STRUCTURE AND WIRELESS COMMUNICATION DEVICE**

**Publication Classification**

(71) Applicant: **CHIUN MAI COMMUNICATION SYSTEMS, INC.**, New Taipei (TW)

(51) **Int. Cl.**  
**H01Q 21/00** (2006.01)

(72) Inventor: **YEN-HUI LIN**, New Taipei (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/0075** (2013.01)  
USPC ..... **343/853**

(73) Assignee: **CHIUN MAI COMMUNICATION SYSTEMS, INC.**, New Taipei (TW)

(57) **ABSTRACT**

(21) Appl. No.: **14/068,251**

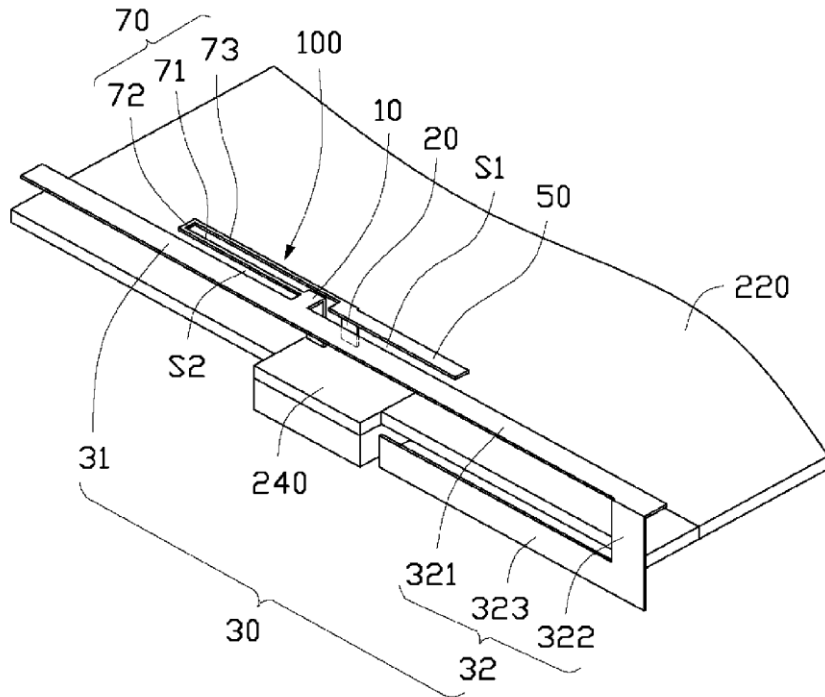
An antenna structure includes a feed portion, a ground portion, a first antenna, a second antenna, and a microstrip line. The first antenna includes a first radiating body and a second radiating body. The first radiating body and the second radiating body are both connected to the feed portion. The second antenna is connected to the ground portion and spaced from the second radiating body. The microstrip line is connected between the feed portion and the ground portion to adjust a matching impedance of the antenna structure.

(22) Filed: **Oct. 31, 2013**

(30) **Foreign Application Priority Data**

Jun. 20, 2013 (TW) ..... 102121840

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US 20140375527A1

(19) **United States**

(12) **Patent Application Publication**  
**Rutfors**

(10) **Pub. No.: US 2014/0375527 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **ANTENNA ARRANGEMENT**

**Publication Classification**

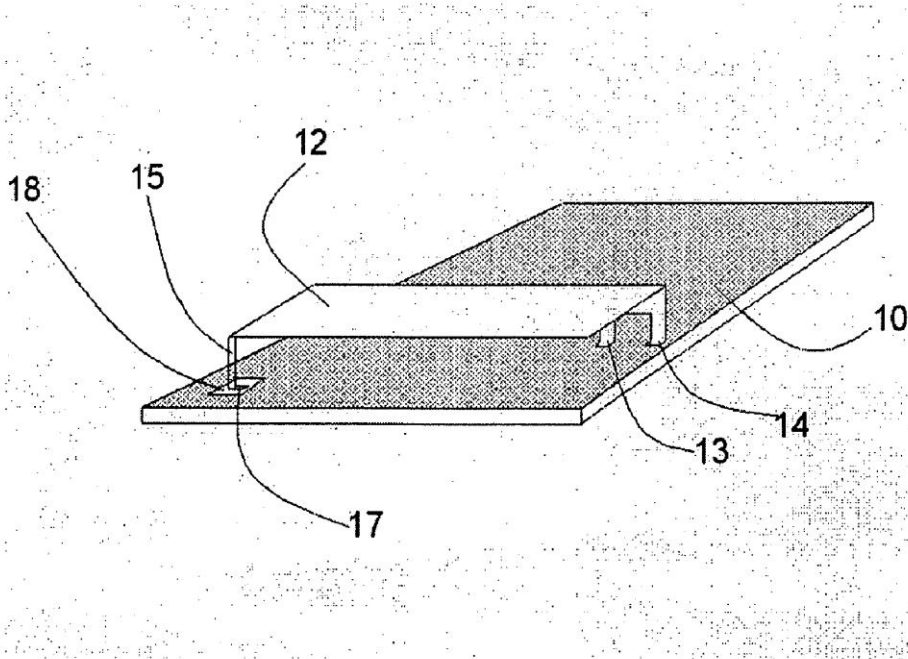
- (71) Applicant: **ProAnt AB**, Umea (SE)
- (72) Inventor: **Tomas Rutfors**, Holmsund (SE)
- (73) Assignee: **ProAnt AB**, Umea (SE)

- (51) **Int. Cl.**  
*H01Q 9/04* (2006.01)  
*H01Q 5/00* (2006.01)
- (52) **U.S. Cl.**  
CPC ..... *H01Q 9/045* (2013.01); *H01Q 5/0027* (2013.01)  
USPC ..... **343/906**

- (21) Appl. No.: **14/249,504**
- (22) Filed: **Apr. 10, 2014**
- (30) **Foreign Application Priority Data**

Apr. 29, 2013 (SE) ..... 1300312-4

(57) **ABSTRACT**  
The present invention provides a solution to how an antenna of the Patch or PIFA type can be made from a sheet metal in order for thereafter to be mounted on a printed circuit board with particularly formed mounting areas in order to provide both an inexpensive but yet robust and efficient antenna solution.





US 20140376534A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0376534 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **SYSTEM AND METHOD FOR OPTIMIZING SIGNAL QUALITY IN A WIFI NETWORK**

**Publication Classification**

(71) Applicant: **Ethertrionics, Inc.**, San Diego, CA (US)

(51) **Int. Cl.**  
*H04W 24/02* (2006.01)  
*H04W 84/12* (2006.01)

(72) Inventors: **Olivier Pajona**, Nice (FR); **Sebastian Rowson**, San Diego, CA (US); **Laurent Desclos**, San Diego, CA (US)

(52) **U.S. Cl.**  
CPC ..... *H04W 24/02* (2013.01); *H04W 84/12* (2013.01)

USPC ..... **370/338**

(73) Assignee: **Ethertrionics, Inc.**, San Diego, CA (US)

(57) **ABSTRACT**

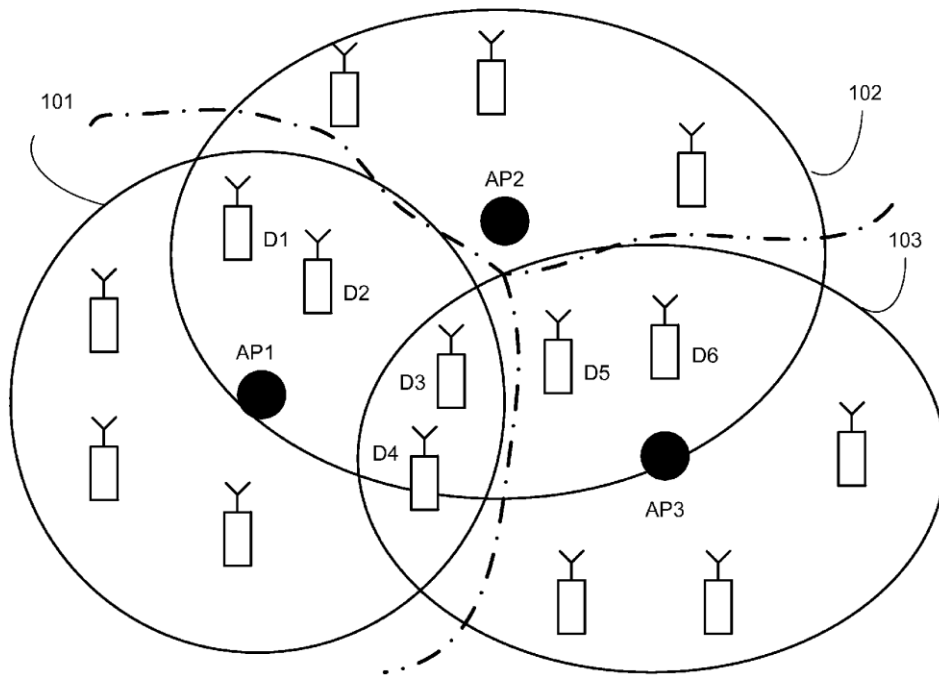
(21) Appl. No.: **14/313,256**

A system and method are provided for a WiFi network including multiple access points, each access point including an antenna having a plurality of modes corresponding to a plurality of radiation patterns, respectively, or an antenna system including a plurality of antennas having a plurality of modes corresponding to a plurality of radiation patterns, respectively, and a processor implemented with an algorithm. The algorithm is a computer program having instructions for performing steps to optimize signal quality for multiple devices linked to the WiFi network.

(22) Filed: **Jun. 24, 2014**

**Related U.S. Application Data**

(60) Provisional application No. 61/838,582, filed on Jun. 24, 2013.





US 20140378074A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0378074 A1**

(43) **Pub. Date: Dec. 25, 2014**

(54) **QUAD-BAND TUNABLE DIVERSITY  
ANTENNA FOR GLOBAL APPLICATIONS**

(52) **U.S. Cl.**  
CPC ..... *H04B 1/40* (2013.01); *H04B 7/0802*  
(2013.01)

USPC ..... *455/77*

(71) Applicant: **Motorola Solutions, Inc.**, Schaumburg,  
IL (US)

(57) **ABSTRACT**

(72) Inventors: **Guangli Yang**, Bellport, NY (US);  
**Sarika Jain**, Vernon Hills, IL (US)

An electronic device includes a main antenna and a diversity antenna. The diversity antenna includes a first portion configured to enable a transceiver to receive a signal in a first low-band frequency of four frequency bands. A second portion enables the transceiver to receive a signal in first and second high-band frequencies. A third portion is RF coupled to the first portion when the third portion is connected to ground. The third portion tunes the first portion such that the transceiver receives a signal in a second low-band frequency. A switch is connected between the third portion and the ground. When the switch is open, the first portion enables the transceiver to receive the signal in the first low-band frequency. When the switch is closed, the third portion tunes the first portion to enable the transceiver to receive the signal in the second low-band frequency.

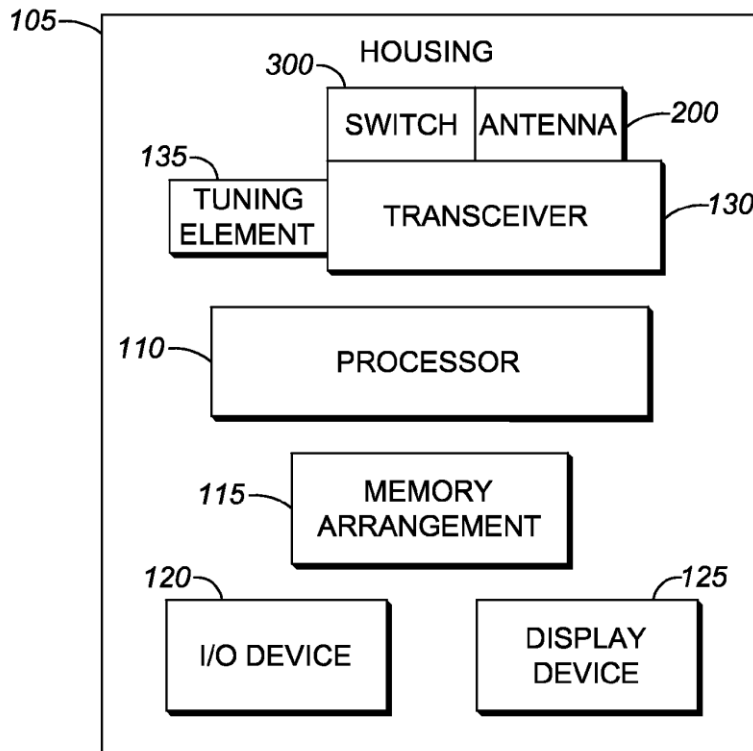
(21) Appl. No.: **13/923,551**

(22) Filed: **Jun. 21, 2013**

**Publication Classification**

(51) **Int. Cl.**  
*H04B 1/40* (2006.01)  
*H04B 7/08* (2006.01)

**MU**  
**100**





US 20150002339A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002339 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **MULTIBAND ANTENNA**

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

(71) Applicant: **Chiun Mai Communication Systems, Inc.**, New Taipei (TW)

CPC ..... **H01Q 9/04** (2013.01)

USPC ..... **343/700 MS**

(72) Inventors: **TE-CHANG LIN**, New Taipei (TW);  
**CHO-KANG HSU**, New Taipei (TW)

(57) **ABSTRACT**

(73) Assignee: **CHIUN MAI COMMUNICATION SYSTEMS, INC.**, New Taipei (TW)

(21) Appl. No.: **14/018,553**

(22) Filed: **Sep. 5, 2013**

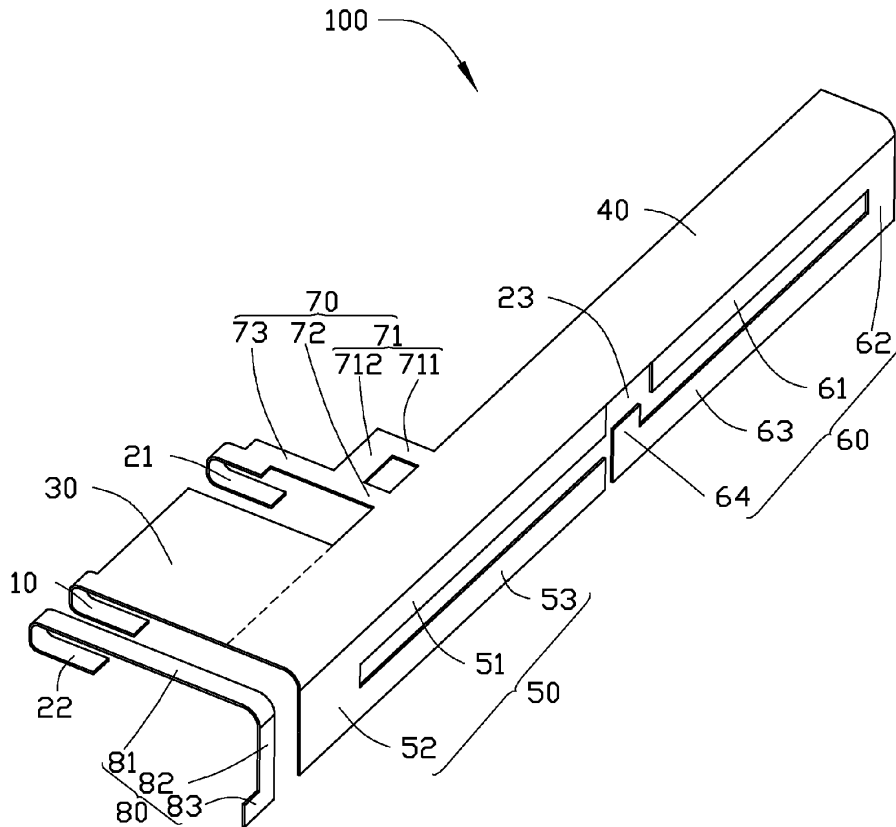
(30) **Foreign Application Priority Data**

Jun. 28, 2013 (TW) ..... 102123338

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)

A multiband antenna includes a feed end, a first grounding end, a first main portion connected to the feed end, a second main portion, a first radiating portion, a second radiating portion, and a third radiating portion. The second main portion is coplanar with and connected to the first main portion. The first radiating portion is connected to a first edge of the second main portion opposite to the first main portion. The second radiating portion is connected to the first edge of the second main portion and spaced from the first radiating portion. The third radiating portion is connected to a second edge of the second main portion opposite to the first radiating portion. The first grounding end is connected to the third radiating portion.





US 20150002340A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002340 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **ANTENNA STRUCTURE AND WIRELESS COMMUNICATION DEVICE USING THE SAME**

**Publication Classification**

(71) Applicant: **Chiun Mai Communication Systems, Inc.**, New Taipei (TW)

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)

(72) Inventors: **GENG-HONG LIOU**, New Taipei (TW); **YEN-HUI LIN**, New Taipei (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 9/04** (2013.01)  
USPC ..... **343/700 MS**

(73) Assignee: **CHIUN MAI COMMUNICATION SYSTEMS, INC.**, New Taipei (TW)

(57) **ABSTRACT**

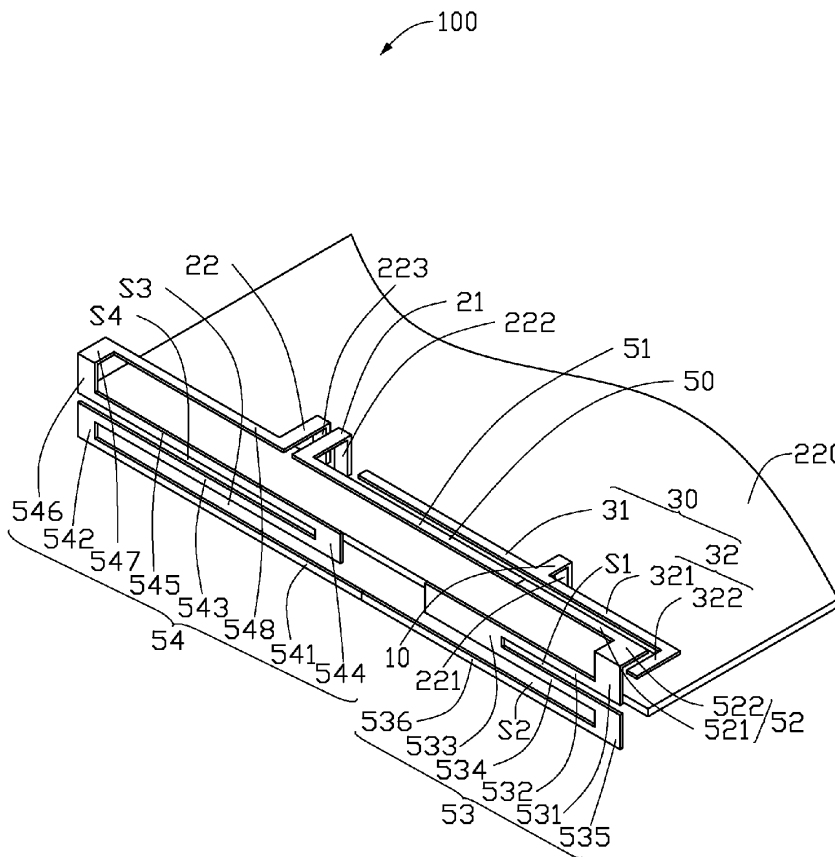
(21) Appl. No.: **14/224,848**

An antenna structure includes a feed portion, a first ground portion, a second ground portion, a first antenna, and a second antenna. The first antenna includes a first radiator and a second radiator. The second antenna includes a first radiation portion, a second radiation portion, a third radiation portion, and a fourth radiation portion. The first radiation portion, the second radiation portion, the third radiation portion, and the fourth radiation portion are connected in turn to substantially form a loop structure. Both of the first radiator and the second radiator are connected to the feed portion, the first radiator is parallel to the first radiation portion, the second radiator is parallel to the second radiation portion, the first radiation portion is connected to the first ground portion, and the fourth radiation portion is connected to the second ground portion.

(22) Filed: **Mar. 25, 2014**

(30) **Foreign Application Priority Data**

Jun. 27, 2013 (TW) ..... 102122950





US 20150002341A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002341 A1**  
(43) **Pub. Date: Jan. 1, 2015**

(54) **RADIATOR FRAME HAVING ANTENNA PATTERN EMBEDDED THEREIN, ANTENNA PATTERN FRAME INCLUDING RADIATOR FRAME, AND ELECTRONIC DEVICE INCLUDING ANTENNA PATTERN FRAME**

(30) **Foreign Application Priority Data**

Jun. 28, 2013 (KR) ..... 10-2013-0076013

**Publication Classification**

(71) Applicant: **SAMSUNG ELECTRO-MECHANICS CO., LTD.**, Suwon (KR)

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

(72) Inventors: **Sung Eun CHO**, Suwon (KR); **Hyeon Gil . NAM**, Suwon (KR); **Dae Kyu . LEE**, Suwon (KR); **Nam Ki . KIM**, Suwon (KR); **Dae Seong JEON**, Suwon (KR); **Dae Ki . LIM**, Suwon (KR); **Hyun Do PARK**, Suwon (KR); **Sang Woo . BAE**, Suwon (KR); **Ha Ryong HONG**, Suwon (KR); **Chan Gwang Gwang AN**, Suwon (KR)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/243** (2013.01)  
USPC ..... **343/702**

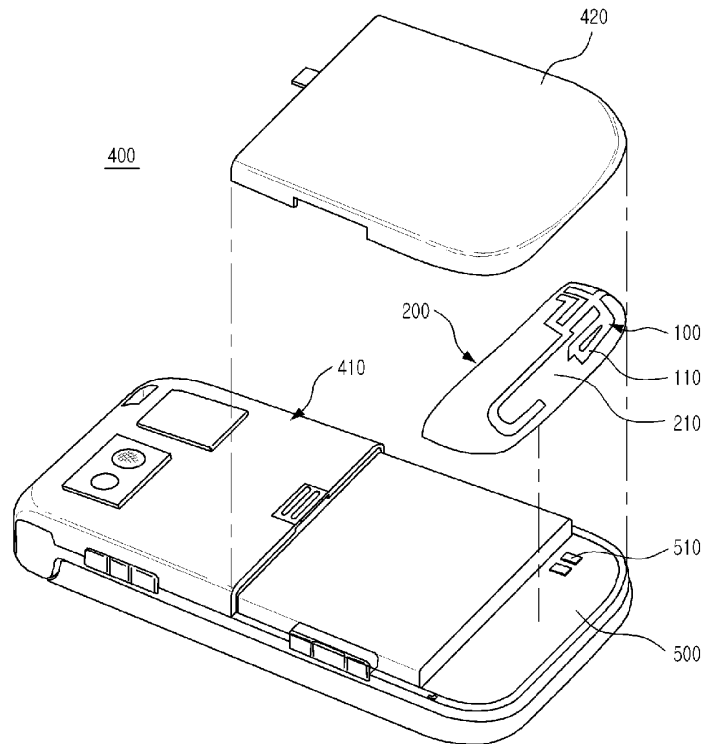
(57) **ABSTRACT**

There are provided a radiator frame having an antenna pattern embedded therein, an antenna pattern frame including the radiator frame, and an electronic device including the antenna pattern frame. The radiator frame includes: a radiator including an antenna pattern part transmitting or receiving a signal and a connection terminal part electrically connecting the antenna pattern part and a circuit board to each other; and a molding frame formed by injection-molding the radiator so that the antenna pattern part is exposed to one surface and the connection terminal part is exposed to the other surface, a surface opposite to the one surface, wherein the antenna pattern part includes one or more spikes molded in and fixed to the molding frame, and the molding frame includes one or more connection part trace grooves formed from end portions of one or more spikes toward an edge of the molding frame.

(73) Assignee: **SAMSUNG ELECTRO-MECHANICS CO., LTD.**, Suwon (KR)

(21) Appl. No.: **14/029,458**

(22) Filed: **Sep. 17, 2013**





US 20150002347A1

(19) **United States**

(12) **Patent Application Publication**  
**Jeong**

(10) **Pub. No.: US 2015/0002347 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **ANTENNA WITH A COMBINED BANDPASS/BANDSTOP FILTER NETWORK**

(57) **ABSTRACT**

(71) Applicant: **Research In Motion Limited**, Waterloo (CA)

(72) Inventor: **Seong Heon Jeong**, Irving, TX (US)

(21) Appl. No.: **13/931,036**

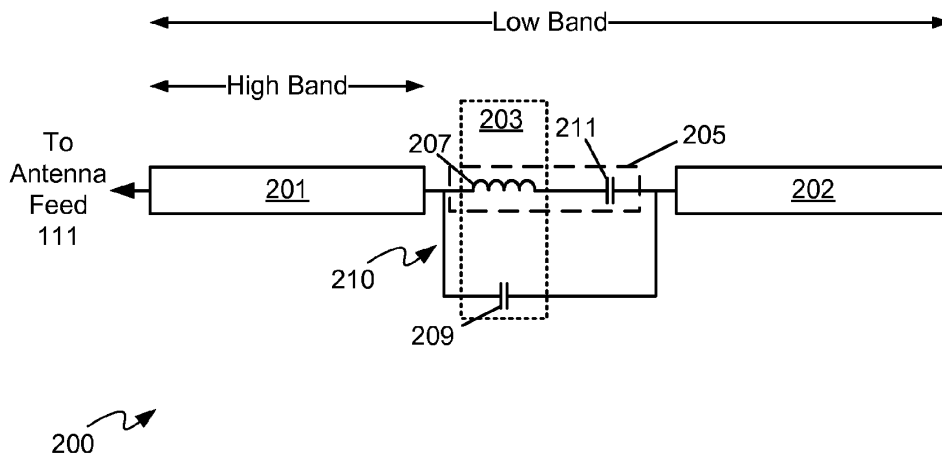
(22) Filed: **Jun. 28, 2013**

An antenna with a combined bandpass/bandstop filter network is provided. The antenna includes: a first radiating arm connectable to an antenna feed, the first radiating arm configured to resonate at a first frequency; a second radiating arm, the second radiating arm and the first radiating arm, when electrically connected, configured to resonate at a second frequency lower than the first frequency; and, a filter network comprising a bandstop filter and a bandpass filter, the filter network filtering an electrical connection between the first radiating arm and the second radiating arm, the filter network configured to: electrically isolate the first radiating arm from the second radiating arm at the first frequency, and electrically connect the first radiating arm and the second radiating arm at the second frequency.

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/36** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/36** (2013.01)  
USPC ..... **343/722**







(19) **United States**

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

(10) **Pub. No.: US 2015/0002348 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **COMMUNICATION DEVICE WITH RECONFIGURABLE LOW-PROFILE ANTENNA ELEMENT**

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 3/01* (2006.01)

(52) **U.S. Cl.**  
CPC ..... *H01Q 3/01* (2013.01)  
USPC ..... **343/724**

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

(72) Inventors: **Kin-Lu Wong**, New Taipei City (TW);  
**Meng-Ting Chen**, New Taipei City (TW)

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

(21) Appl. No.: **14/071,660**

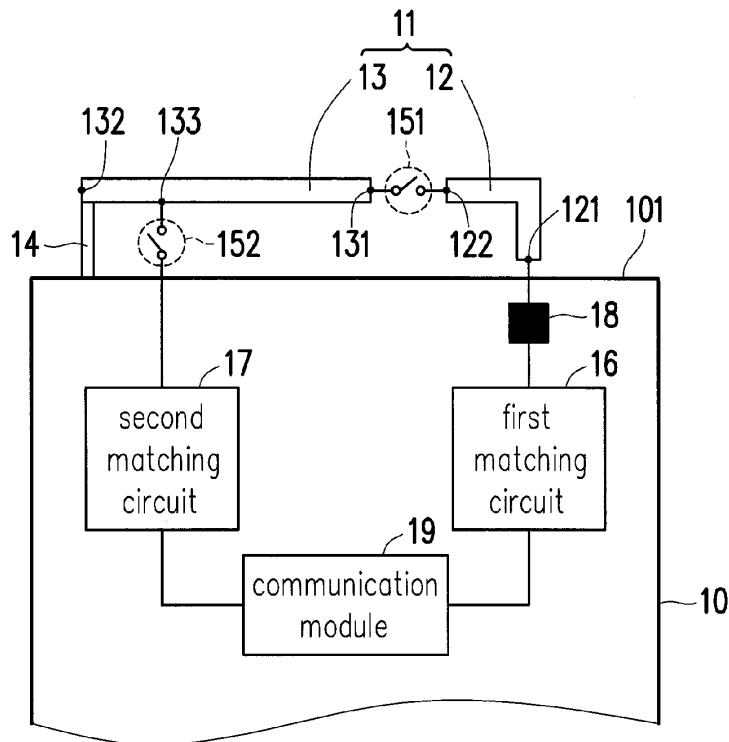
(22) Filed: **Nov. 5, 2013**

(30) **Foreign Application Priority Data**

Jun. 27, 2013 (TW) ..... 102122988

(57) **ABSTRACT**

A communication device including a ground element and an antenna element is provided. The antenna element is disposed adjacent to an edge of the ground element, and a loop structure is formed by the antenna element and the edge of the ground element. The antenna element includes a first and a second metal portions. The first metal portion has a first and a second ends. The first end is a first feeding point of the antenna element and connected to a communication module through a capacitive element. The second metal portion has a third end connected to the second end through a first switch and a fourth end connected to the ground element through a shorting metal portion. The second metal portion further has a second feeding point connected to the communication module through a second switch and disposed away from the third end and close to the fourth end.





US 20150002349A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002349 A1**  
(43) **Pub. Date: Jan. 1, 2015**

(54) **RADIO-FREQUENCY DEVICE AND WIRELESS COMMUNICATION DEVICE FOR ENHANCING ANTENNA ISOLATION**

**Publication Classification**

(71) Applicant: **Wistron NeWeb Corporation**, Hsinchu (TW)

(51) **Int. Cl.**  
*H01Q 21/28* (2006.01)  
*H01Q 1/48* (2006.01)  
(52) **U.S. Cl.**  
CPC . *H01Q 21/28* (2013.01); *H01Q 1/48* (2013.01)  
USPC ..... 343/727; 343/848

(72) Inventors: **Yen-Chun Peng**, Hsinchu (TW);  
**Yen-Liang Wu**, Hsinchu (TW);  
**Cheng-Geng Jan**, Hsinchu (TW);  
**Guo-Cheng Tsai**, Hsinchu (TW);  
**Huang-Tse Peng**, Hsinchu (TW);  
**Chin-Jui Wu**, Hsinchu (TW)

(57) **ABSTRACT**

(73) Assignee: **Wistron NeWeb Corporation**, Hsinchu (TW)

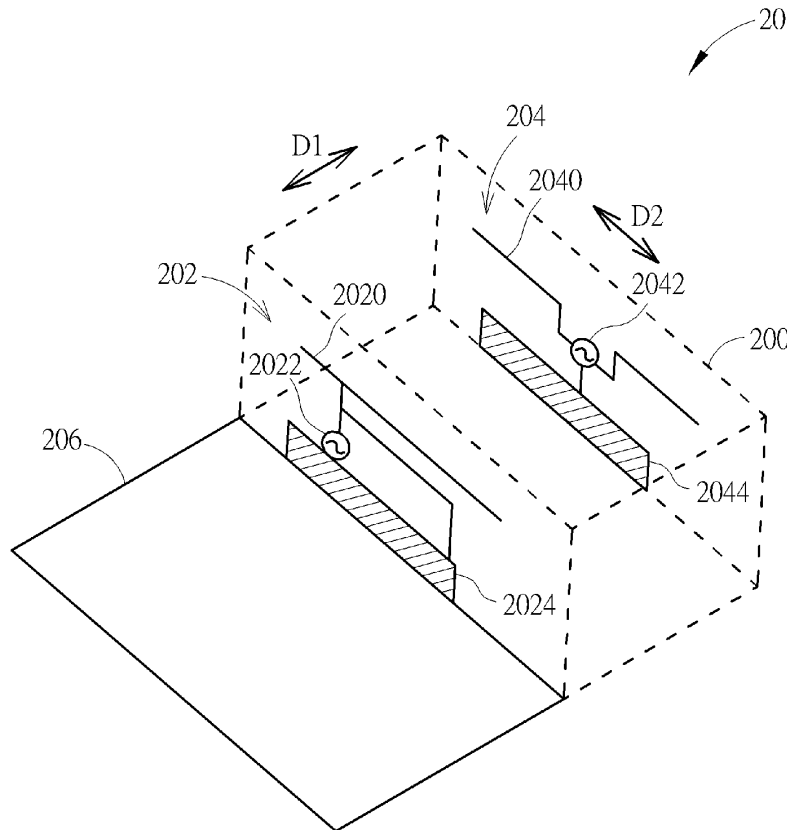
A radio-frequency device for a wireless communication device includes an antenna disposition area; a plurality of linearly polarized antennas for transmitting and receiving a plurality of radio signals, wherein the plurality of linearly polarized antennas are substantially disposed in the antenna disposition area in a manner such that polarization directions of the plurality of linearly polarized antennas are orthogonal to each other; and a grounding resonant element coupled to a grounding terminal of one of the plurality of linearly polarized antennas for enhancing isolations of the plurality of linearly polarized antennas.

(21) Appl. No.: **14/269,191**

(22) Filed: **May 4, 2014**

(30) **Foreign Application Priority Data**

Jun. 28, 2013 (TW) ..... 102123231





US 20150002351A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002351 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **SLOT ANTENNA WITH A COMBINED BANDPASS/BANDSTOP FILTER NETWORK**

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

CPC ..... **H01Q 13/103** (2013.01)

USPC ..... **343/750; 343/749**

(71) Applicant: **Research In Motion Limited**, Waterloo (CA)

(57) **ABSTRACT**

(72) Inventors: **Seong Heon Jeong**, Irving, TX (US);  
**David Fisk**, Bedford, TX (US)

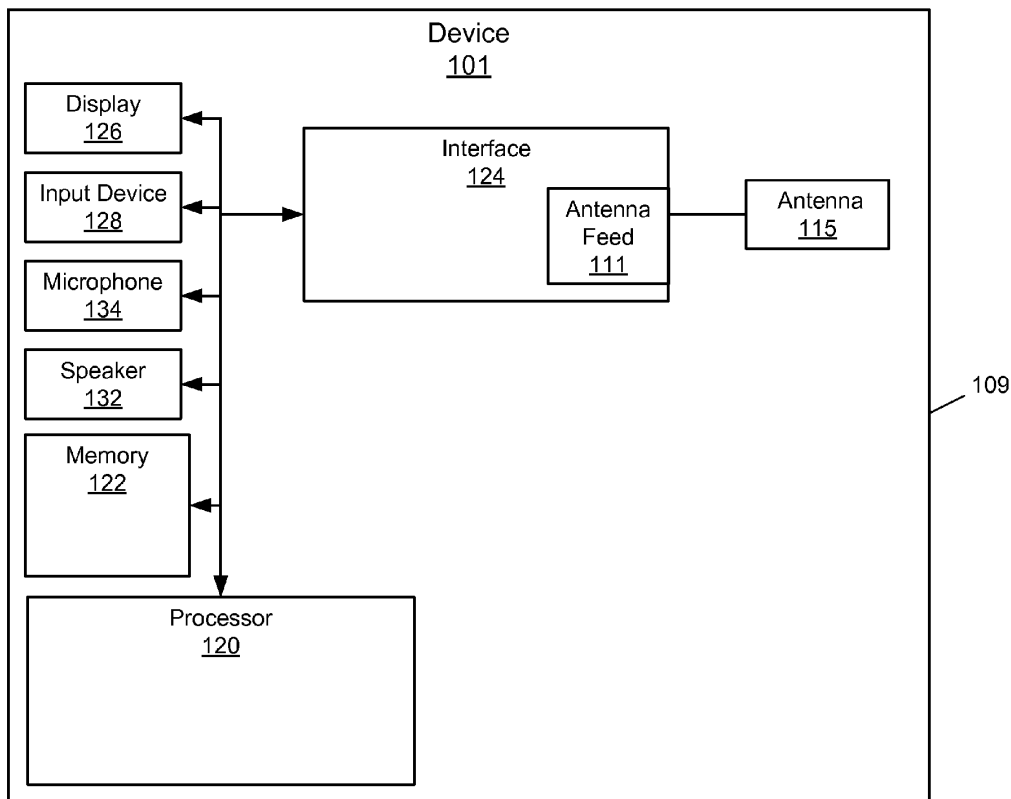
A slot antenna with a filter network is provided. The slot antenna is connectable to an antenna feed, and configured to resonate at a first frequency when surface current from the antenna feed flows around the slot antenna, the slot antenna comprising a first side and a second side separated by a width. A filter network bridges the first side and the second side, across the width, at a given position from a surface-current-originating end of slot antenna, the filter network configured to: electrically isolate the first side from the second side at the first frequency so that a length of the slot antenna defines a resonant length of the slot antenna at the first frequency; and, electrically connect the first side to the second side at a second frequency higher than the first frequency, so that the surface current flows across the filter network at the given position.

(21) Appl. No.: **13/930,981**

(22) Filed: **Jun. 28, 2013**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 13/10** (2006.01)





US 20150002353A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002353 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **ANTENNA DEVICE**

**Publication Classification**

(71) Applicant: **Panasonic Corporation**, Osaka (JP)

(51) **Int. Cl.**  
**H01Q 13/10** (2006.01)

(72) Inventors: **Yuichi Kashino**, Ishikawa (JP);  
**Hiroyuki Uno**, Ishikawa (JP); **Suguru Fujita**, Tokyo (JP); **Ryosuke Shiozaki**, Kanagawa (JP); **Kentaro Watanabe**, Hyogo (JP)

(52) **U.S. Cl.**  
CPC ..... **H01Q 13/106** (2013.01)  
USPC ..... **343/770**

(57) **ABSTRACT**

There is provided an antenna device which can suitably tilt directivity of an antenna. The antenna device includes a dielectric substrate, a conductive plate arranged on one surface of the dielectric substrate, a first slot element to which electric power is supplied from a power supply line, which has an electrical length having an approximately  $\frac{1}{2}$  wavelength of use frequency of the antenna device, and which is formed in the conductive plate, a second slot element which has an electrical length longer than that of the first slot element, and which is formed in the conductive plate to be substantially parallel to the first slot element by leaving a gap of an approximately  $\frac{1}{4}$  wavelength of the electrical length from the first slot element, and a ground conductor arranged to be substantially parallel to the conductive plate by leaving a predetermined gap from the conductive plate.

(21) Appl. No.: **14/381,061**

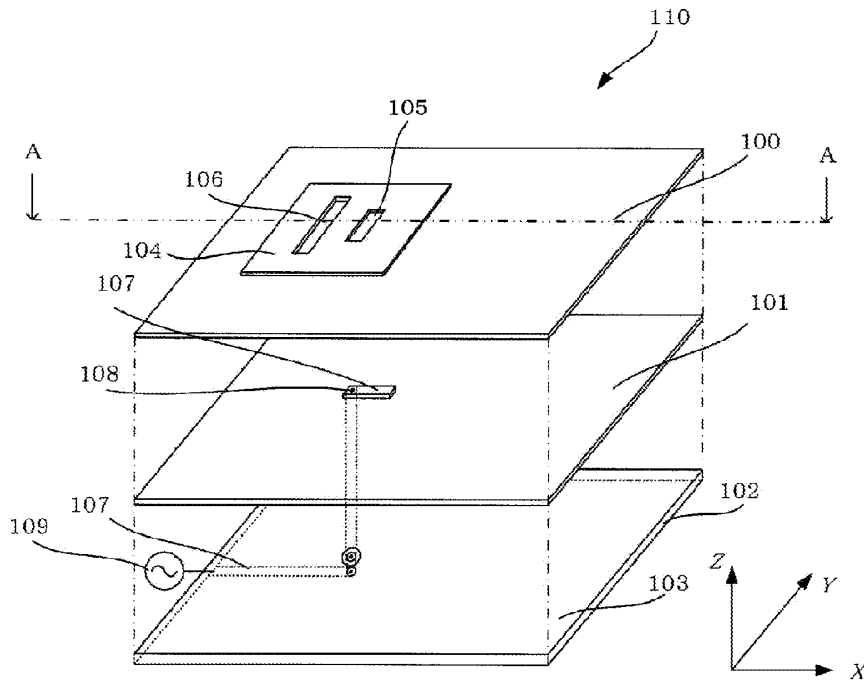
(22) PCT Filed: **Dec. 25, 2013**

(86) PCT No.: **PCT/JP2013/007599**

§ 371 (c)(1),  
(2) Date: **Aug. 26, 2014**

(30) **Foreign Application Priority Data**

Dec. 28, 2012 (JP) ..... 2012-289071





US 20150002359A1

(19) **United States**

(12) **Patent Application Publication**

**Dong et al.**

(10) **Pub. No.: US 2015/0002359 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **ANTENNAS WITH SHARED GROUNDING STRUCTURE**

(71) Applicant: **QUALCOMM Incorporated**, San Diego, CA (US)

(72) Inventors: **Yuandan Dong**, San Diego, CA (US);  
**Guining Shi**, San Diego, CA (US);  
**Allen Minh-Triet Tran**, San Diego, CA (US)

(21) Appl. No.: **13/932,105**

(22) Filed: **Jul. 1, 2013**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 21/00** (2006.01)

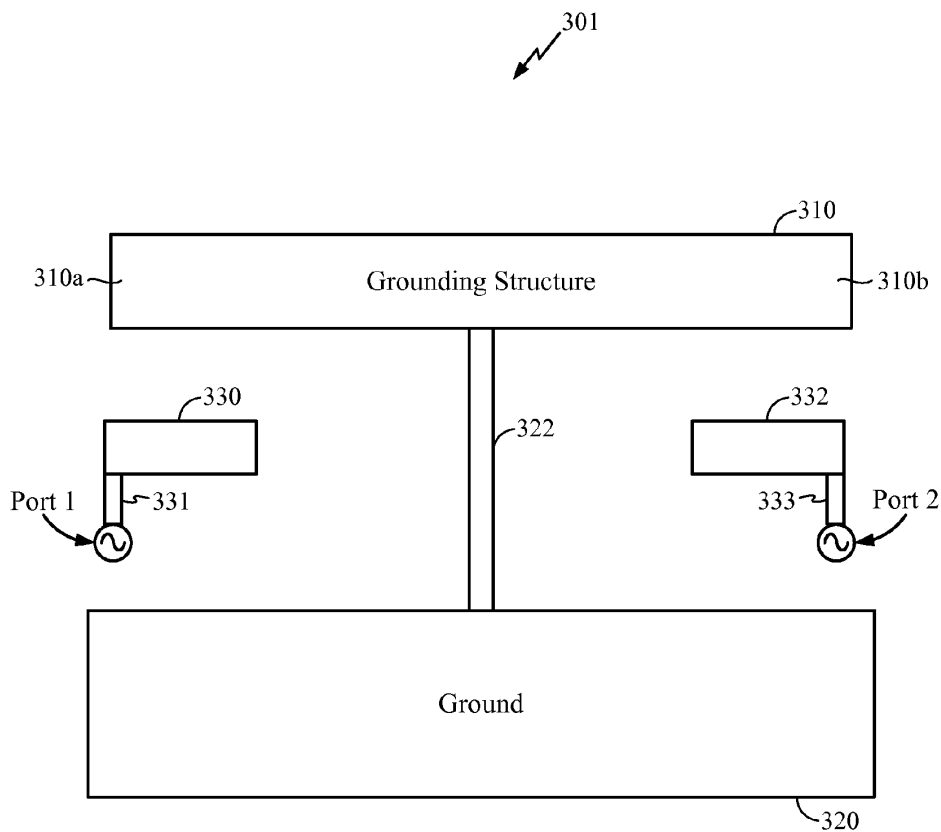
(52) **U.S. Cl.**

CPC ..... **H01Q 21/0006** (2013.01)

USPC ..... **343/853; 29/600**

(57) **ABSTRACT**

Techniques for providing multiple antennas in a wireless device using a compact configuration to achieve good isolation and broad bandwidth. In an aspect, first and second monopole elements that may be separately driven are provided on opposite sides of a grounding strip conductively coupled to a common grounding structure. By capacitively coupling the first and second monopole elements to the common grounding structure, the effective resonator size of each monopole antenna is increased, thus achieving better performance for the antenna structure. Illustrative patterns for the common grounding structure and other antenna elements are further disclosed.





US 20150002363A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002363 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **COMMUNICATION DEVICE AND ANTENNA ELEMENT THEREIN**

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

CPC . **H01Q 1/36** (2013.01); **H01Q 1/50** (2013.01);  
**H01Q 5/001** (2013.01)

USPC ..... **343/860**; 343/700 MS

(71) Applicant: **ACER INCORPORATED**, NEW  
TAIPEI CITY (TW)

(72) Inventors: **Kin-Lu WONG**, New Taipei City (TW);  
**Hung-Jen HSU**, New Taipei City (TW)

(57)

**ABSTRACT**

(73) Assignee: **ACER INCORPORATED**, NEW  
TAIPEI CITY (TW)

(21) Appl. No.: **14/012,314**

(22) Filed: **Aug. 28, 2013**

(30) **Foreign Application Priority Data**

Jun. 26, 2013 (TW) ..... 102122644

**Publication Classification**

(51) **Int. Cl.**

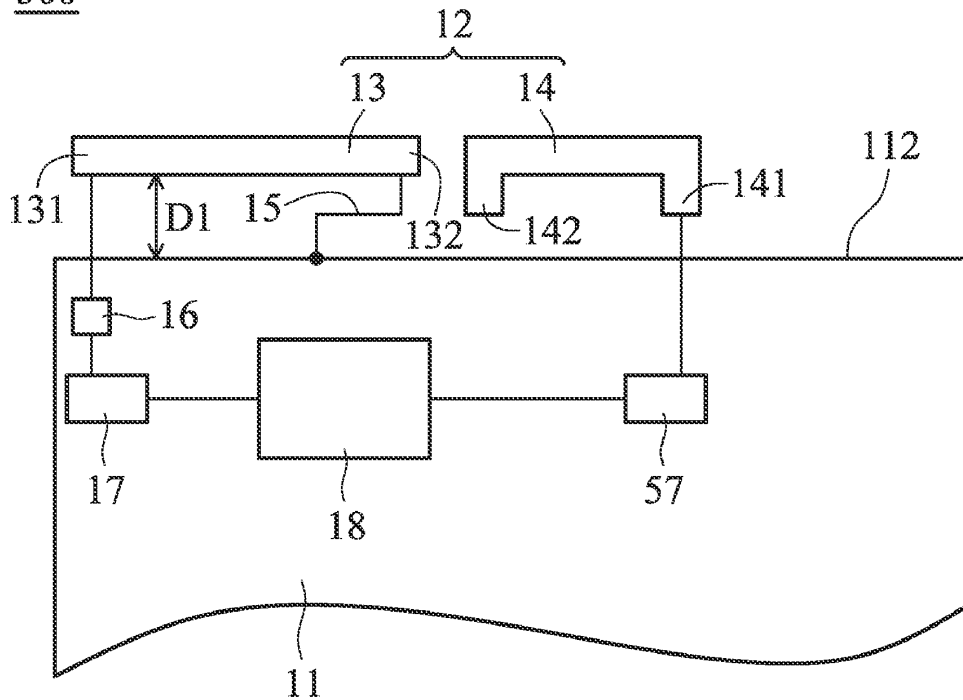
**H01Q 1/36** (2006.01)

**H01Q 5/00** (2006.01)

**H01Q 1/50** (2006.01)

A communication device includes a ground element and an antenna element. The antenna element is disposed adjacent to an edge of the ground element. The antenna element includes a first metal element and a second metal element. The first metal element has a first end and a second end. The first end is coupled through a capacitive element to a communication module. The second end is coupled through a shorting element to the ground element. The second metal element has a third end and a fourth end. The third end is coupled to the communication module. The fourth end is open. The first metal element and the second metal element are adjacent to each other, but not connected to each other. The first metal element and the second metal element have projections on the edge of the ground element, wherein the projections do not overlap with each other.

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US 20150002366A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002366 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **ANTENNA STRUCTURE AND WIRELESS COMMUNICATION DEVICE EMPLOYING SAME**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 21/00** (2006.01)  
(52) **U.S. Cl.**  
CPC ..... **H01Q 21/00** (2013.01)  
USPC ..... **343/893**

(71) Applicant: **FIH (Hong Kong) Limited**, Kowloon (HK)

(72) Inventors: **CHUAN-CHOU CHI**, New Taipei (TW); **CHI-SHENG LIU**, New Taipei (TW); **CHIH-YANG TSAI**, New Taipei (TW); **HAO-YING CHANG**, New Taipei (TW); **CHAO-WEI HO**, New Taipei (TW); **PAI-CHENG HUANG**, New Taipei (TW)

(57) **ABSTRACT**

An antenna structure includes a main antenna, a diversity antenna, and at least one accessorial antenna. The main antenna extends in a main antenna direction. The diversity antenna is spaced apart from the main antenna and extends in a first radiation direction substantially parallel to the main antenna direction. The at least one accessorial antenna extends in a second radiation direction which is substantially perpendicular to either the main antenna direction or the first radiation direction.

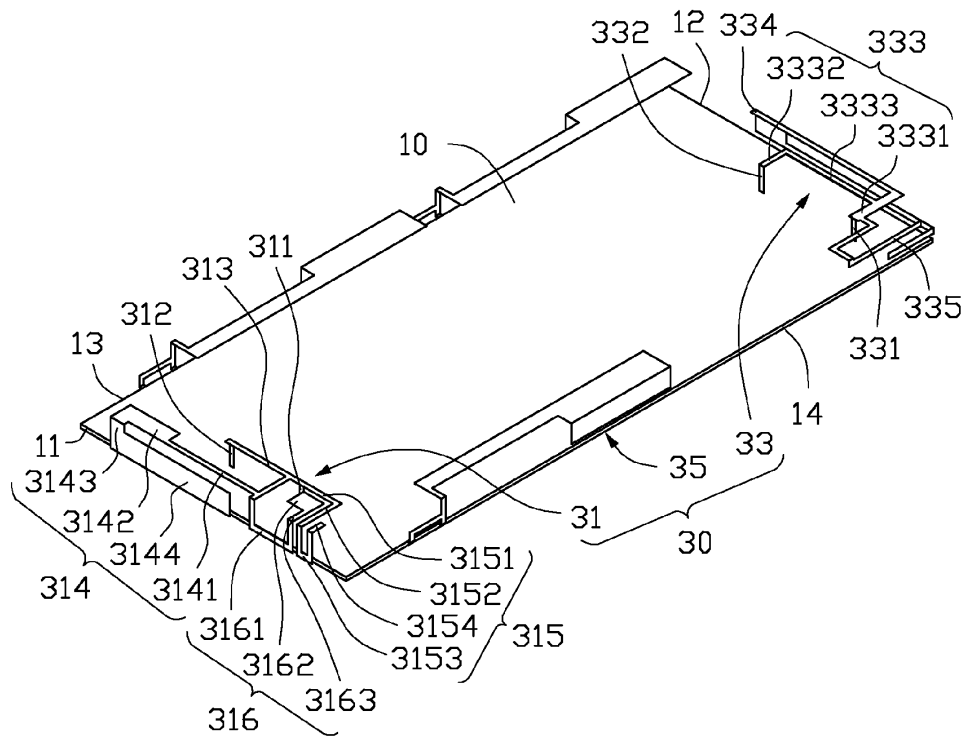
(21) Appl. No.: **14/315,008**

(22) Filed: **Jun. 25, 2014**

(30) **Foreign Application Priority Data**

Jun. 28, 2013 (TW) ..... 102123216

100





US 20150002367A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0002367 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **ANTENNA DEVICE AND WIRELESS  
TERMINAL DEVICE USING THE SAME**

**Publication Classification**

(71) Applicant: **NEC CORPORATION**, Tokyo (JP)

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

(72) Inventors: **Keishi Kosaka**, Tokyo (JP); **Hiroshi Toyao**, Tokyo (JP); **Yoshiaki Kasahara**, Tokyo (JP)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/523** (2013.01)  
USPC ..... **343/893**

(73) Assignee: **NEC CORPORATION**, Minato-ku, Tokyo (JP)

(57) **ABSTRACT**

(21) Appl. No.: **14/375,179**

There are provided an antenna device that comprises: a conductor plate; at least two antenna elements arranged near an end of the conductor plate; a first slotline formed into the conductor plate, the first slotline having a characteristic impedance of an optional numerical value  $Z1$ ; a second slotline formed into the conductor plate, the second slotline having a characteristic impedance of an optional numerical value  $Z2$  larger than  $Z1$ ; one end of the first slotline being an open end in an area between the antenna elements within the conductor plate end; the other end of the first slotline connecting with one end of the second slotline; and the other end of the second slotline being short-circuited inside the conductor plate, and wireless terminal apparatus using this.

(22) PCT Filed: **Mar. 15, 2013**

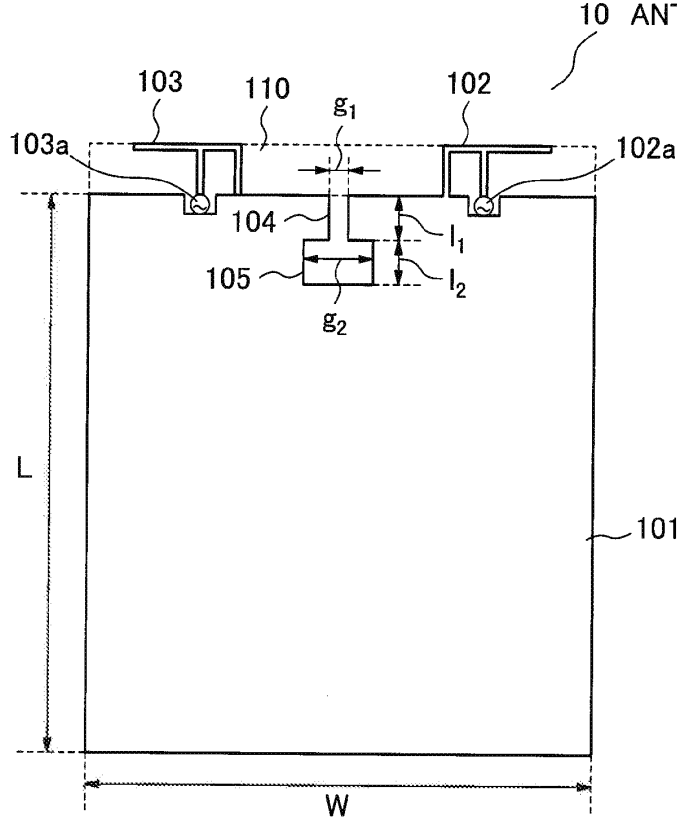
(86) PCT No.: **PCT/JP2013/001767**

§ 371 (c)(1),  
(2) Date: **Jul. 29, 2014**

(30) **Foreign Application Priority Data**

Mar. 22, 2012 (JP) ..... 2012-064789

**10 ANTENNA DEVICE**







US 20150005037A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0005037 A1**

(43) **Pub. Date: Jan. 1, 2015**

(54) **ANTENNA SYSTEM WITH RECEIVER DIVERSITY AND TUNABLE MATCHING CIRCUIT**

(52) **U.S. Cl.**  
CPC ..... **H04M 1/026** (2013.01); **H01Q 1/243** (2013.01); **H01Q 21/30** (2013.01); **H04M 1/0266** (2013.01)  
USPC ..... **455/566**; **455/575.7**

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Ruben Caballero**, San Jose, CA (US); **Mattia Pascolini**, San Francisco, CA (US); **Mohit Narang**, Cupertino, CA (US); **Matthew A. Mow**, Los Altos, CA (US); **Robert W. Schlub**, Cupertino, CA (US)

(57) **ABSTRACT**

Electronic devices may be provided that contain wireless communications circuitry. The wireless communications circuitry may include radio-frequency transceiver circuitry and antenna structures. An electronic device may include a display mounted within a housing. A peripheral conductive member may run around the edges of the display and housing. Dielectric-filled gaps may divide the peripheral conductive member into individual segments. A ground plane may be formed within the housing from conductive housing structures, printed circuit boards, and other conductive elements. The ground plane and the segments of the peripheral conductive member may form antennas in upper and lower portions of the housing. The radio-frequency transceiver circuitry may implement receiver diversity using both the upper and lower antennas. The lower antenna may be used in transmitting signals. The upper antenna may be tuned using a tunable matching circuit.

(21) Appl. No.: **14/490,576**

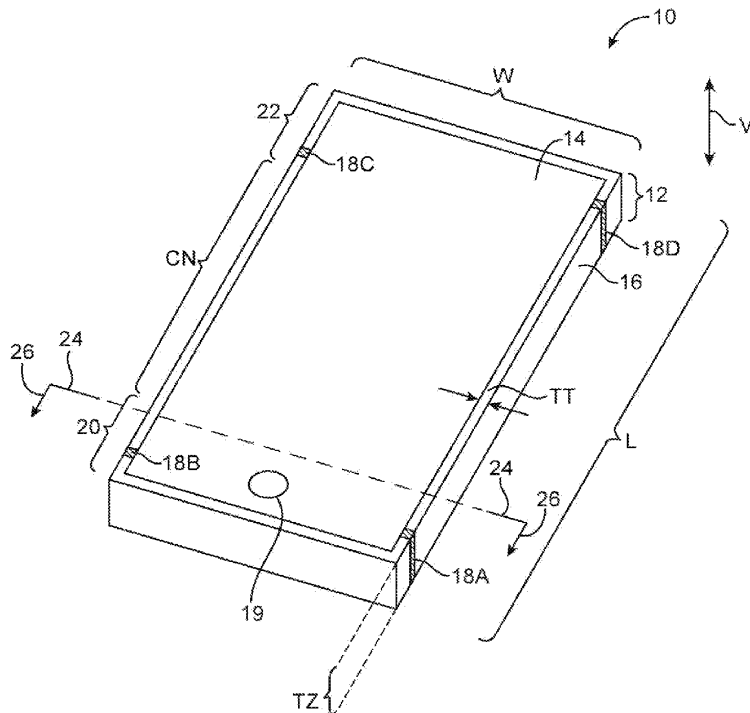
(22) Filed: **Sep. 18, 2014**

**Related U.S. Application Data**

(63) Continuation of application No. 12/941,010, filed on Nov. 5, 2010, now Pat. No. 8,872,706.

**Publication Classification**

(51) **Int. Cl.**  
**H04M 1/02** (2006.01)  
**H01Q 21/30** (2006.01)  
**H01Q 1/24** (2006.01)





US 20150005045A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0005045 A1**  
(43) **Pub. Date: Jan. 1, 2015**

(54) **WIRELESS DEVICE**

**Publication Classification**

(71) Applicant: **KABUSHIKI KAISHA TOSHIBA**,  
Tokyo (JP)

(51) **Int. Cl.**  
*H01Q 1/24* (2006.01)  
*H01Q 9/42* (2006.01)  
*H01Q 9/30* (2006.01)  
*G06F 1/16* (2006.01)  
*H01Q 21/28* (2006.01)

(72) Inventors: **Koichi Sato**, Tokyo (JP); **Makoto Tabata**, Tokyo (JP)

(73) Assignee: **KABUSHIKI KAISHA TOSHIBA**,  
Tokyo (JP)

(52) **U.S. Cl.**  
CPC ..... *H01Q 1/243* (2013.01); *G06F 1/1626*  
(2013.01); *G06F 1/1698* (2013.01); *H01Q*  
*21/28* (2013.01); *H01Q 9/30* (2013.01); *H01Q*  
*9/42* (2013.01)  
USPC ..... **455/575.1**

(21) Appl. No.: **14/488,687**

(22) Filed: **Sep. 17, 2014**

(57) **ABSTRACT**

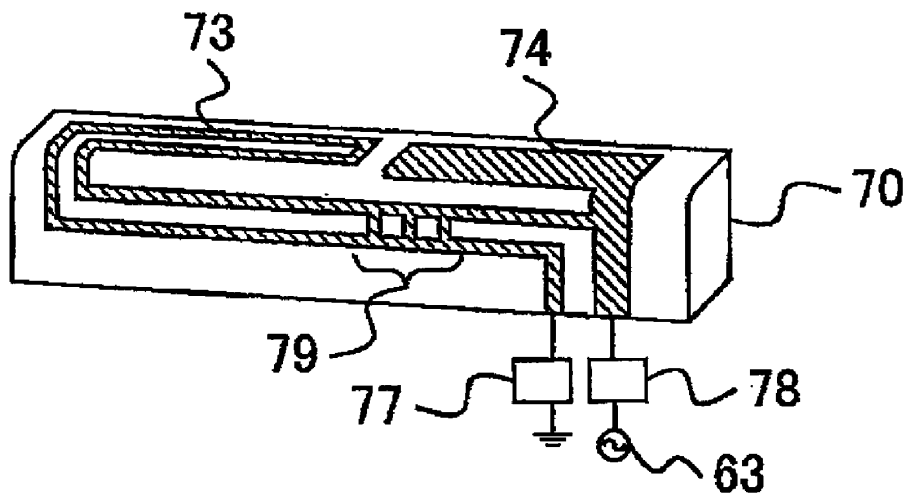
**Related U.S. Application Data**

(63) Continuation of application No. 13/654,145, filed on Oct. 17, 2012, which is a continuation of application No. 12/556,766, filed on Sep. 10, 2009, now abandoned.

A wireless device includes: a casing having a first face; a display configured to be visible from the first face; a touch sensor formed by a transparent material and mounted in the casing with respect to the display as a part of the first face; a substrate mounted to a side opposite to the first face with respect to the display; and an antenna element including: a first portion built in the casing, connected to a feeding point included in the substrate, and located within a first range occupied by the touch sensor when viewed from a direction perpendicular to the first face; and a second portion located within a second range other than the first range.

**Foreign Application Priority Data**

(30) Mar. 30, 2009 (JP) ..... 2009-082341





US 20150009074A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0009074 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **ELECTRONIC DEVICE**

(30) **Foreign Application Priority Data**

(71) Applicant: **ASUSTeK COMPUTER INC.**, TAIPEI (TW)

Nov. 8, 2013 (TW) ..... 102140779

**Publication Classification**

(72) Inventors: **Wang-Ta HSIEH**, TAIPEI (TW);  
**Chuan-Chien HUANG**, TAIPEI (TW);  
**Kuei-Shun YEH**, TAIPEI (TW);  
**Wei-Hsin SHIH**, TAIPEI (TW);  
**Chih-Chan LIANG**, TAIPEI (TW)

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 9/04** (2013.01)  
USPC ..... **343/700 MS**

(73) Assignee: **ASUSTeK COMPUTER INC.**, TAIPEI (TW)

(57) **ABSTRACT**

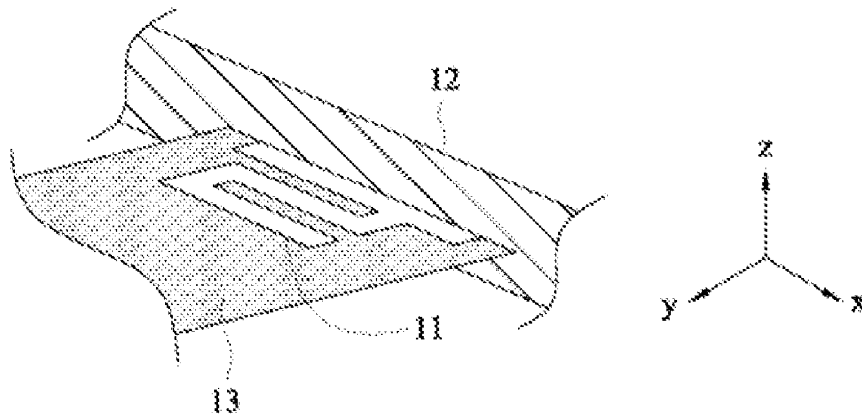
(21) Appl. No.: **14/294,163**

(22) Filed: **Jun. 3, 2014**

**Related U.S. Application Data**

(60) Provisional application No. 61/843,455, filed on Jul. 8, 2013.

An electronic device includes a conducting element, a supporting element, and a multiband antenna is disclosed. The conducting element is connected to the ground of the electronic device by a high impedance connection. The supporting element has a supporting surface, and the supporting surface and the conducting element are perpendicular. The multiband antenna is disposed at the supporting surface and includes a radiating element, and the radiating element and the conducting element form a coupling capacitor.





US 20150009075A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0009075 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **ORTHOGONAL MULTI-ANTENNAS FOR MOBILE HANDSETS BASED ON CHARACTERISTIC MODE MANIPULATION**

(52) **U.S. Cl.**  
CPC ..... **H01Q 5/0024** (2013.01)  
USPC ..... **343/702**

(71) Applicant: **Sony Corporation**, Tokyo (JP)

(57) **ABSTRACT**

(72) Inventors: **Buon Kiong Lau**, Lund (SE); **Hui Li**, Lund (SE); **Zachary Miers**, Boulder, CO (US)

(73) Assignee: **Sony Corporation**, Tokyo (JP)

(21) Appl. No.: **14/050,761**

(22) Filed: **Oct. 10, 2013**

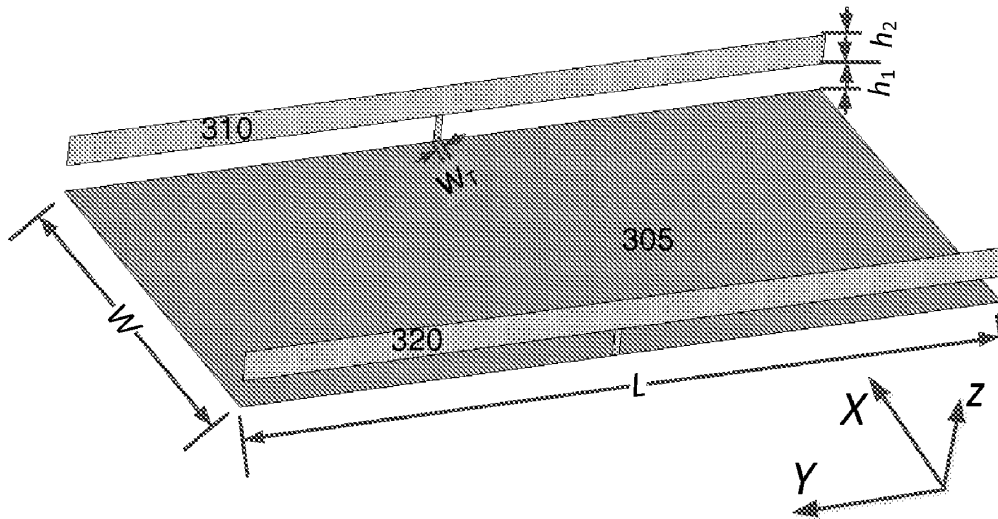
**Related U.S. Application Data**

(60) Provisional application No. 61/843,172, filed on Jul. 5, 2013.

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 5/00** (2006.01)

A novel multi-antenna design approach is proposed to obtain uncorrelated and energy efficient antennas. By manipulating the chassis, more than one characteristic mode is enabled to resonate at frequency below 1 GHz. With proper excitations for different characteristic modes, which are inherently orthogonal to each other, well performed multiple antennas with low mutual coupling and correlation are achieved. Three examples of chassis manipulation, a bezel structure and two T-shaped structures with metal strips along the chassis, are introduced. With efficient excitations of the fundamental dipole mode and T-strip mode, two antennas with low correlations and high total antenna efficiencies are achieved, with both antennas covering one or more of the low frequency LTE bands 5, 6, 8, 12, 13, 14, 17, 18, 19, and 20 in combination with one or more of high frequency LTE bands 1, 2, 3, 4, 9, 10, 11, 15, 16, 21, 23, 24, and 25.





US 20150009076A1

(19) **United States**

(12) **Patent Application Publication**  
**JANG**

(10) **Pub. No.: US 2015/0009076 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **PORTABLE ELECTRONIC DEVICE WITH ANTENNA DEVICE**

**Publication Classification**

(71) Applicant: **Samsung Electronics Co., Ltd.**,  
Gyeonggi-do (KR)

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

(72) Inventor: **Si-Young JANG**, Gyeongsangbuk-do  
(KR)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/243** (2013.01)  
USPC ..... **343/702**

(73) Assignee: **Samsung Electronics Co., Ltd.**,  
Gyeonggi-do (KR)

(57) **ABSTRACT**

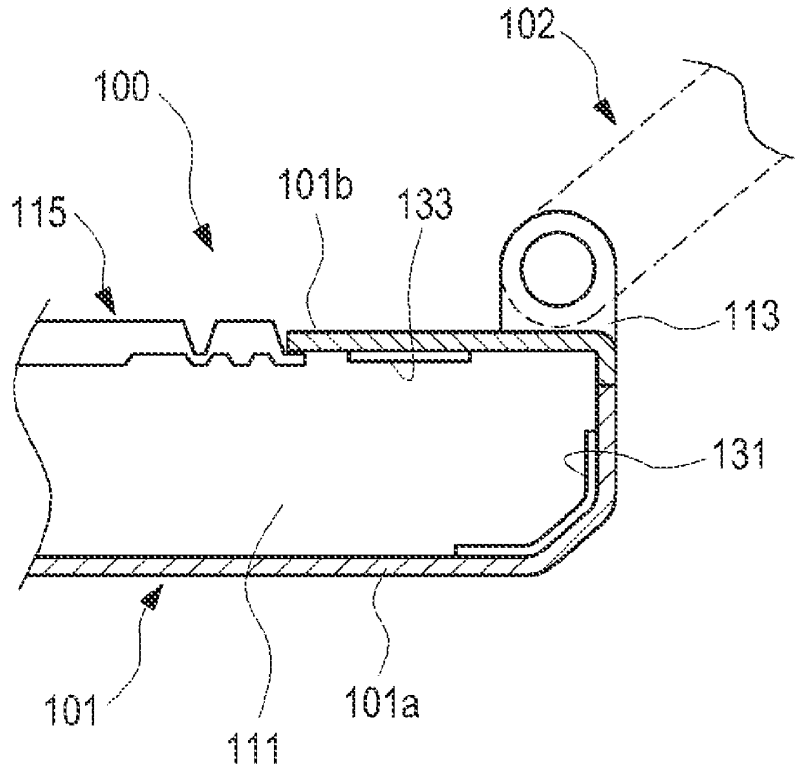
(21) Appl. No.: **14/265,903**

A portable electronic device is provided which includes a first housing; a second housing that is coupled to the first housing; at least one pair of antenna elements that are housed in the first housing; and a switch element that connects the antenna elements to a transmission/reception circuit module. The switch element connects a first antenna element to the transmission/reception circuit module when the first and second housings are folded and connects a second antenna element to the transmission/reception circuit module when the second housing is unfolded.

(22) Filed: **Apr. 30, 2014**

(30) **Foreign Application Priority Data**

Jul. 3, 2013 (KR) ..... 10-2013-0077510





US 20150009082A1

(19) **United States**

(12) **Patent Application Publication**  
**Taura**

(10) **Pub. No.: US 2015/0009082 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **SLOT ANTENNA**

**Publication Classification**

(71) Applicant: **Toru Taura**, Tokyo (JP)

(51) **Int. Cl.**  
**H01Q 13/10** (2006.01)

(72) Inventor: **Toru Taura**, Tokyo (JP)

(52) **U.S. Cl.**  
CPC ..... **H01Q 13/106** (2013.01)  
USPC ..... **343/767**

(73) Assignee: **NEC CORPORATION**, Tokyo (JP)

(57) **ABSTRACT**

(21) Appl. No.: **14/371,231**

This slot antenna is provided with: a dielectric substrate (1); a dielectric surface (10) formed on one surface of the dielectric substrate (1); a slot (11) formed in the dielectric surface (10) and having an open end at one end; and a first stub (21) and a second stub (22) which are L-shaped conductors formed in the slot (11) interior and which are individually connected at one end to the dielectric surface (10). In the slot (11) interior, a first side (11a) at which a connecting part (21a) for the first stub (21) and the dielectric surface (10) is formed, and a second side (11b) at which a connecting part (22a) for the second stub (22) and the dielectric surface (10) is formed, are opposed to one another. or claim 2,

(22) PCT Filed: **Feb. 4, 2013**

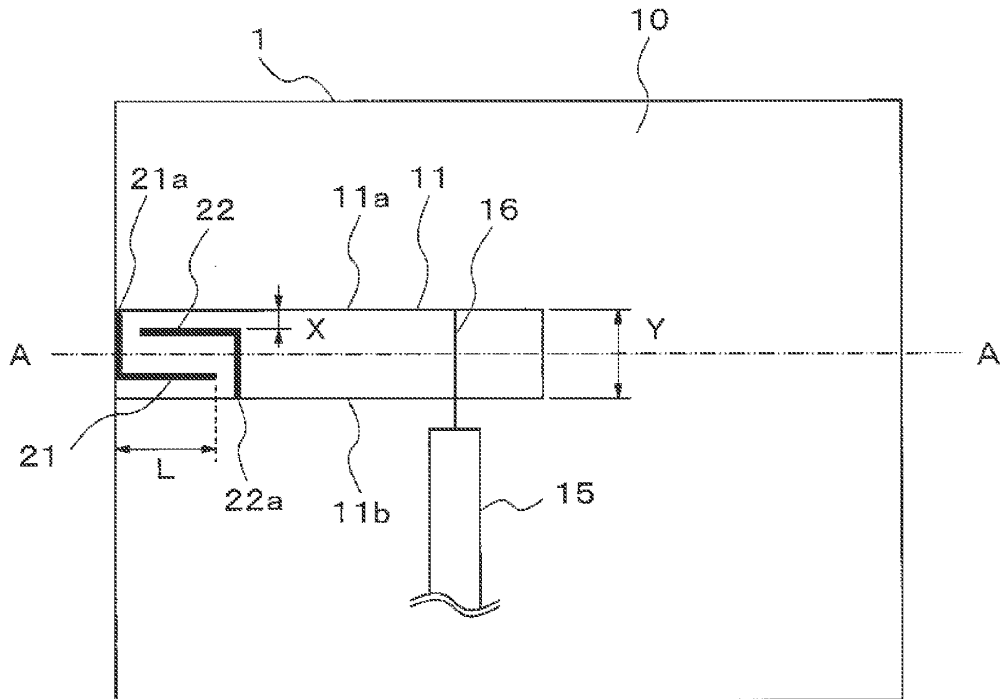
(86) PCT No.: **PCT/JP2013/000605**

§ 371 (c)(1),

(2) Date: **Jul. 9, 2014**

(30) **Foreign Application Priority Data**

Feb. 7, 2012 (JP) ..... 2012-024278





US 20150009086A1

(19) **United States**

(12) **Patent Application Publication**  
**Yeh**

(10) **Pub. No.: US 2015/0009086 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **ACTIVE ANTENNA SYSTEM WITH  
MULTIPLE FEED PORTS AND CONTROL  
METHOD THEREOF**

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

CPC ..... *H01Q 1/50* (2013.01)

USPC ..... **343/858**

(71) Applicant: **Ming-Hao Yeh**, New Taipei City (TW)

(57)

**ABSTRACT**

(72) Inventor: **Ming-Hao Yeh**, New Taipei City (TW)

An active antenna system with multiple feed ports and a control method of the active antenna system are provided. The active antenna system includes an antenna radiation element, a first feed port and a second feed port. If the first control circuit is in a close state, the first feed port and a first physical position of the antenna radiation element are connected with each other, so that a signal is fed to the antenna radiation element through the first feed port and the first physical position. If the second control circuit is in the close state, the second feed port and a second physical position of the antenna radiation element are connected with each other, so that the signal is fed to the antenna radiation element through the second feed port and the second physical position.

(21) Appl. No.: **14/312,073**

(22) Filed: **Jun. 23, 2014**

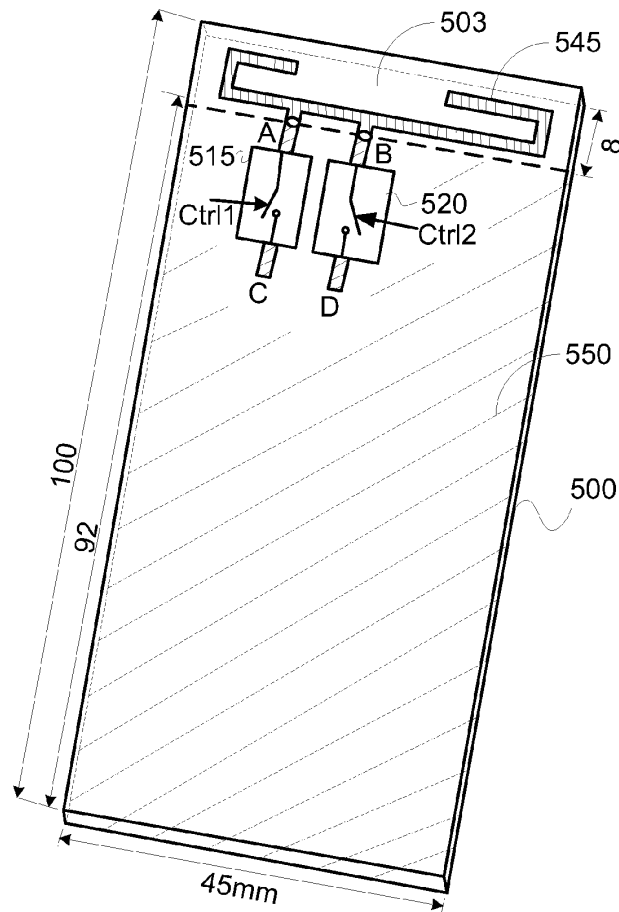
(30) **Foreign Application Priority Data**

Jul. 2, 2013 (TW) ..... 102123645

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/50*

(2006.01)





US 20150009087A1

(19) **United States**  
(12) **Patent Application Publication**  
**Lee**

(10) **Pub. No.: US 2015/0009087 A1**  
(43) **Pub. Date: Jan. 8, 2015**

- (54) **MULTI-BAND ANTENNA**
- (71) Applicant: **AMAZON TECHNOLOGIES, INC.**,  
Reno, NV (US)
- (72) Inventor: **Chen-Jung Lee**, San Jose, CA (US)
- (21) Appl. No.: **14/495,462**
- (22) Filed: **Sep. 24, 2014**

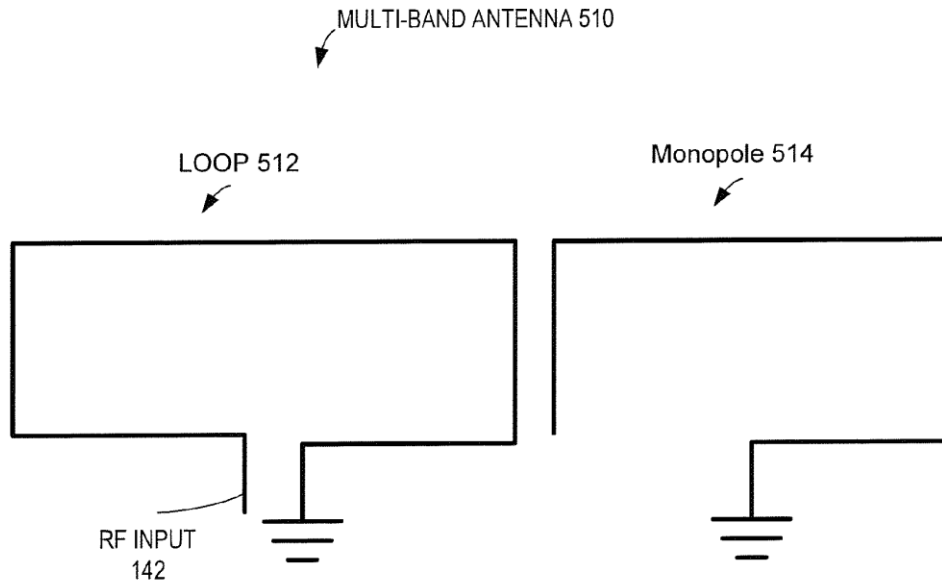
- (52) **U.S. Cl.**  
CPC ..... **H01Q 5/0062** (2013.01); **H01Q 7/00**  
(2013.01)  
USPC ..... **343/866**

- Related U.S. Application Data**
- (63) Continuation of application No. 13/211,138, filed on Aug. 16, 2011, now Pat. No. 8,872,712.
  - (60) Provisional application No. 61/494,799, filed on Jun. 8, 2011.

- Publication Classification**
- (51) **Int. Cl.**  
**H01Q 5/00** (2006.01)  
**H01Q 7/00** (2006.01)

(57) **ABSTRACT**

Methods and systems for extending a bandwidth of a multi-band antenna of a user device are described. A multi-band antenna includes a single radio frequency (RF) input coupled to a first loop antenna, the first loop antenna configured to provide a first resonant mode. The multi-band antenna also includes a second antenna parasitically coupled to the first loop antenna to provide additional resonant modes of the multi-band antenna. The second antenna is a T-monopole antenna with a base coupled to the ground plane, a first arm extending out from a first side of the base, a second arm extending out from a second side of the base and a folded arm extending back towards the second side of the base from a distal end of the second arm.







US 20150009090A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0009090 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **ANTENNA DEVICE AND ELECTRONIC DEVICE HAVING THE ANTENNA DEVICE**

**Publication Classification**

(71) Applicant: **Samsung Electronics Co., Ltd.**,  
Suwon-si (KR)

(51) **Int. Cl.**  
**H01Q 1/50** (2006.01)

(72) Inventors: **Sung-Wu PARK**, Daegu (KR);  
**Soon-Sang PARK**, Daegu (KR)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/50** (2013.01)  
USPC ..... **343/876**

(21) Appl. No.: **14/301,997**

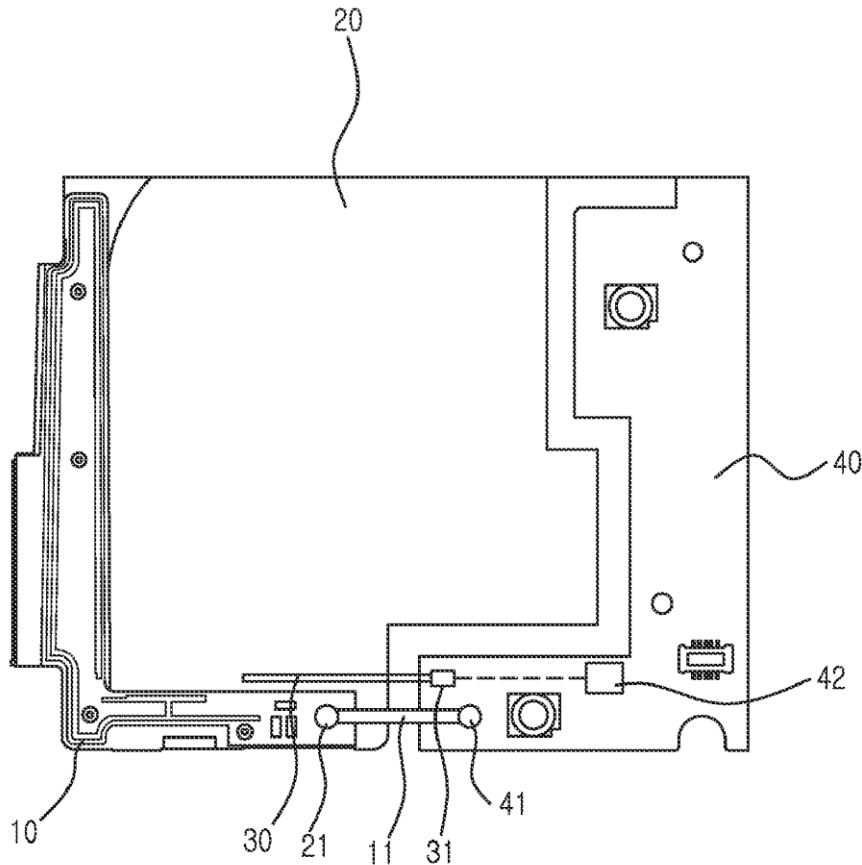
(57) **ABSTRACT**

(22) Filed: **Jun. 11, 2014**

An electronic device includes is provided. The electronic device includes an antenna radiator configured to operate in at least one frequency band, a ground stub disposed at a coupling location in proximity to the antenna radiator, and a switching device configured to selectively ground the ground stub and a ground of a main board. Thus, the present disclosure is easily applicable without design constraints in terms of space use when the main board and the antenna radiator are separated, and simplifies the assembly and reduces the cost without a separate sub-board.

(30) **Foreign Application Priority Data**

Jul. 8, 2013 (KR) ..... 10-2013-0079699





US 20150009092A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0009092 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **MULTI-ANTENNA STRUCTURE**

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

CPC ..... *H01Q 21/28* (2013.01)

USPC ..... **343/893**

(71) Applicant: **Auden Techno.Corp.**, Taoyuan Hsien (TW)

(57) **ABSTRACT**

(72) Inventors: **Chun-Hua CHEN**, Taoyuan Hsien (TW); **Hsien-Wen LIU**, Taoyuan Hsien (TW)

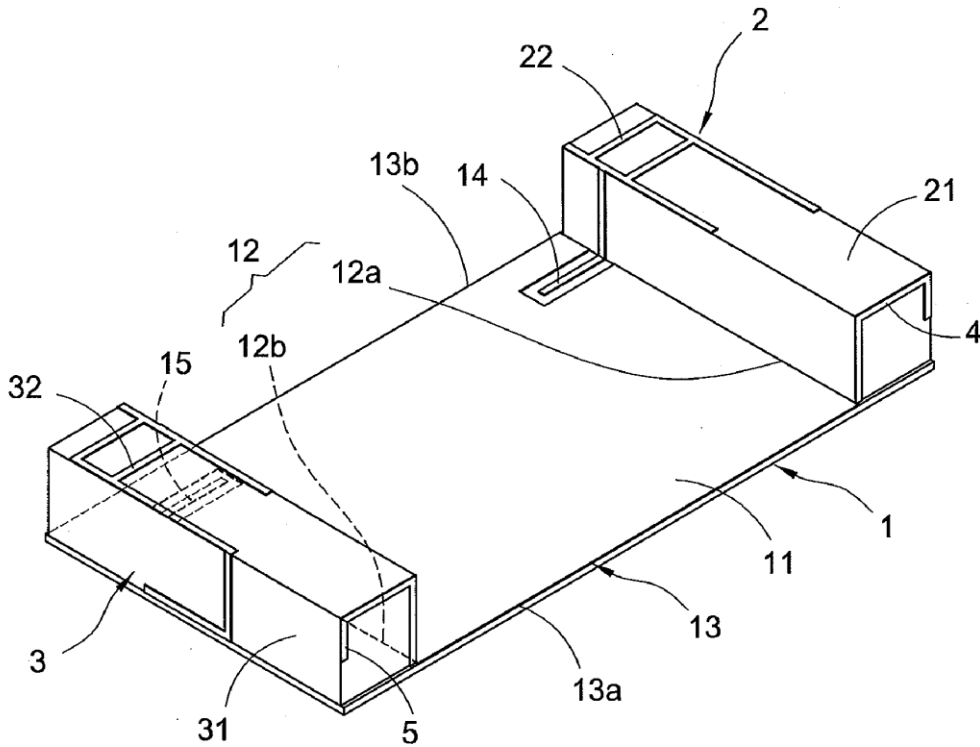
A multi-antenna structure includes a base plate, a first antenna, a second antenna, a first metal line, and a second metal line. The base plate includes a grounded metal surface. The grounded metal surface includes two short sides and two long sides. The first antenna and the second antenna are arranged on the base plate. The first metal line and the second metal line are electrically connected to the two short sides of the grounded metal surface. A current path of the two short sides is prolonged because of the first metal line and the second metal line. A longitudinal current is equal to a transverse current at a low frequency. A current of the first antenna and a current of the second antenna does not interfere each other. Isolation between the first antenna and the second antenna is improved.

(21) Appl. No.: **13/936,035**

(22) Filed: **Jul. 5, 2013**

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 21/28* (2006.01)





US 20150009093A1

(19) **United States**

(12) **Patent Application Publication**  
**Taura**

(10) **Pub. No.: US 2015/0009093 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **ANTENNA APPARATUS AND PORTABLE WIRELESS DEVICE EQUIPPED WITH THE SAME**

**Publication Classification**

(71) Applicant: **NEC CORPORATION**, Tokyo (JP)

(51) **Int. Cl.**  
**H01Q 1/52** (2006.01)  
**H01Q 5/00** (2006.01)

(72) Inventor: **Toru Taura**, Tokyo (JP)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/521** (2013.01); **H01Q 5/0034** (2013.01)

(73) Assignee: **NEC CORPORATION**, Tokyo (JP)

USPC ..... **343/893**

(21) Appl. No.: **14/376,337**

(57) **ABSTRACT**

(22) PCT Filed: **Mar. 18, 2013**

(86) PCT No.: **PCT/JP2013/001816**

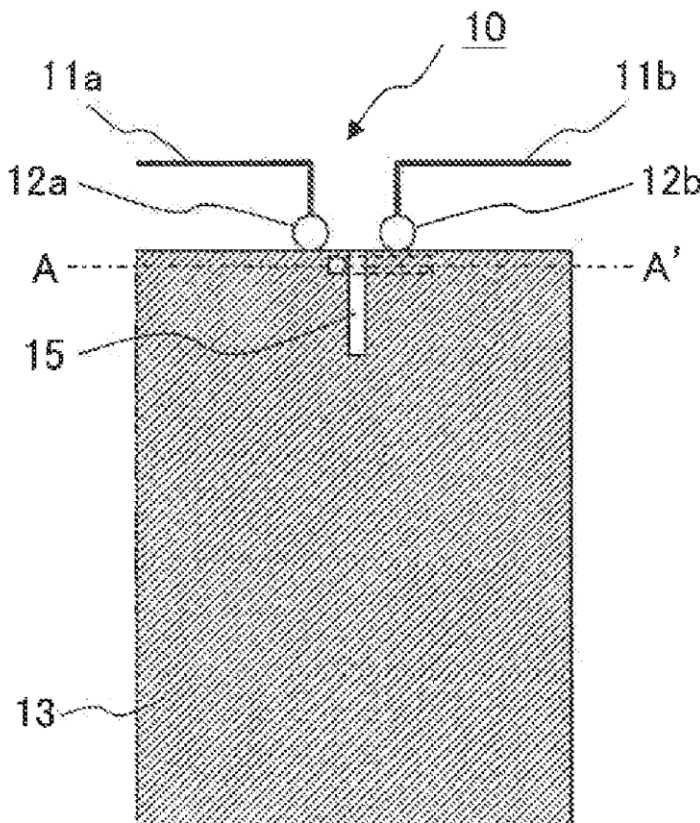
§ 371 (c)(1),

(2) Date: **Aug. 1, 2014**

(30) **Foreign Application Priority Data**

Mar. 28, 2012 (JP) ..... 2012-073664

The antenna apparatus of the present invention is characterized by including a substrate, a conductor arranged on one of the surfaces of the substrate, two antennas arranged on the substrate, a notch portion formed to the conductor so as to have an open end between two antennas, a stub formed on the other surface of the substrate so as to cross over the notch portion, and a via for electrically connecting the conductor and the stub.





US 20150011273A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0011273 A1**

(43) **Pub. Date: Jan. 8, 2015**

(54) **ELECTRONIC DEVICE CASE WITH ANTENNA**

(71) Applicant: **BluFlux RF Technologies, LLC**,  
Louisville, CO (US)

(72) Inventors: **Benjamin R. Wilmhoff**, Boulder, CO  
(US); **Andrew D. Rowser**, Boulder, CO  
(US)

(21) Appl. No.: **14/322,027**

(22) Filed: **Jul. 2, 2014**

**Related U.S. Application Data**

(60) Provisional application No. 61/842,735, filed on Jul. 3, 2013, provisional application No. 62/007,002, filed on Jun. 3, 2014.

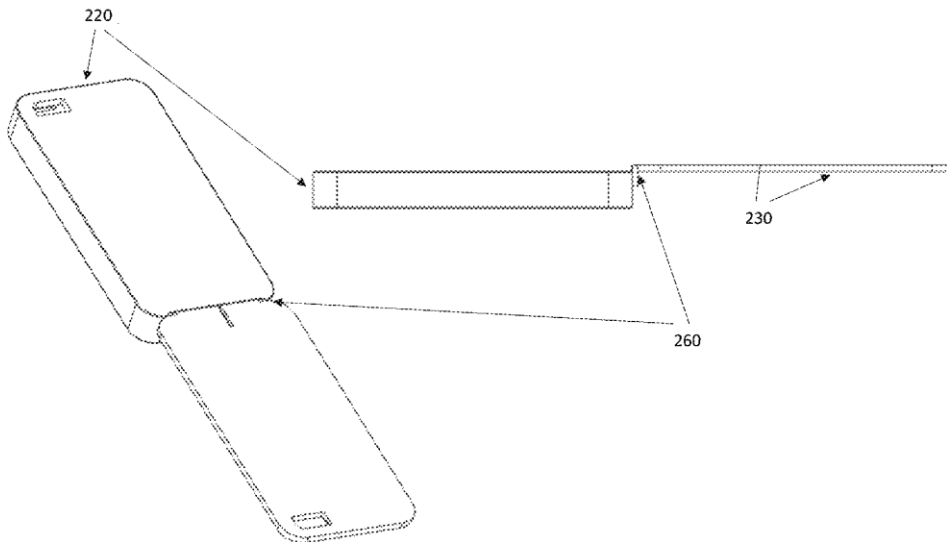
**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)  
**H04W 4/02** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/245** (2013.01); **H01Q 1/243**  
(2013.01); **H04W 4/02** (2013.01)  
USPC ..... **455/575.7**; 343/702; 455/456.3

(57) **ABSTRACT**

A case for a mobile electronic device is provided. The case includes a shell, a case antenna, a transmission line, and a near-field coupling device. The shell encases at least a portion of the mobile electronic device. The case antenna is attached to the shell. The transmission line is also attached to the shell and electrically interconnects to the case antenna. The near-field coupling device has a feed port electrically interconnected to the transmission line and is configured to near-field couple to a native antenna of the mobile electronic device to capture an electromagnetic signal generated by the native antenna of the mobile electronic device. The near-field coupling device is also configured to conduct the captured electromagnetic signal from the feed port of the near-field coupling device to the case antenna through the transmission line.





US 20150015443A1

(19) **United States**

(12) **Patent Application Publication**  
**LEE**

(10) **Pub. No.: US 2015/0015443 A1**

(43) **Pub. Date: Jan. 15, 2015**

(54) **COVER DEVICE AND PORTABLE  
TERMINAL HAVING THE SAME**

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

CPC ..... *H01Q 1/243* (2013.01)

USPC ..... **343/702**

(71) Applicant: **Samsung Electronics Co., Ltd.**,  
Gyeonggi-do (KR)

(72) Inventor: **Kun-Hak LEE**, Gyeonggi-do (KR)

(57) **ABSTRACT**

(73) Assignee: **Samsung Electronics Co., Ltd.**

(21) Appl. No.: **14/330,779**

(22) Filed: **Jul. 14, 2014**

(30) **Foreign Application Priority Data**

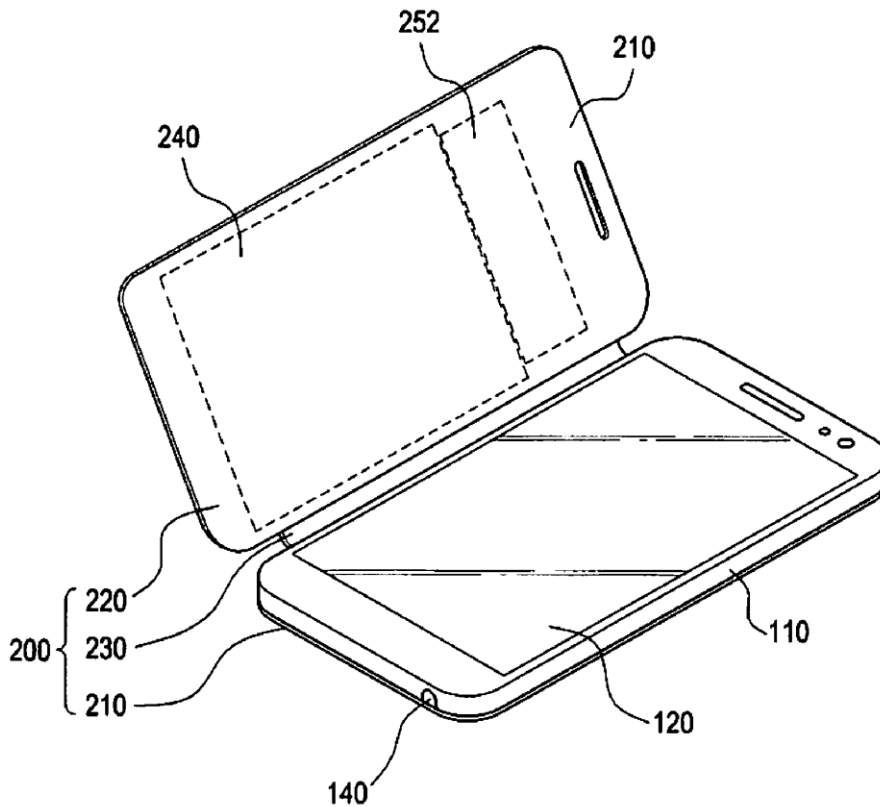
Jul. 12, 2013 (KR) ..... 10-2013-0082273

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/24*

(2006.01)

A cover device and a portable terminal having the cover device are provided. The cover device includes a rear cover provided with a first antenna, and a front cover rotatably connected to the rear cover and provided with a second antenna communicating with the first antenna, in face to face relation, and an output unit outputting data through communication between the first and second antennas. The portable terminal includes a body, a cover unit detachably installed to the body and including an auxiliary output unit, and an antenna unit configured to output content of the body to the auxiliary output unit by pairing the body with the cover unit.





US 20150015445A1

(19) **United States**

(12) **Patent Application Publication**  
**Sanchez**

(10) **Pub. No.: US 2015/0015445 A1**

(43) **Pub. Date: Jan. 15, 2015**

(54) **CAPACITIVELY COUPLED LOOP INVERTED F RECONFIGURABLE ANTENNA**

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

CPC ..... *H01Q 5/0055* (2013.01)

USPC ..... **343/724**

(71) Applicant: **FutureWei Technologies, Inc.**, Plano, TX (US)

(57) **ABSTRACT**

(72) Inventor: **Jorge Fabrega Sanchez**, San Diego, CA (US)

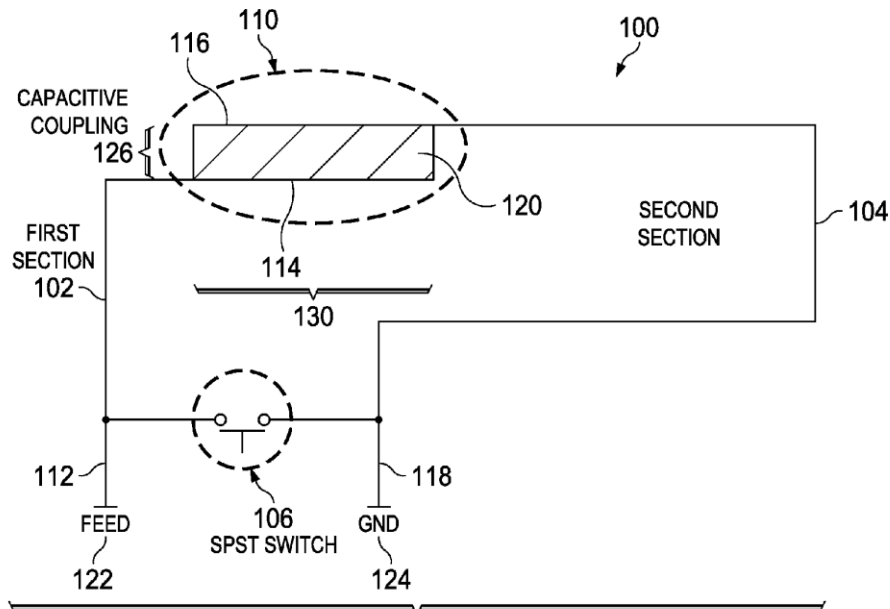
System and method embodiments are provided for capacitive coupled loop inverted F reconfigurable multiband antenna. The embodiments enable tuning and adjustment of the low frequency response of the antenna without appreciably effecting the high frequency response of the antenna. In an embodiment, a reconfigurable multiband antenna includes a first antenna section comprising a first end and a second end, wherein the second end is coupled to an antenna feed, a second antenna section comprising a third end and a fourth end, wherein the third end is coupled to ground, and a switch coupling the second end to the third end, wherein the first end and the fourth end are capacitively coupled.

(21) Appl. No.: **13/939,631**

(22) Filed: **Jul. 11, 2013**

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 5/00* (2006.01)





US 20150015446A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0015446 A1**

(43) **Pub. Date: Jan. 15, 2015**

(54) **ON RADIATOR SLOT FED ANTENNA**

**Publication Classification**

(71) Applicant: **Molex Incorporated**, Lisle, IL (US)  
(72) Inventors: **Ole Jagielski**, Frederikshavn (DK); **Simon Svendsen**, Aalborg (DK); **Finn Hausager**, Aalborg (DK); **Morten Christensen**, Aalborg (DK)

(51) **Int. Cl.**  
**H01Q 13/10** (2006.01)  
**H01Q 1/50** (2006.01)  
(52) **U.S. Cl.**  
CPC ..... **H01Q 13/106** (2013.01); **H01Q 1/50** (2013.01)  
USPC ..... **343/767**

(73) Assignee: **Molex Incorporated**, Lisle, IL (US)

(21) Appl. No.: **14/378,124**

(22) PCT Filed: **Feb. 14, 2013**

(86) PCT No.: **PCT/US13/26020**

§ 371 (c)(1),

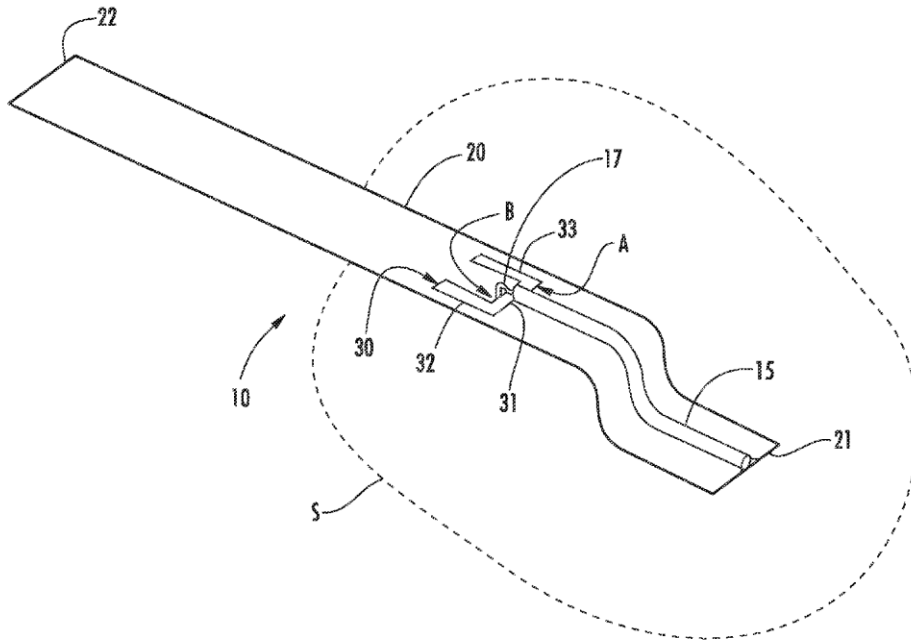
(2) Date: **Aug. 12, 2014**

(57) **ABSTRACT**

An antenna includes a slot feed on the radiator itself (On Radiator Slot Fed Antenna or ORSFA) instead of the slot feed being a separate element. One of the advantages of having the slot feed integrated onto the radiator is that the antenna is less dependent on the adjacent conductive parts, since the feed is coupling to the radiator rather than to ground (as is done in a standard slot feed antenna concept). The Q of the radiator can also be reduced for a given volume, since the coupler is removed from the antenna volume. In an embodiment the antenna can include a transmission line and an impedance match circuit directly on the radiator.

**Related U.S. Application Data**

(60) Provisional application No. 61/598,549, filed on Feb. 14, 2012.





US 20150015452A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0015452 A1**

(43) **Pub. Date: Jan. 15, 2015**

(54) **ACTIVE ANTENNA MODULE**

**Publication Classification**

(71) Applicant: **U&U Engineering Inc.**, Taipei (TW)

(51) **Int. Cl.**  
**H01Q 1/50** (2006.01)  
**H01Q 7/00** (2006.01)

(72) Inventors: **Chi-Ho Chang**, Taipei City (TW);  
**Ren-Her Chen**, Taipei City (TW);  
**Ping-Chang Tsao**, Taipei City (TW);  
**Jen-Chih Huang**, Taipei City (TW);  
**Guo-Zhong Lu**, Taipei City (TW);  
**Yun-Chun Sung**, Taipei City (TW)

(52) **U.S. Cl.**  
CPC ... **H01Q 1/50** (2013.01); **H01Q 7/00** (2013.01)  
USPC ..... **343/850**

(73) Assignee: **U&U Engineering Inc.**, Taipei (TW)

(57) **ABSTRACT**

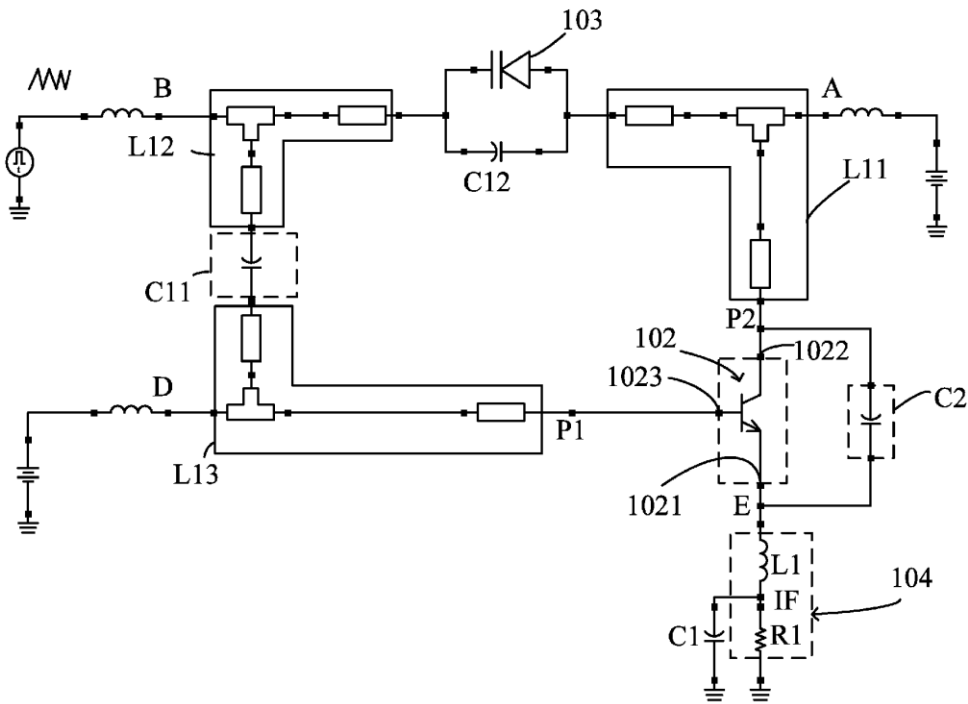
An active antenna module is disclosed. The active antenna module comprises a loop antenna, a RF transistor, a LR series circuit, a first bypass capacitor and a second bypass capacitor. The RF transistor comprises a control port, a first port, and a second port. Each of two ends of the loop antenna is electrically connected to one of the control port and the second port, and the control port and the second port are out of phase. The second port is electrically connected to the first port via the first bypass capacitor. The first port is electrically connected to ground via the LR series circuit. The second bypass capacitor and a resistor of the LR series circuit are connected in parallel.

(21) Appl. No.: **13/975,337**

(22) Filed: **Aug. 25, 2013**

(30) **Foreign Application Priority Data**

Jul. 10, 2013 (TW) ..... 102124685







US 20150015454A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0015454 A1**

(43) **Pub. Date: Jan. 15, 2015**

(54) **WIRELESS COMMUNICATION DEVICE  
HAVING TWO ANTENNAS**

**Publication Classification**

(71) Applicant: **FIH (Hong Kong) Limited**, Kowloon (HK)

(51) **Int. Cl.**  
**H01Q 21/28** (2006.01)

(72) Inventors: **CHIH-YANG TSAI**, New Taipei (TW);  
**CHUAN-CHOU CHI**, New Taipei (TW);  
**CHAO-WEI HO**, New Taipei (TW);  
**CHI-SHENG LIU**, New Taipei (TW);  
**PAI-CHENG HUANG**, New Taipei (TW);  
**HAO-YING CHANG**, New Taipei (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/28** (2013.01)  
USPC ..... **343/893**

(57) **ABSTRACT**

(21) Appl. No.: **14/325,976**

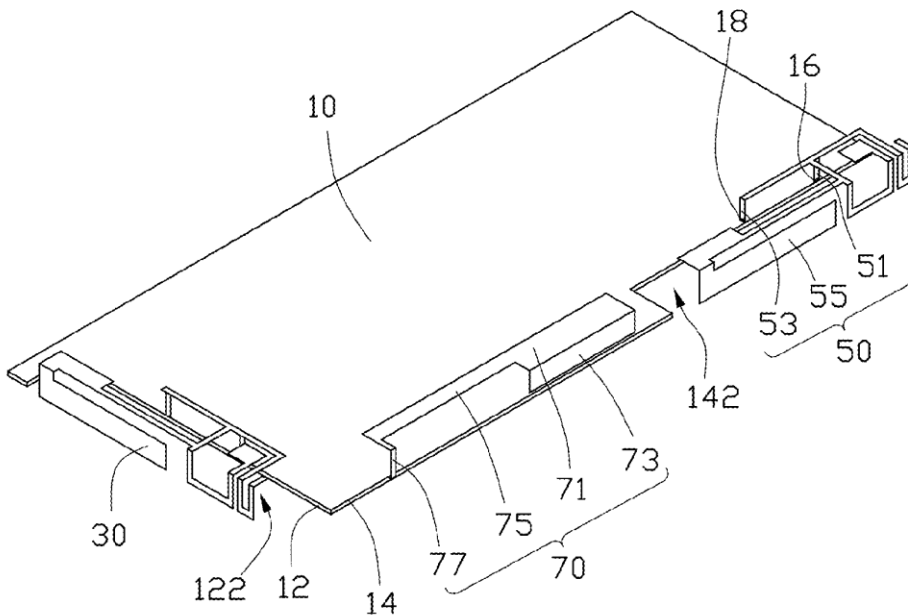
(22) Filed: **Jul. 8, 2014**

A wireless communication device includes a printed circuit board (PCB), a main antenna, an auxiliary antenna, and a metal member. The main antenna, the auxiliary antenna, and the metal member are positioned on the PCB. The metal member is spaced from the auxiliary antenna to allow current to be coupled from the auxiliary antenna to the metal member. Thus, the main antenna and the auxiliary antenna jointly form an orthographic electromagnetic field.

(30) **Foreign Application Priority Data**

Jul. 15, 2013 (TW) ..... 102125162

100





US 20150016229A1

(19) **United States**  
(12) **Patent Application Publication**  
**Yanagisawa et al.**

(10) **Pub. No.: US 2015/0016229 A1**  
(43) **Pub. Date: Jan. 15, 2015**

(54) **ELECTRONIC TIMEPIECE WITH BUILT-IN ANTENNA**

**Publication Classification**

(71) Applicant: **SEIKO EPSON CORPORATION,**  
Tokyo (JP)

(51) **Int. Cl.**  
**G04R 60/10** (2006.01)  
**G04R 20/02** (2006.01)  
**G04G 17/04** (2006.01)

(72) Inventors: **Toshiaki Yanagisawa,** Suwa (JP);  
**Toshitaka Nagahama,** Shiojiri (JP)

(52) **U.S. Cl.**  
CPC ..... **G04R 60/10** (2013.01); **G04G 17/045**  
(2013.01); **G04R 20/02** (2013.01)  
USPC ..... **368/47**

(21) Appl. No.: **14/381,109**

(22) PCT Filed: **Feb. 22, 2013**

(86) PCT No.: **PCT/JP2013/001032**

§ 371 (c)(1),

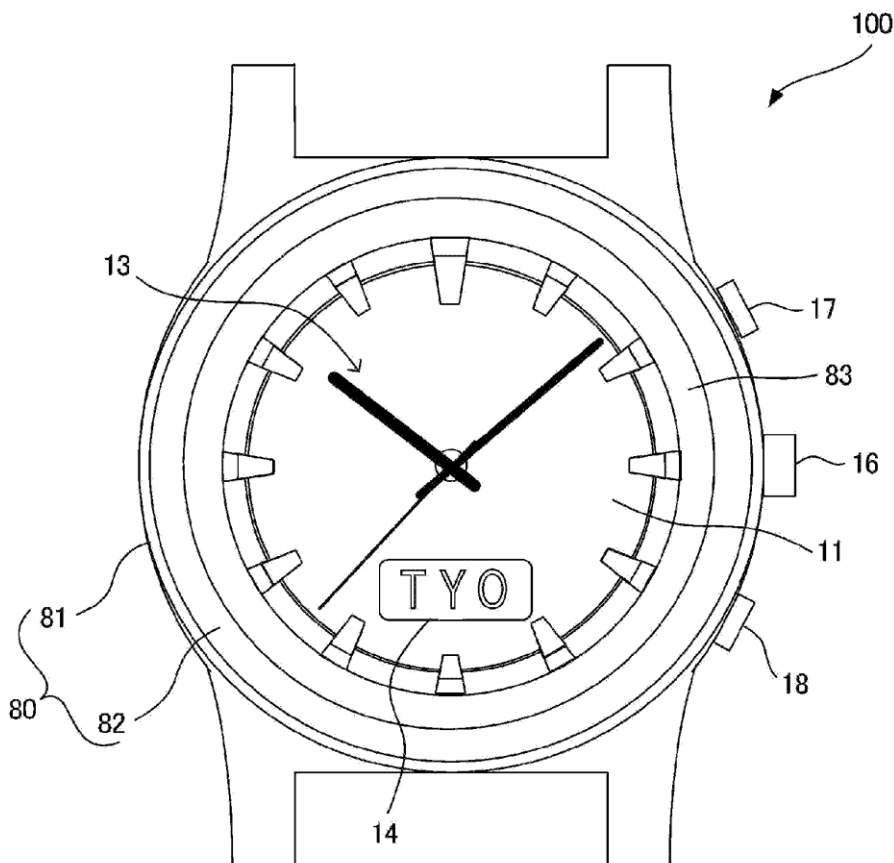
(2) Date: **Aug. 26, 2014**

(57) **ABSTRACT**

An electronic timepiece includes a tubular exterior case, a cover glass plate that blocks one of two openings of the exterior case, a ring-shaped antenna body provided along an inner circumference of the exterior case, a circuit substrate which is provided in a position below the antenna body when viewed from the cover glass plate and on which a shield pattern G is formed, and a GPS receiver that is so provided on the circuit substrate that the GPS receiver faces away from the antenna body with the shield pattern G being a boundary and amplifies and processes a signal received by the antenna body.

(30) **Foreign Application Priority Data**

Feb. 29, 2012 (JP) ..... 2012-042878  
Mar. 2, 2012 (JP) ..... 2012-047261





US 20150022401A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022401 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **ANTENNA SYSTEM AND AN ELECTRONIC DEVICE INCLUDING THE SAME**

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

CPC ..... *H01Q 21/28* (2013.01); *H01Q 1/241* (2013.01)

(71) Applicant: **Nvidia Corporation**, Santa Clara, CA (US)

USPC ..... **343/702**; 343/728

(72) Inventors: **Joselito Gavilan**, Santa Clara, CA (US);  
**Warren Lee**, Santa Clara, CA (US)

(57)

**ABSTRACT**

(73) Assignee: **Nvidia Corporation**, Santa Clara, CA (US)

Provided is an antenna system. The antenna system, in this aspect, includes a first antenna operable to communicate at a given frequency below about 1000 MHz. The antenna system, in this aspect, further includes a second antenna of a different type associated with the first antenna and operable to communicate at the given frequency, wherein a correlation coefficient of the first and second antennas is less than about 0.5 for the given frequency. In this antenna system, the first and second antennas are capable of fitting within a conductive chassis having a largest physical dimension of about  $\frac{1}{4}$  or less a wavelength of the given frequency.

(21) Appl. No.: **13/945,083**

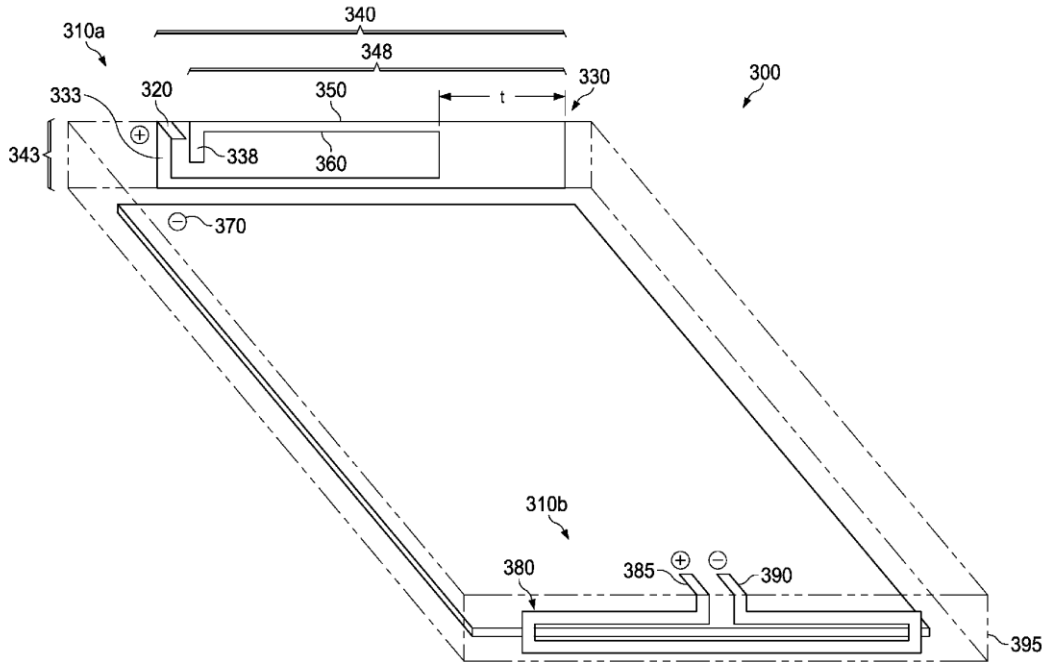
(22) Filed: **Jul. 18, 2013**

**Publication Classification**

(51) **Int. Cl.**

*H01Q 21/28* (2006.01)

*H01Q 1/24* (2006.01)





US 20150022402A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022402 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **CAPACITIVELY COUPLED LOOP ANTENNA AND AN ELECTRONIC DEVICE INCLUDING THE SAME**

(71) Applicant: **Nvidia Corporation**, Santa Clara, CA (US)

(72) Inventors: **Joselito Gavilan**, Santa Clara, CA (US);  
**Warren Lee**, Santa Clara, CA (US)

(21) Appl. No.: **13/945,106**

(22) Filed: **Jul. 18, 2013**

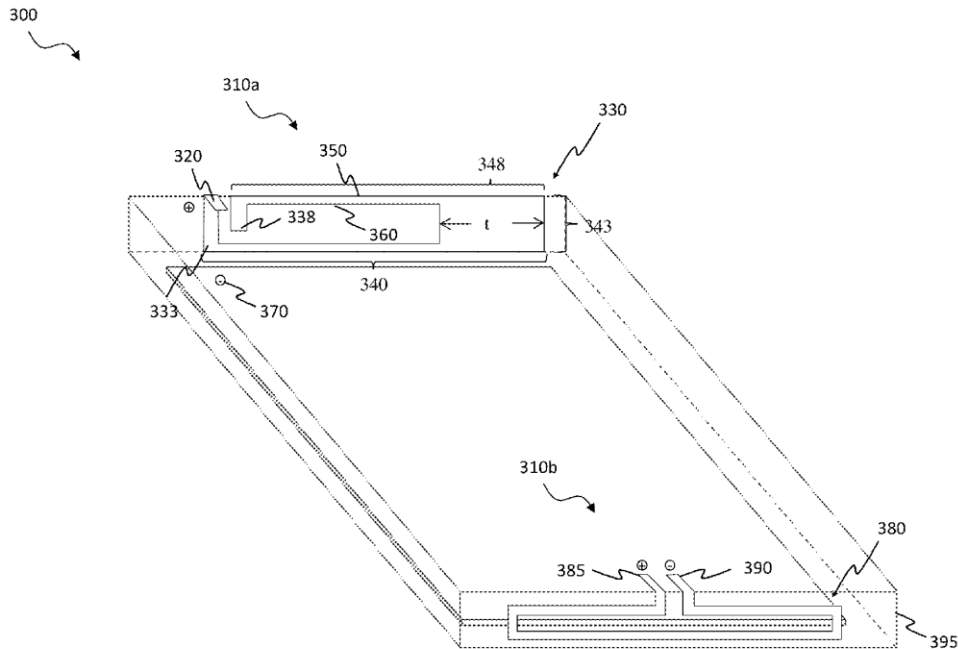
**Publication Classification**

(51) **Int. Cl.**  
**H01Q 7/00** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 7/00** (2013.01)  
USPC ..... **343/702; 343/866**

(57) **ABSTRACT**

Provided is an antenna. The antenna, in one embodiment, includes a feed element electrically connectable to a positive terminal of a transmission line, and a ground element electrically connectable to a negative terminal of the transmission line. In this embodiment of the antenna, the feed element and ground element capacitively couple to one another without touching to form a capacitively coupled loop antenna.





US 20150022403A1

(19) **United States**

(12) **Patent Application Publication**  
**Lin**

(10) **Pub. No.: US 2015/0022403 A1**

(43) **Pub. Date: Jan. 22, 2015**

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

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

CPC ..... *H01Q 1/241* (2013.01)

USPC ..... **343/702**

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

(72) Inventor: **Ching-Chi Lin**, New Taipei City (TW)

(57) **ABSTRACT**

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

(21) Appl. No.: **14/254,207**

(22) Filed: **Apr. 16, 2014**

(30) **Foreign Application Priority Data**

Jul. 22, 2013 (TW) ..... 102126053

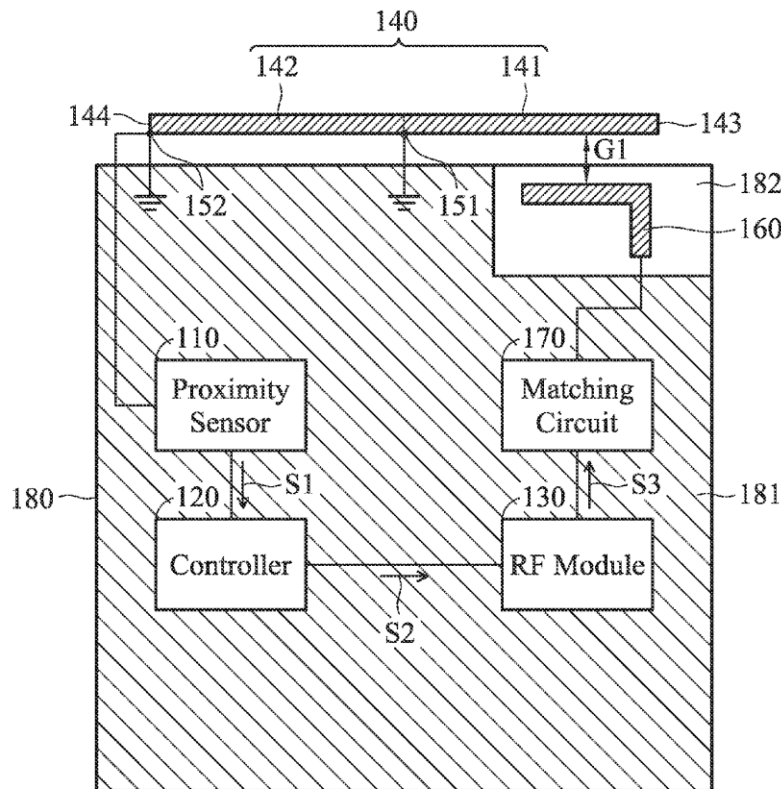
**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/24*

(2006.01)

A mobile device includes a proximity sensor, a controller, an RF (Radio Frequency) module, and a metal frame. The proximity sensor generates a detection signal. The controller generates a control signal according to the detection signal. The RF module generates an RF feeding signal, and adjusts an RF power of the RF feeding signal according to the control signal. The metal frame includes a first portion and a second portion. An antenna structure is formed by the first portion. A sensing metal element is formed by the first portion and the second portion. The sensing metal element is further coupled to the proximity sensor. The antenna structure directly or indirectly receives the RF feeding signal from the RF module.

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US 20150022404A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022404 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **HANDHELD DEVICE**

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

(72) Inventors: **Chien-Chih CHEN**, Taoyuan City (TW); **Chun-Wei TSENG**, Taoyuan City (TW); **Yen-Liang KUO**, Taoyuan City (TW); **Wan-Ming CHEN**, Taoyuan City (TW)

(21) Appl. No.: **14/508,427**

(22) Filed: **Oct. 7, 2014**

**Related U.S. Application Data**

(62) Division of application No. 13/041,858, filed on Mar. 7, 2011.

**Publication Classification**

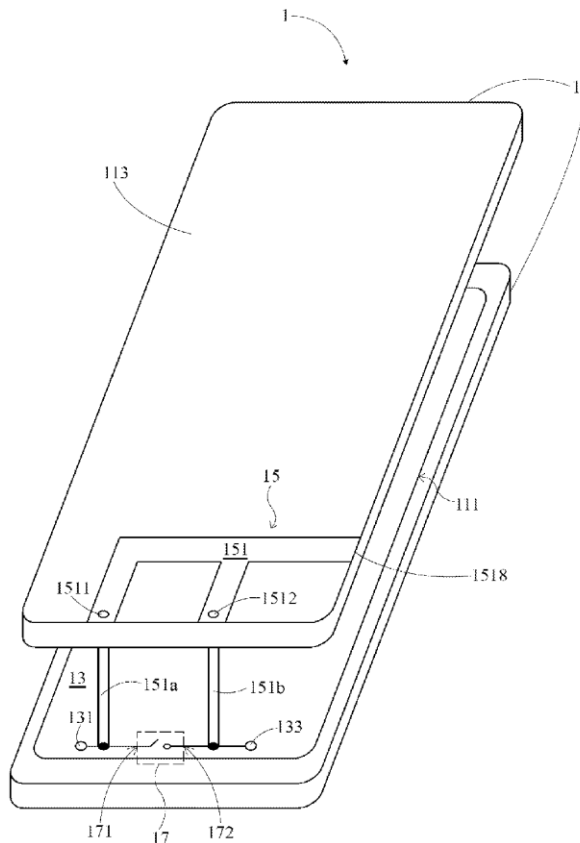
(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)  
**H01Q 5/00** (2006.01)

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

CPC ..... **H01Q 1/243** (2013.01); **H01Q 5/0041** (2013.01)  
USPC ..... **343/702**

(57) **ABSTRACT**

A handheld device is provided, wherein the handheld device comprises a housing, a circuit board, a planar antenna and a switch. The housing comprising an outer surface is configured to define a receiving space. The circuit board is disposed in the receiving space. The planar antenna comprises a metal layer, wherein the metal layer comprising a first connecting point and a second connecting point is patterned on the outer surface. The switch comprising a first electrode and a second electrode is configured to control the electrical connection between the first connecting point and the second connecting point, wherein the first electrode and the second electrode are electrically connected between the first connecting point and the second connecting point. The planar antenna operates at a first central band when the switch is turned on, and operates at a second central band when the switch is turned off.





US 20150022408A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022408 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **ANTENNA WITH ACTIVE ELEMENTS**

continuation of application No. 11/841,207, filed on Aug. 20, 2007, now Pat. No. 7,830,320.

(71) Applicant: **Ethertronics, Inc.**, San Diego, CA (US)

**Publication Classification**

(72) Inventors: **Jeff Shamblin**, San Marcos, CA (US);  
**Chulmin Han**, San Diego, CA (US);  
**Rowland Jones**, Carlsbad, CA (US);  
**Sebastian Rowson**, San Diego, CA (US);  
**Laurent Desclos**, San Diego, CA (US)

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 9/0442** (2013.01)  
USPC ..... **343/745**

(21) Appl. No.: **14/218,796**

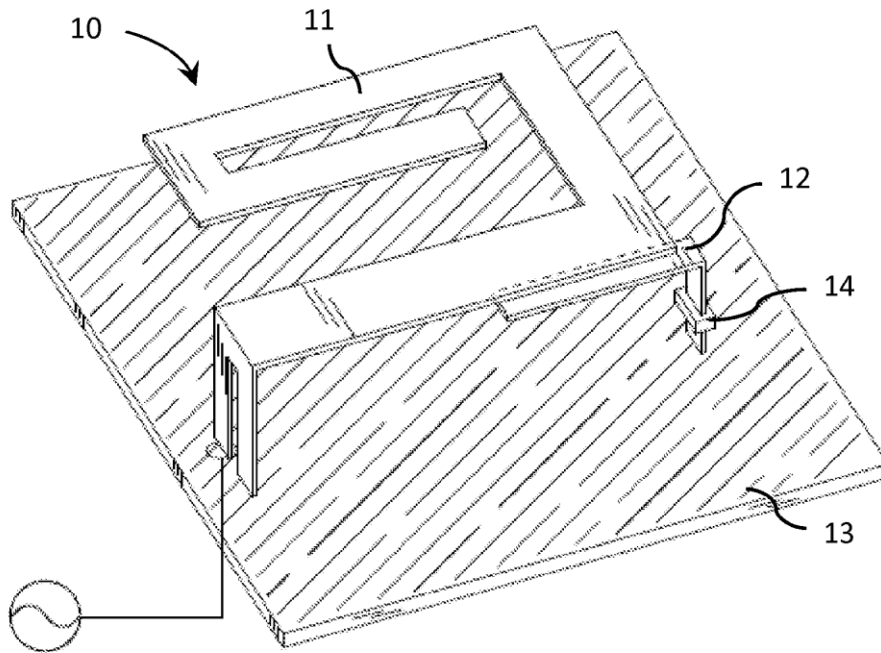
(57) **ABSTRACT**

(22) Filed: **Mar. 18, 2014**

A multi-frequency antenna comprising an IMD element, one or more active tuning elements and one or more parasitic elements. The IMD element is used in combination with the active tuning and parasitic elements for enabling a variable frequency at which the antenna operates, wherein, when excited, the parasitic elements may couple with the IMD element to change an operating characteristic of the IMD element.

**Related U.S. Application Data**

(63) Continuation of application No. 13/289,901, filed on Nov. 4, 2011, now Pat. No. 8,717,241, which is a continuation of application No. 12/894,052, filed on Sep. 29, 2010, now Pat. No. 8,077,116, which is a





US 20150022411A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022411 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **METHOD AND SYSTEM FOR MULTIPLE  
FEED POINT ANTENNAS**

*H01Q 7/00* (2006.01)

*H01Q 9/16* (2006.01)

(71) Applicant: **BlackBerry Limited**, Waterloo (CA)

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

CPC . *H01Q 1/50* (2013.01); *H01Q 9/16* (2013.01);

*H01Q 19/10* (2013.01); *H01Q 7/00* (2013.01)

USPC ..... **343/793**; 29/600; 343/834; 343/866;  
343/904

(72) Inventors: **Shirook M. ALI**, Milton (CA);  
**Abdulhadi Ebrahim ABDULAHDI**,  
Montreal (CA); **Christopher Andrew  
DEVRIES**, St. Thomas (CA)

(73) Assignee: **BlackBerry Limited**, Waterloo (CA)

(57) **ABSTRACT**

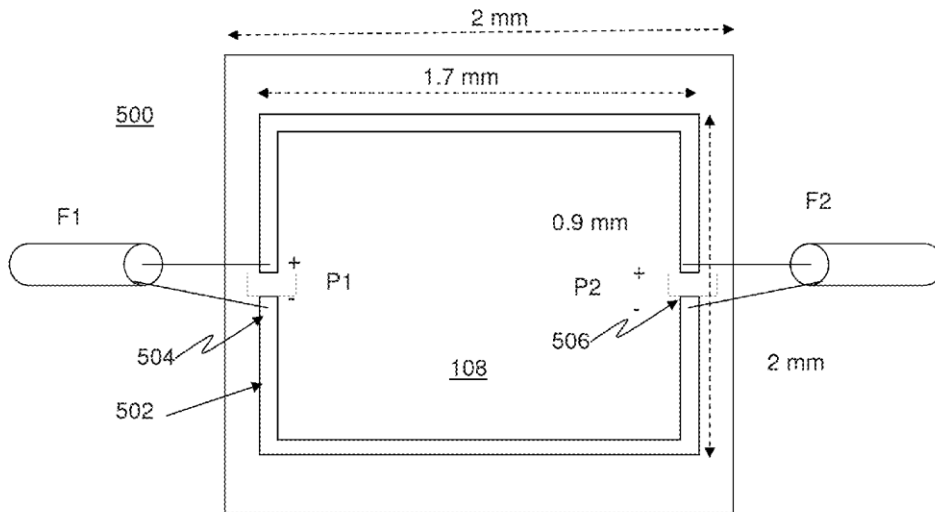
(21) Appl. No.: **13/947,718**

(22) Filed: **Jul. 22, 2013**

An antenna, including a radiating element configured to have a fundamental resonance frequency being regarded as a first harmonic resonance frequency  $f_0$ , and feed points positioned on the configured radiating element at selected multiple locations that correspond to where a multiple of the first harmonic resonance frequency have current maxima, wherein feeds at the feed points cooperate at an operating frequency of the antenna to constructively combine their respective antenna radiation patterns.

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/50* (2006.01)  
*H01Q 19/10* (2006.01)







US 20150022412A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022412 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **RECONFIGURABLE ANTENNA STRUCTURE WITH PARASITIC ELEMENTS**

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

CPC ... *H01Q 3/44* (2013.01); *H01Q 3/00* (2013.01)

USPC ..... **343/833; 343/834**

(71) Applicant: **Adant Technologies, Inc.**, Santa Clara, CA (US)

(72) Inventors: **Mauro Facco**, Padova (IT); **Francesco Sacchetto**, Padova (IT); **Daniele Piazza**, Padova (IT)

(57)

**ABSTRACT**

(73) Assignee: **Adant Technologies, Inc.**, Santa Clara, CA (US)

The present invention refers to a reconfigurable antenna structure. The antenna structure comprises an active radiating structure comprising at least an active radiating element, a passive radiating structure comprising at least a passive radiating element, a ground plane structure comprising at least a ground plane element and at least a first circuitry element to selectively electrically connect/disconnect said passive radiating element with/from said ground plane element. The ground plane structure comprises regulating means of the current distribution along said ground plane structure, when said antenna structure emits/receives an electromagnetic radiation.

(21) Appl. No.: **13/945,031**

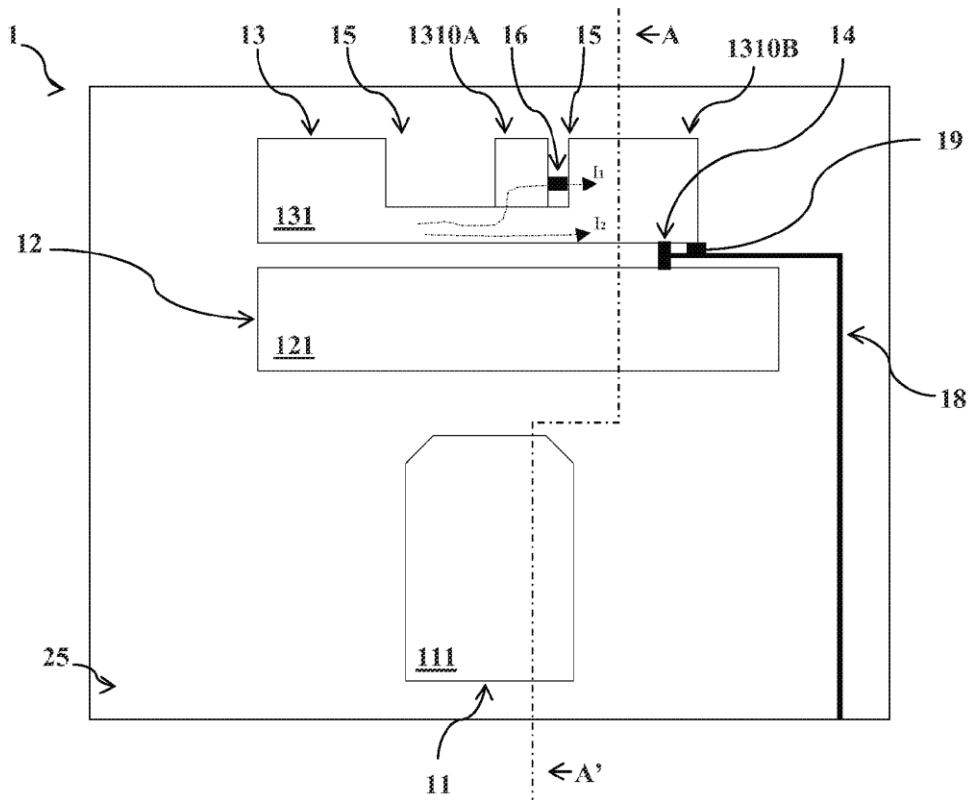
(22) Filed: **Jul. 18, 2013**

**Publication Classification**

(51) **Int. Cl.**

*H01Q 3/44* (2006.01)

*H01Q 3/00* (2006.01)





US 20150022415A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022415 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **ANTENNA STRUCTURE AND WIRELESS COMMUNICATION DEVICE EMPLOYING SAME**

**Publication Classification**

(71) Applicant: **FIH (Hong Kong) Limited**, Kowloon (HK)

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

(72) Inventors: **SHIH-CHIEH LIN**, Shindian (TW);  
**HAO-YING CHANG**, Shindian (TW);  
**CHENG-HUNG KO**, Shindian (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/526** (2013.01)  
USPC ..... **343/841**

(73) Assignee: **FIH (HONG KONG) LIMITED**, Kowloon (HK)

(57) **ABSTRACT**

(21) Appl. No.: **14/193,204**

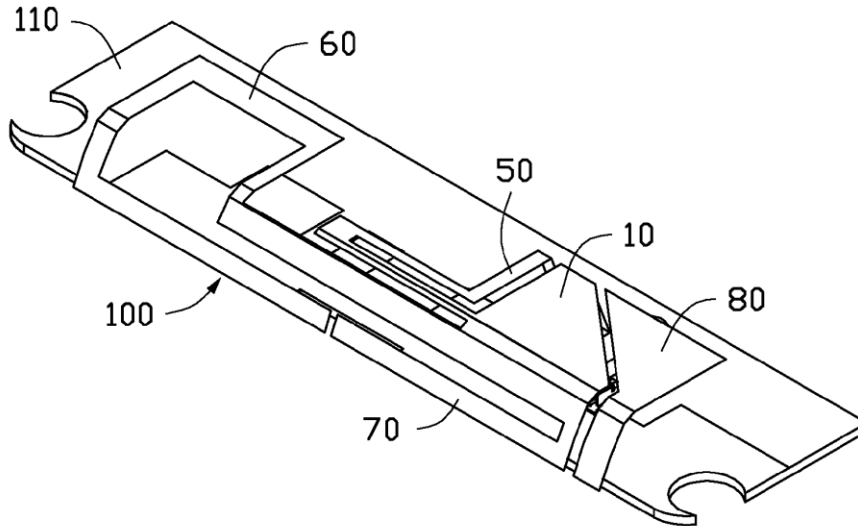
An antenna structure includes a main portion, a first radiating portion connected to the main portion, a second radiating portion connected to the main portion and opposite to the first radiating portion, and a coupling portion spaced from and coplanar with the main portion and opposite to the second radiating portion. The main portion and the first radiating portion excite a low frequency mode, the main portion, the first radiating portion, the second radiating portion, and the coupling portion excite a high frequency mode, and when the antenna structure is interfered by a user's human body when close to the user's human body, the coupling portion transmits the interference to ground. A wireless communication device employing the antenna structure is also disclosed.

(22) Filed: **Feb. 28, 2014**

(30) **Foreign Application Priority Data**

Jul. 17, 2013 (TW) ..... 102125486

**200**





US 20150022417A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022417 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **ANTENNA ELEMENT FOR WIRELESS COMMUNICATION**

(52) **U.S. Cl.**  
CPC . **H01Q 1/48** (2013.01); **H01Q 9/045** (2013.01)  
USPC ..... **343/843; 343/848**

(71) Applicants: **Tyco Electronics AMP GmbH**,  
Bensheim (DE); **TE Connectivity**  
**Nederland BV**, s'Hertogenbosch (NL)

(57) **ABSTRACT**

(72) Inventors: **Sheng-Gen PAN**, Kamp-Lintfort (DE);  
**Andreas ENGEL**,  
Fraenkisch-Crumbach (DE); **Wijnand**  
**VAN GILS**, Raamsdonksveer (NL)

The invention relates to an improved antenna element. Such an antenna element comprises a substrate, a first conductor and a second conductor. The substrate has at least a first lateral surface. The first conductor is provided on the first lateral surface, and includes a feed line portion and a monopole portion. The second conductor is provided at least partially on the same, first lateral surface, and includes: two ground planes which are disposed on the first lateral surface adjacent to the feed line portion of the first conductor at opposite sides thereof, and two stubs which are disposed on the first lateral surface at opposite sides of the respective of the two ground planes, and which extend in a direction parallel to the feed line portion of the first conductor. The two ground planes and the two stubs of the second conductor are arranged to form a coplanar waveguide.

(21) Appl. No.: **14/332,295**

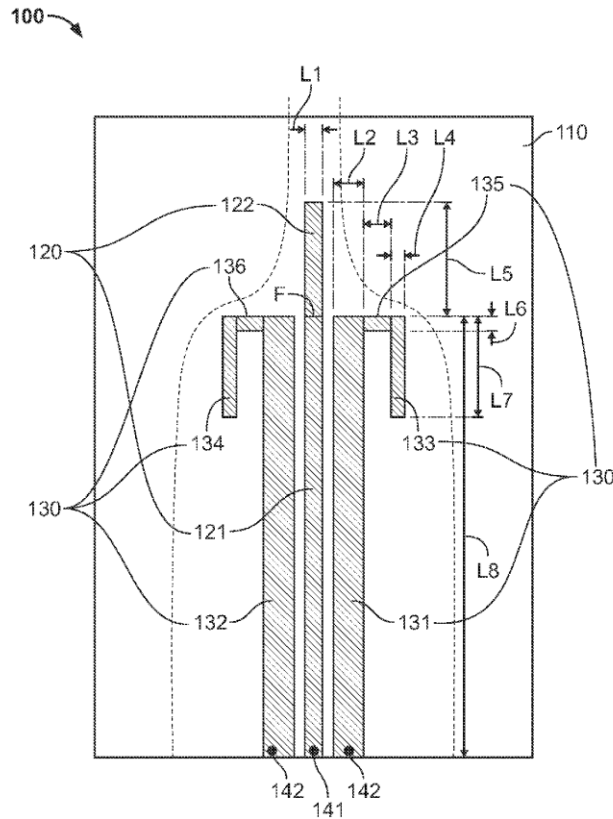
(22) Filed: **Jul. 15, 2014**

(30) **Foreign Application Priority Data**

Jul. 16, 2013 (EP) ..... 13176706.3

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/48** (2006.01)  
**H01Q 9/04** (2006.01)





US 20150022418A1

(19) **United States**

(12) **Patent Application Publication**  
**AZUMA**

(10) **Pub. No.: US 2015/0022418 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **WIRELESS MODULE**

(71) Applicant: **ALPS ELECTRIC CO., LTD.**, Tokyo (JP)

(72) Inventor: **Toshiyuki AZUMA**, Miyagi-ken (JP)

(73) Assignee: **ALPS ELECTRIC CO., LTD.**, Tokyo (JP)

(21) Appl. No.: **14/251,287**

(22) Filed: **Apr. 11, 2014**

(30) **Foreign Application Priority Data**

Jul. 18, 2013 (JP) ..... 2013-14509

**Publication Classification**

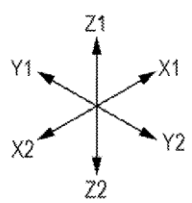
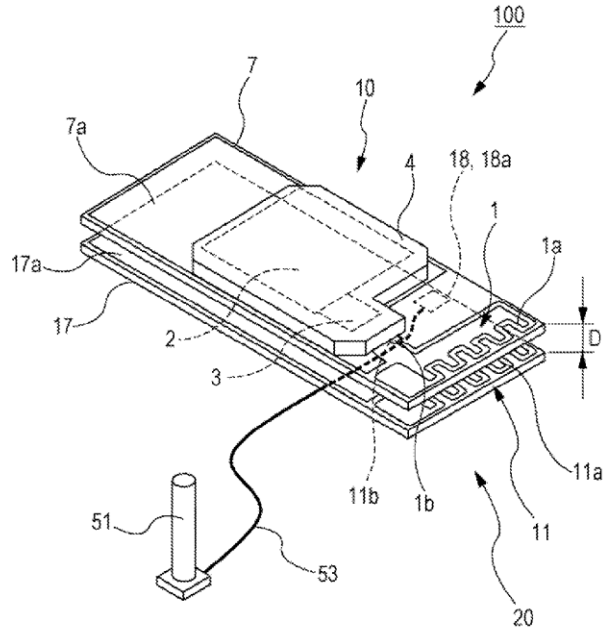
(51) **Int. Cl.**  
**H01Q 1/50** (2006.01)

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

CPC ..... **H01Q 1/50** (2013.01)  
USPC ..... **343/850**

(57) **ABSTRACT**

A wireless module includes a wireless module main body including a first antenna on a first insulating substrate, and a coupler including a second antenna on a second insulating substrate arranged so as to face the first insulating substrate, wherein a connection terminal to which an external antenna is connectable is formed in the second insulating substrate, the connection terminal being connected to a feeding point for the second antenna, individual portions of the conductor patterns in the first antenna and the second antenna are configured so as to face each other, a resonant frequency of the second antenna is set to be higher than a resonant frequency of the first antenna, and the resonant frequency of the second antenna is set so that a transmission frequency characteristic from the first antenna to the second antenna matches a frequency characteristic of the resonant frequency of the first antenna.





US 20150024810A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0024810 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **MOBILE TERMINAL HAVING ANTENNA**

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

(71) Applicant: **Samsung Electronics Co., Ltd.**,  
Suwon-si (KR)

CPC ..... **H04M 1/0202** (2013.01); **H04B 1/3838**  
(2013.01)

(72) Inventors: **Oh Yong KWON**, Hwaseong-si (KR);  
**Jeon Il LEE**, Suwon-si (KR)

USPC ..... **455/575.5**

(21) Appl. No.: **14/511,533**

(57) **ABSTRACT**

(22) Filed: **Oct. 10, 2014**

**Related U.S. Application Data**

(63) Continuation of application No. 13/404,281, filed on  
Feb. 24, 2012, now Pat. No. 8,880,132.

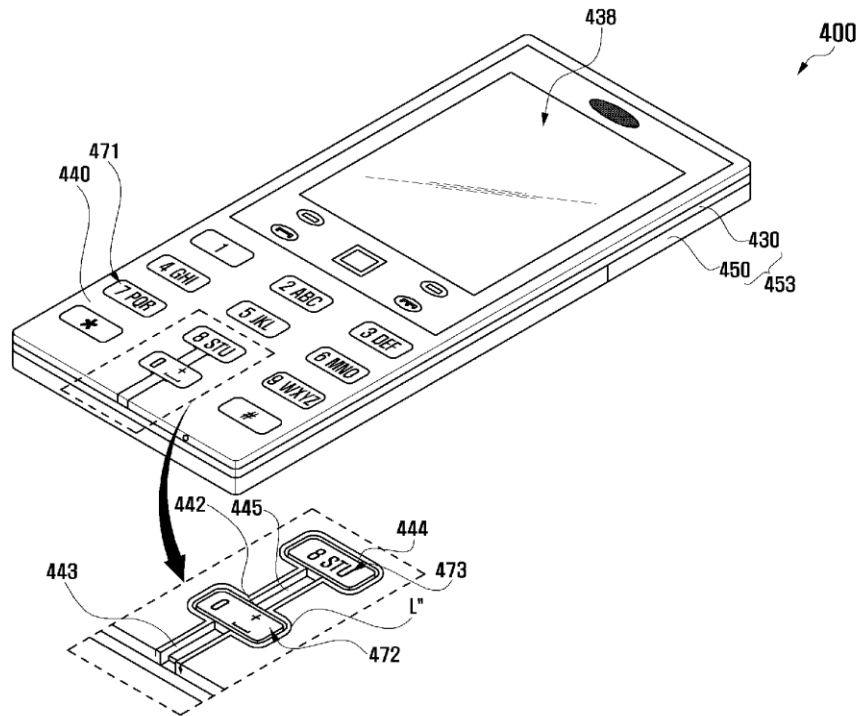
**Foreign Application Priority Data**

(30) Sep. 23, 2011 (KR) ..... 10-2011-0096203

**Publication Classification**

(51) **Int. Cl.**  
**H04M 1/02** (2006.01)  
**H04B 1/38** (2006.01)

A mobile terminal that can prevent radiation performance deterioration of an antenna is provided. The mobile terminal includes a circuit board in which an antenna and one or more key buttons are mounted, a housing mounted on the antenna and the circuit board, and a case for enclosing a periphery of the one or more key buttons and having a plurality of openings according to the quantity of the key buttons, wherein an antenna adjacent opening among the plurality of openings is extended through a slot toward an edge of the case to embody a loop antenna. Therefore, radiation deterioration of an antenna due to a case can be prevented. In addition, production costs can be minimized, and a desired external appearance of the mobile terminal is not compromised.





US 20150022419A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022419 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **ANTENNA DEVICE**

**Publication Classification**

(71) Applicant: **CHIUN MAI COMMUNICATION SYSTEMS, INC.**, New Taipei (TW)

(51) **Int. Cl.**  
**H01Q 5/00** (2006.01)

(72) Inventors: **TZE-HSUAN CHANG**, New Taipei (TW); **CHO-KANG HSU**, New Taipei (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 5/0093** (2013.01)  
USPC ..... **343/852**

(73) Assignee: **CHIUN MAI COMMUNICATION SYSTEMS, INC.**, New Taipei (TW)

(57) **ABSTRACT**

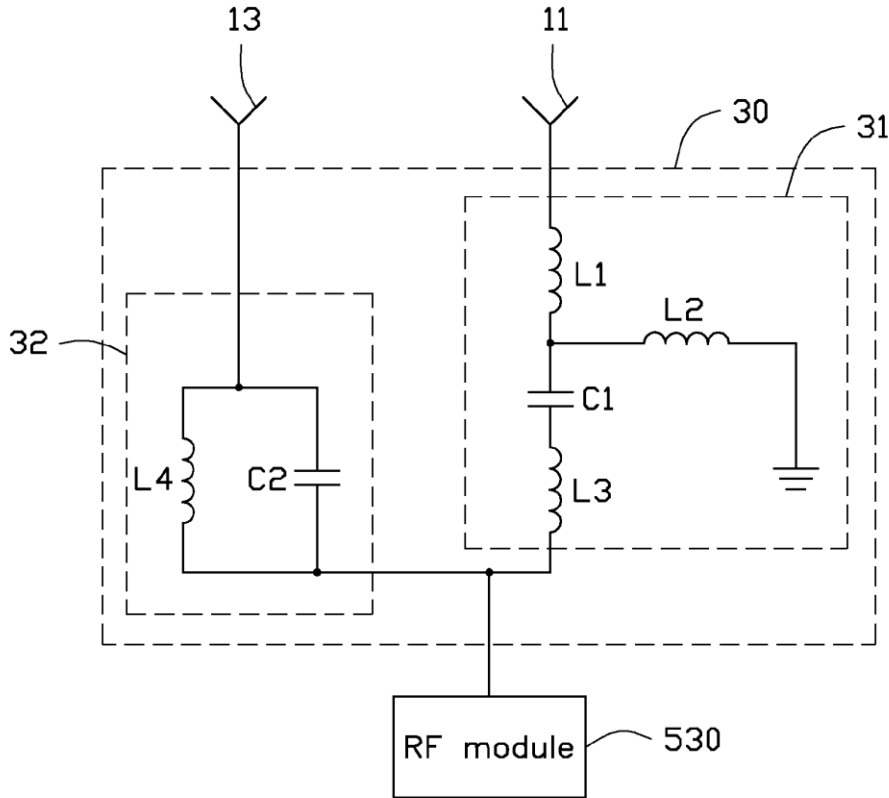
An antenna device includes an antenna and a matching circuit. The antenna includes a first radiating body and a second radiating body. The matching circuit includes a first matching path connected to the first radiating body and a second matching path connected to the second radiating body. The first radiating body and the second radiating body correspondingly operate at a first frequency band and a second frequency band by adjusting impedances of the first matching path and the second matching path.

(21) Appl. No.: **14/038,963**

(22) Filed: **Sep. 27, 2013**

(30) **Foreign Application Priority Data**

Jul. 19, 2013 (TW) ..... 102213679





US 20150022420A1

(19) **United States**

(12) **Patent Application Publication**  
LU

(10) **Pub. No.: US 2015/0022420 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **ANTENNA STRUCTURE AND WIRELESS COMMUNICATION DEVICE EMPLOYING SAME**

(52) **U.S. Cl.**  
CPC ..... *H01Q 3/34* (2013.01)  
USPC ..... **343/853**

(71) Applicant: **Chiun Mai Communication Systems, Inc.**, New Taipei (TW)

(57) **ABSTRACT**

(72) Inventor: **CHUN-YU LU**, New Taipei (TW)

(21) Appl. No.: **14/333,763**

(22) Filed: **Jul. 17, 2014**

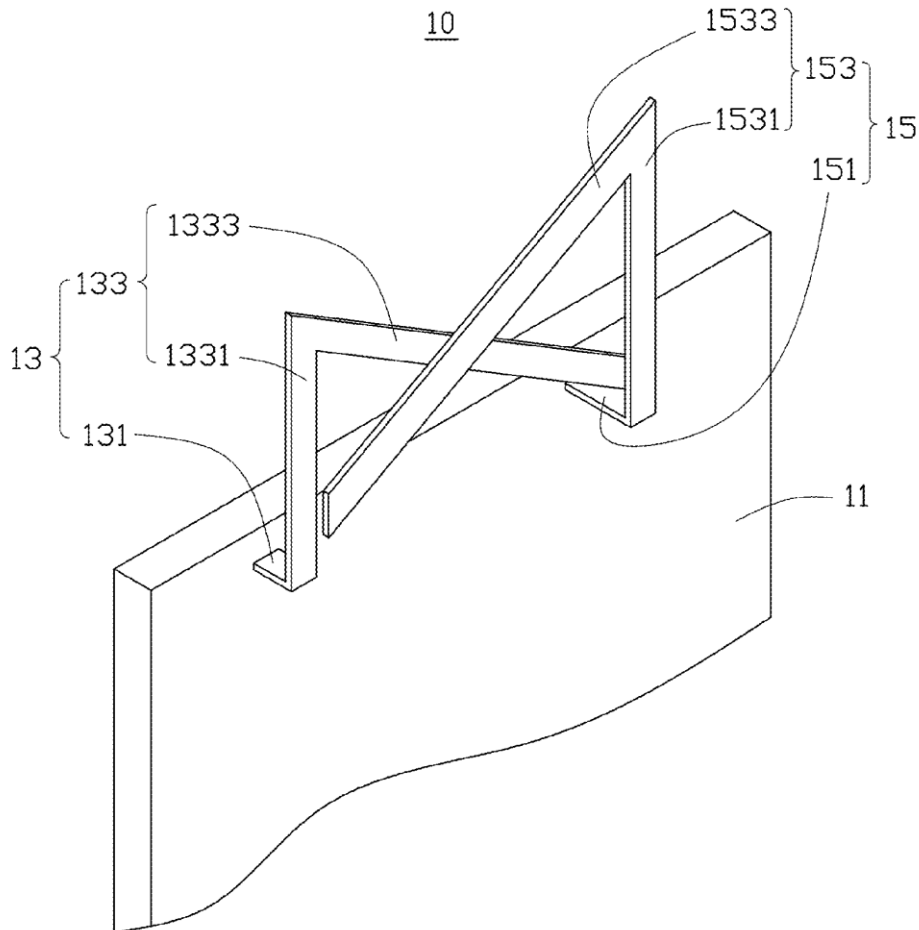
(30) **Foreign Application Priority Data**

Jul. 19, 2013 (TW) ..... 102125839

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 3/34* (2006.01)

An antenna structure includes a first antenna, a second antenna, a radio frequency ("RF") circuit, and a controller. The first antenna includes a first radiating portion and a first feeding portion. The second antenna includes a second radiating portion and a second feeding portion. The second radiating portion is positioned in a first plane that is substantially parallel to a second plane in which the first radiating portion is positioned. The RF circuit is configured to output a first current signal to the first feeding portion and a second current signal to the second feeding portion. The controller is configured to control the RF circuit to adjust phases of the first current signal and the second current signal.





US 20150022422A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0022422 A1**

(43) **Pub. Date: Jan. 22, 2015**

(54) **MOBILE DEVICE AND MULTI-BAND ANTENNA STRUCTURE THEREIN**

**Publication Classification**

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

(51) **Int. Cl.**  
**H01Q 1/50** (2006.01)

(72) Inventors: **Kun-Sheng Chang**, New Taipei City (TW); **Ming-Yu Chou**, New Taipei City (TW); **Ching-Chi Lin**, New Taipei City (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/50** (2013.01)  
USPC ..... **343/861**

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

(57) **ABSTRACT**

A mobile device includes a dielectric substrate, a ground plane, an RF (Radio Frequency) module, an antenna structure, a bypass inductor, matching circuits, and a switch circuit. The antenna structure includes a first radiation element and a second radiation element. The first end of the first radiation element is connected to the RF module, and the second end of the first radiation element is open. The second radiation element is separate from the first radiation element. The first end of the second radiation element is open and adjacent to the first radiation element, and the second end of the second radiation element is connected through the bypass inductor to the ground plane. The switch circuit selects one of the matching circuits according to a control signal. The second end of the second radiation element is further connected through the selected matching circuit to the ground plane.

(21) Appl. No.: **14/083,997**

(22) Filed: **Nov. 19, 2013**

(30) **Foreign Application Priority Data**

Jul. 22, 2013 (TW) ..... 102126052

