US 20130278480A1

(19) **United States**

(12) **Patent Application Publication**

McMilin et al.

(10) **Pub. No.: US 2013/0278480 A1**

(43) **Pub. Date: Oct. 24, 2013**

(54) **ANTENNA WITH VARIABLE DISTRIBUTED CAPACITANCE**

(76) Inventors: **Emily B. McMilin**, Mountain View, CA (US); **Qingxiang Li**, Mountain View, CA (US); **Robert W. Schlub**, Cupertino, CA (US)

(21) Appl. No.: **13/452,585**

(22) Filed: **Apr. 20, 2012**

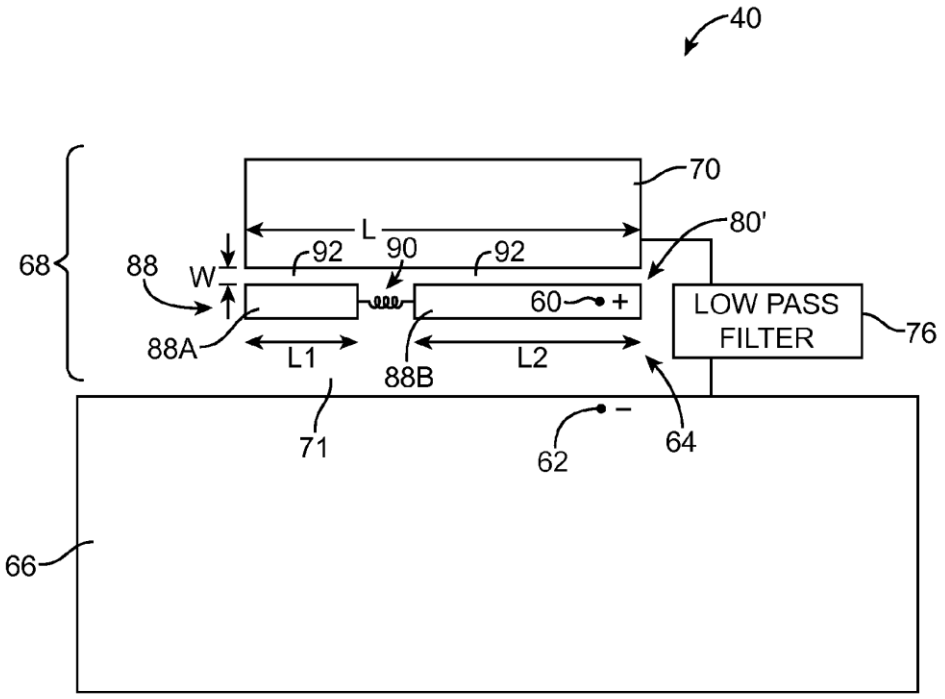
Publication Classification

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

(52) **U.S. Cl.**
USPC **343/904**

(57) **ABSTRACT**

Electronic devices may be provided with antennas. An antenna may be formed from conductive antenna structures that include a frequency-dependent distributed capacitor. The antenna may include an antenna ground and an antenna resonating element that are separated by a gap. A low pass filter circuit may bridge the gap. The antenna resonating element may have antenna resonating element conductive structures that serve as first and second electrodes for the distributed capacitor. The second electrode may have first and second conductive elements coupled by a filter. The filter may be a low pass filter implemented using an inductor. The inductor may have a first terminal coupled to the first conductive element and a second terminal coupled to the second conductive element. A first antenna feed terminal may be coupled to the first conductive element and a second antenna feed terminal may be coupled to the antenna ground.



US 20130278481A1

(19) **United States**

(12) **Patent Application Publication**

Voltmer et al.

(10) **Pub. No.: US 2013/0278481 A1**

(43) **Pub. Date: Oct. 24, 2013**

(54) **WIDEBAND ANTENNA USING ELECTROMAGNETIC BANDGAP STRUCTURES**

(71) Applicants: **David R. Voltmer**, Terre Haute, IN (US); **Eric R. Wandel**, Newburgh, IN (US); **Edward Dean Wheeler**, Terre Haute, IN (US)

(72) Inventors: **David R. Voltmer**, Terre Haute, IN (US); **Eric R. Wandel**, Newburgh, IN (US); **Edward Dean Wheeler**, Terre Haute, IN (US)

(21) Appl. No.: **13/654,412**

(22) Filed: **Oct. 17, 2012**

Related U.S. Application Data

(60) Provisional application No. 61/548,178, filed on Oct. 17, 2011.

Publication Classification

(51) **Int. Cl.**

H01Q 15/00 (2006.01)

H01Q 1/22 (2006.01)

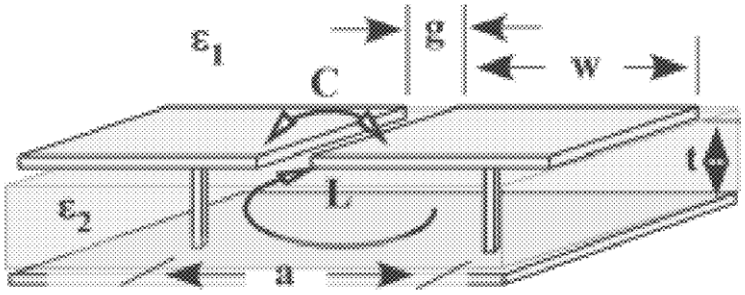
(52) **U.S. Cl.**

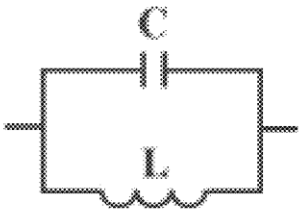
CPC ***H01Q 15/0006*** (2013.01); ***H01Q 1/22*** (2013.01)

USPC **343/904**; 343/913

(57) **ABSTRACT**

The present invention relates to the field of antennas and specifically to broadband antennas. Planar low-profile antennas over high-impedance surfaces show improved performance compared to that over metal ground planes, but these high-impedance surfaces often operate over narrow bandwidths because current approaches to the design of high-impedance substrates typically employ identical unit cells with the same resonant frequency to produce high-impedance behavior over a relatively narrow frequency range. The present invention provides improved antenna performance over a broader bandwidth through the use of electromagnetic bandgap cells having a size and related resonant frequency that varies with position to the antenna radiating element in order to match the resonance of the element.





US 20130285857A1

(19) **United States**

(12) **Patent Application Publication**

SCHULTZ et al.

(10) **Pub. No.: US 2013/0285857 A1**

(43) **Pub. Date: Oct. 31, 2013**

(54) **ANTENNA ARRANGEMENT**

(71) Applicants: **John Colin SCHULTZ**, Mawson Lakes (AU); **David Malcolm HALL**, Mawson Lakes (AU)

(72) Inventors: **John Colin SCHULTZ**, Mawson Lakes (AU); **David Malcolm HALL**, Mawson Lakes (AU)

(21) Appl. No.: **13/661,453**

(22) Filed: **Oct. 26, 2012**

(30) **Foreign Application Priority Data**

Oct. 26, 2011 (AU) 2011904444

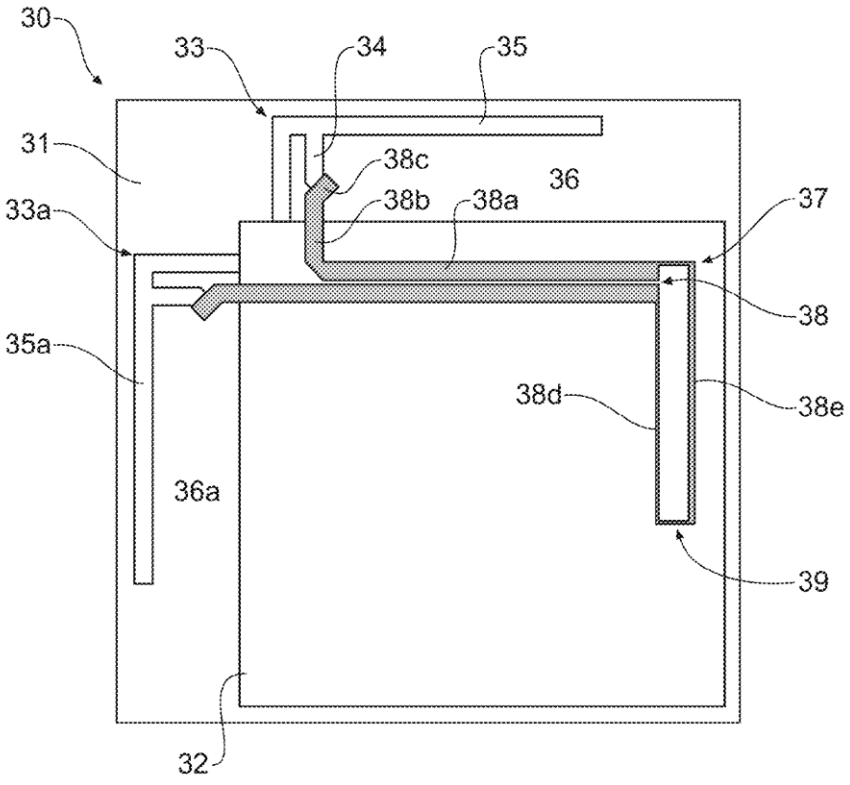
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 5/0027*** (2013.01)
USPC ..... **343/700 MS**

(57) **ABSTRACT**

Disclosed are antennas for printed circuit boards (PCB) including a printed circuit board having antenna conductors, ground plane, an insulating substrate and a feed structure. The antenna is at least partially formed by an array of two similarly sized and shaped antenna elements. Each antenna element is oriented substantially orthogonal to the other and similarly positioned relative to the ground plane. The two antenna elements are coupled to the feed structure and are connectable to a transceiver such that when the two like antenna elements are fed differentially the far fields of each antenna are substantially similar and substantially orthogonal to each other so as to provide substantial omni-directionality.



US 20130285860A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0285860 A1

(43) Pub. Date: Oct. 31, 2013

LAI et al.

(54) **MOBILE WIRELESS DEVICE WITH MULTI-BAND LOOP ANTENNA WITH ARMS DEFINING A SLOTTED OPENING AND RELATED METHODS**

(71) Applicant: **RESEARCH IN MOTION LIMITED**, Waterloo (CA)

(72) Inventors: **CHUN KIT LAI**, CORAL SPRINGS, FL (US); **SOO LIAM OOI**, PLANTATION, FL (US); **QIWU TAN**, PLANTATION, FL (US)

(21) Appl. No.: **13/927,501**

(22) Filed: **Jun. 26, 2013**

Related U.S. Application Data

(63) Continuation of application No. 13/005,326, filed on Jan. 12, 2011, now Pat. No. 8,497,806.

(60) Provisional application No. 61/367,083, filed on Jul. 23, 2010.

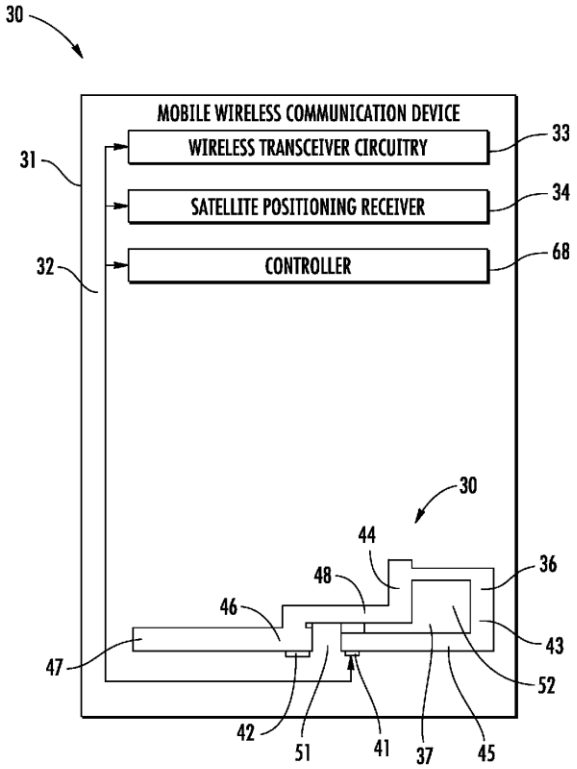
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 1/243*** (2013.01)
USPC **343/702**; 29/600

(57) **ABSTRACT**

A mobile wireless communications device may include a housing, a printed circuit board (PCB) carried by the housing. The device may also include an antenna coupled to wireless transceiver circuitry carried by the PCB. The antenna may include first and second feed legs extending upwardly from the PCB, a loop conductor spaced above the PCB and having a gap therein defining first and second ends, and a first conductor arm spaced above the PCB and extending between the first feed leg and the first end. The antenna may further include a second conductor arm spaced above the PCB and having a proximal portion between the second feed leg and the second end, and having a distal portion extending outwardly from the second feed leg. The first conductor arm and the proximal portion may define a slotted opening into an interior of the loop conductor.



US 20130285863A1

(19) **United States**

(12) **Patent Application Publication**

De Luis et al.

(10) **Pub. No.: US 2013/0285863 A1**

(43) **Pub. Date: Oct. 31, 2013**

(54) **RECONFIGURABLE MULTI-BAND ANTENNA**

(75) Inventors: **Javier Rodriguez De Luis**, Kirkland, WA (US); **Alireza Mahanfar**, Redmond, WA (US); **Benjamin J. Shewan**, Redmond, WA (US); **Stanley Yu Tao Ng**, Bellevue, WA (US)

(73) Assignee: **MICROSOFT CORPORATION**, Redmond, WA (US)

(21) Appl. No.: **13/456,931**

(22) Filed: Apr. 26, 2012

Publication Classification

(51) **Int. Cl.**

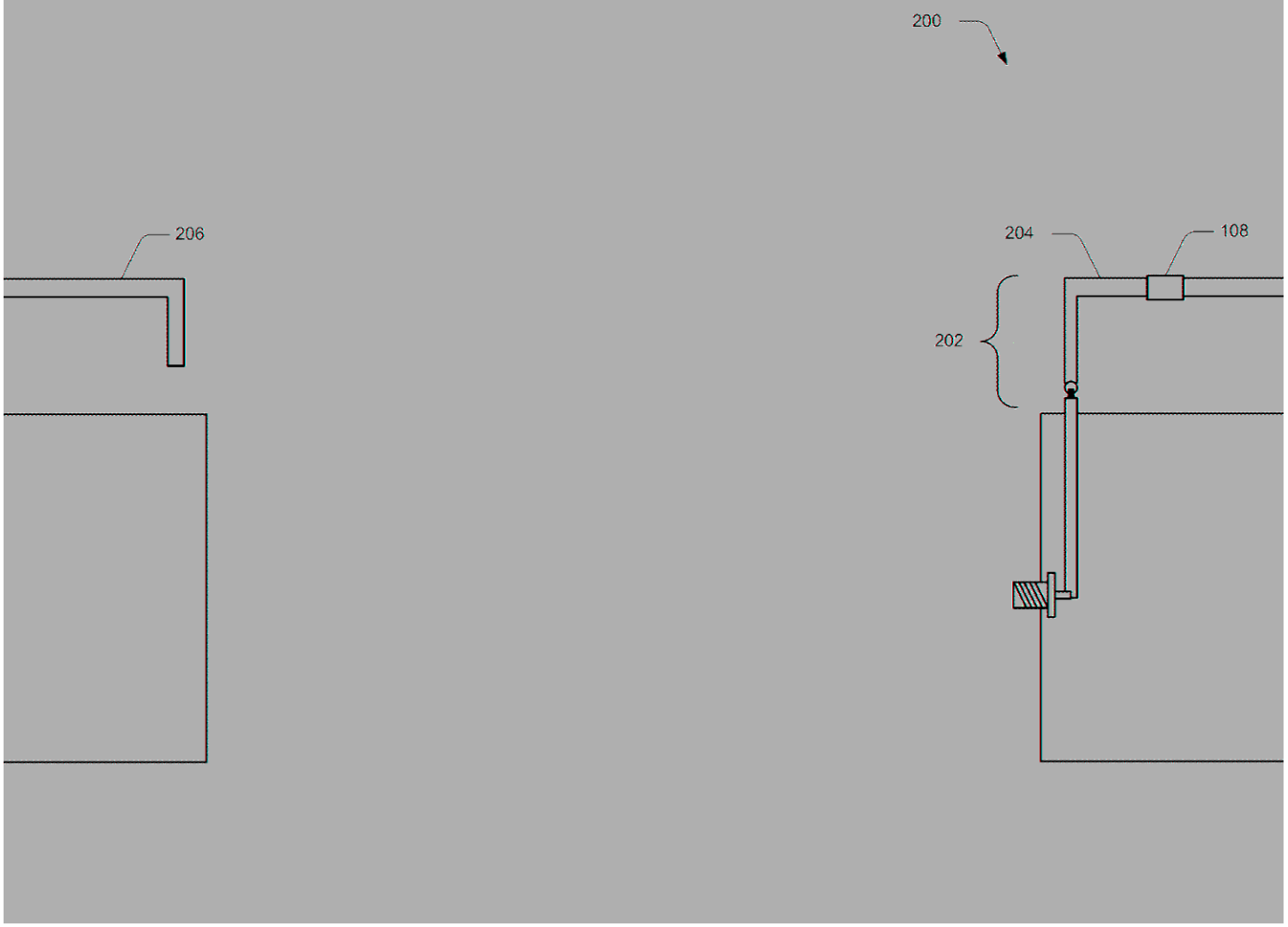
H01Q 5/00 (2006.01)

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

USPC **343/745**

(57) **ABSTRACT**

Reconfigurable multi-band antenna techniques are described. In one or more implementations, an apparatus includes an antenna that can operate at multiple frequency bands that include first and second frequency bands, respectively. The antenna includes a first radiator structure configured to tune to the first frequency band and comprising a first radiator element. In addition, the antenna includes a second radiator structure configured to tune to the second frequency band and comprising the first radiator element and a second radiator element. The antenna also includes a tunable circuit configured to couple the first radiator element to the second radiator element. Additionally, the apparatus includes a communication module configured to use the tunable circuit to adjust one of said first and second frequency bands independently from the other of said first and second frequency bands, without causing a change in the other of said first and second frequency bands.



US 20130285868A1

(19) **United States**

(12) **Patent Application Publication**

QI et al.

(10) **Pub. No.: US 2013/0285868 A1**

(43) **Pub. Date: Oct. 31, 2013**

(54) **MOBILE WIRELESS COMMUNICATIONS DEVICE ANTENNA ASSEMBLY WITH ANTENNA ELEMENT AND FLOATING DIRECTOR ELEMENT ON FLEXIBLE SUBSTRATE AND RELATED METHODS**

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

(72) Inventors: **YIHONG QI**, WATERLOO (CA); **YING TONG MAN**, WATERLOO (CA); **ADRIAN MATTHEW COOKE**, KITCHENER (CA)

(21) Appl. No.: **13/927,691**

(22) Filed: **Jun. 26, 2013**

Related U.S. Application Data

(63) Continuation of application No. 12/901,641, filed on Oct. 11, 2010, now Pat. No. 8,487,815, which is a continuation of application No. 11/863,324, filed on Sep. 28, 2007, now Pat. No. 7,812,773.

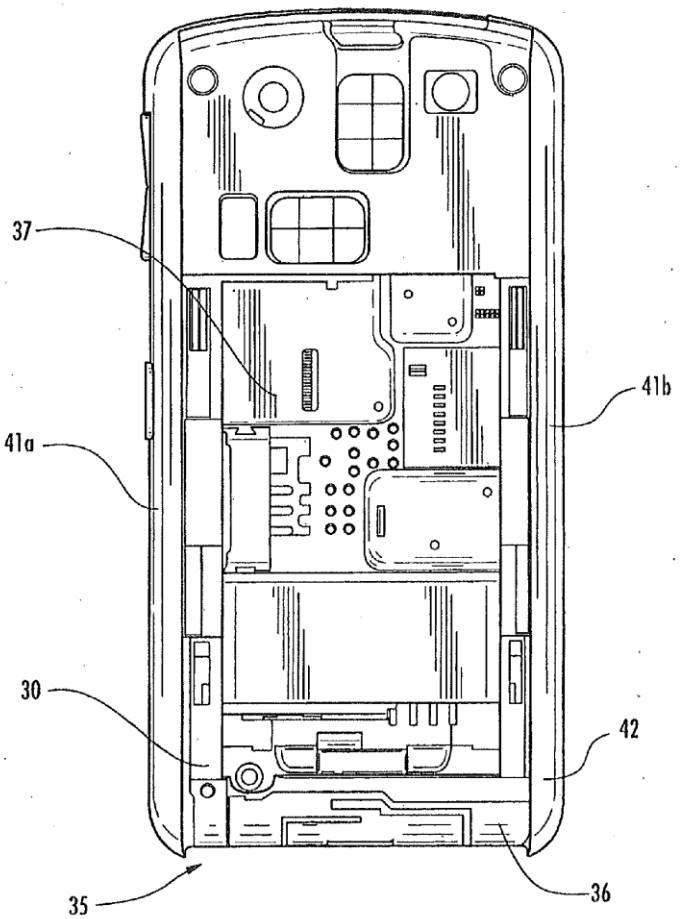
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 1/38*** (2013.01)
USPC **343/833**; 29/600

(57) **ABSTRACT**

A mobile wireless communications device may include a portable housing, a circuit board carried by the portable housing and having a ground plane thereon, wireless communications circuitry carried by the circuit board, and an antenna assembly carried by the housing. More particularly, the antenna assembly may include a flexible substrate, an electrically conductive antenna element on the flexible substrate and connected to the wireless communications circuitry and the ground plane, and a floating, electrically conductive director element on the flexible substrate for directing a beam pattern of the antenna element.



US 20130285869A1

(19) **United States**

(12) **Patent Application Publication**

CHUNG et al.

(10) **Pub. No.: US 2013/0285869 A1**

(43) **Pub. Date: Oct. 31, 2013**

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

(71) Applicants: **AMBIT MICROSYSTEMS (SHANGHAI) LTD.**, Shanghai (CN); **HON HAI PRECISION INDUSTRY CO., LTD.**, New Taipei (TW)

(72) Inventors: **CHO-JU CHUNG**, New Taipei (TW); **GUAN-RUN TAO**, Shanghai (CN)

(73) Assignees: **HON HAI PRECISION INDUSTRY CO., LTD.**, New Taipei (TW); **AMBIT MICROSYSTEMS (SHANGHAI) LTD.**, Shanghai (CN)

(21) Appl. No.: **13/853,148**

(22) Filed: **Mar. 29, 2013**

(30) **Foreign Application Priority Data**

Apr. 28, 2012 (CN) 201210132784.4

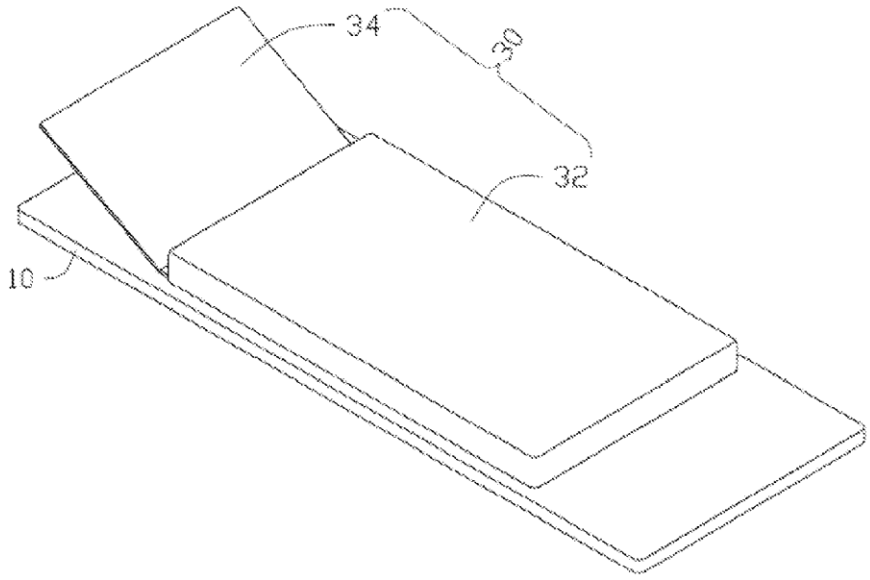
Publication Classification

(51) **Int. Cl.**
H01Q 15/14 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 15/14*** (2013.01)
USPC **343/835**

(57) **ABSTRACT**

The antenna system includes a substrate, a first antenna, a second antenna and a reflection portion. The substrate is a printed circuit board (PCB), and includes a vacancy portion and a metal ground portion. The vacancy portion includes a radio frequency (RF) component portion and a non-RF component portion. The RF component portion includes some radio frequency components. In order to transmit and receive electromagnetic signal, the radio frequency components are electronically connected to the first antenna and the second antenna.



US 20130285870A1

(19) **United States**

(12) **Patent Application Publication**

Hotta et al.

(10) **Pub. No.: US 2013/0285870 A1**

(43) **Pub. Date: Oct. 31, 2013**

(54) **ANTENNA APPARATUS AND ELECTRONIC DEVICE INCLUDING ANTENNA APPARATUS**

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

(72) Inventors: **Hiroyuki Hotta**, Ome-shi (JP); **Koichi Sato**, Tachikawa-shi (JP); **Ippei Kashiwagi**, Fuchu-shi (JP)

(73) Assignee: **Kabushiki Kaisha Toshiba**, Tokyo (JP)

(21) Appl. No.: **13/771,484**

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

(30) **Foreign Application Priority Data**

Apr. 26, 2012 (JP) 2012-101759

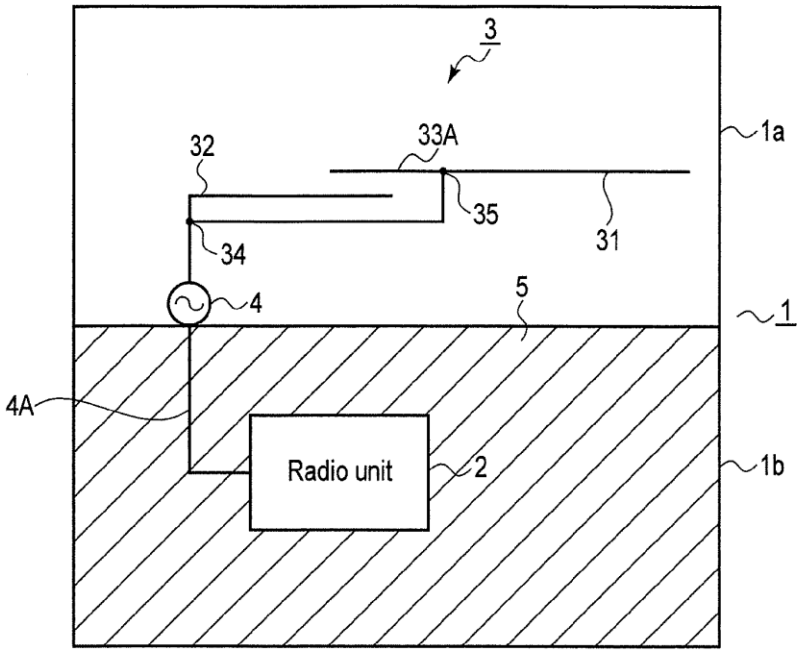
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 5/001*** (2013.01)
USPC **343/843**

(57) **ABSTRACT**

According to one embodiment, an antenna apparatus includes a first antenna element, a second antenna element, and a third antenna element. The first antenna element has one end connected to a feed terminal, and other end open. The second antenna element has one end connected to a first position set on an element of the first antenna element, and other end open, with a portion between one end and the other end being disposed parallel to the first antenna element. The third antenna element has one end connected to a second position set between the other end and the first position on the element of the first antenna element, and other end open, with at least part of a portion between one end and the other end being disposed near the second antenna element.



US 20130285872A1

(19) **United States**

(12) **Patent Application Publication**

OH et al.

(10) **Pub. No.: US 2013/0285872 A1**

(43) **Pub. Date: Oct. 31, 2013**

(54) **ANTENNA**

(71) Applicants: **INDUSTRY-UNIVERSITY COOPERATION FOUNDATION HANYANG UNIVERSITY**, (US); **LG INNOTEK CO., LTD.**, Seoul (KR)

(72) Inventors: **Sae Won OH**, Seoul (KR); **Hyeong Dong KIM**, Seoul (KR); **Sin Hyung JEON**, Seoul (KR); **Bum Ki PARK**, Seoul (KR); **Jin Hyuk JANG**, Seoul (KR)

(73) Assignees: **INDUSTRY-UNIVERSITY COOPERATION FOUNDATION HANYANG UNIVERSITY**, Seoul (KR); **LG INNOTEK CO., LTD.**, Seoul (KR)

(21) Appl. No.: **13/871,741**

(22) Filed: **Apr. 26, 2013**

(30) **Foreign Application Priority Data**

Apr. 27, 2012 (KR) 10-2012-0044991

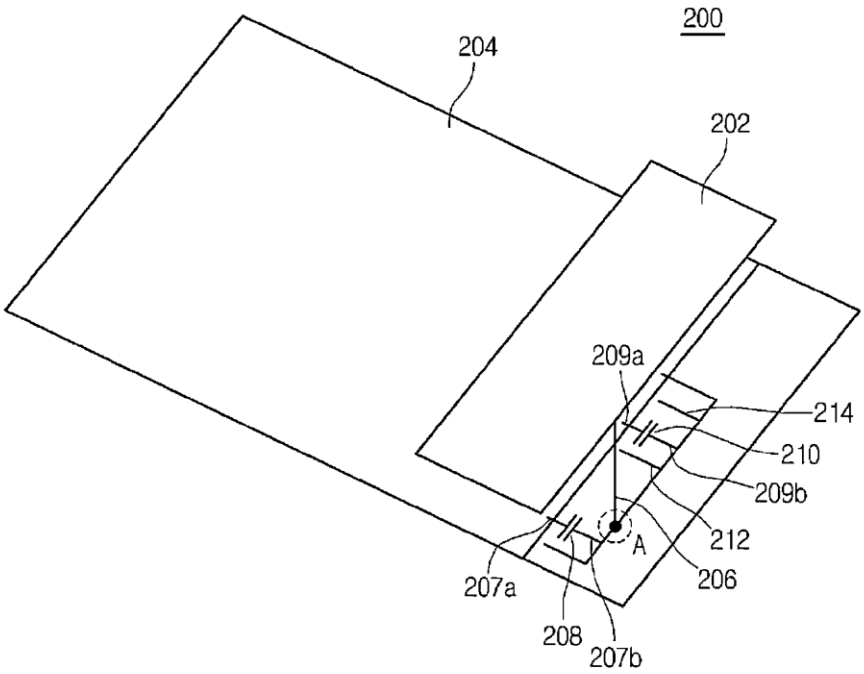
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 5/0041*** (2013.01)
USPC **343/850**

(57) **ABSTRACT**

An antenna according to an embodiment includes a substrate; a radiator; a ground plane spaced apart from the radiator; a feeding pin for feeding an RF signal; a first branch reactance at one side of the feeding pin, the first branch reactance including one end connected to the substrate and an opposite end connected to the ground plane; and a second branch reactance at an opposite end of the feeding pin, the second branch reactance including one end connected to the substrate and an opposite end connected to the ground plane.



US 20130285875A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0285875 A1

(43) Pub. Date: Oct. 31, 2013

KAWAHATA

(54) **FREQUENCY-VARIABLE CIRCUIT AND MULTI-BAND ANTENNA DEVICE**

(71) Applicant: **MURATA MANUFACTURING CO., LTD.**, KYOTO (JP)

(72) Inventor: **Kazunari KAWAHATA**, Kyoto (JP)

(21) Appl. No.: **13/928,139**

(22) Filed: **Jun. 26, 2013**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2011/079138, filed on Dec. 16, 2011.

(30) **Foreign Application Priority Data**

Dec. 28, 2010 (JP) 2010-293028

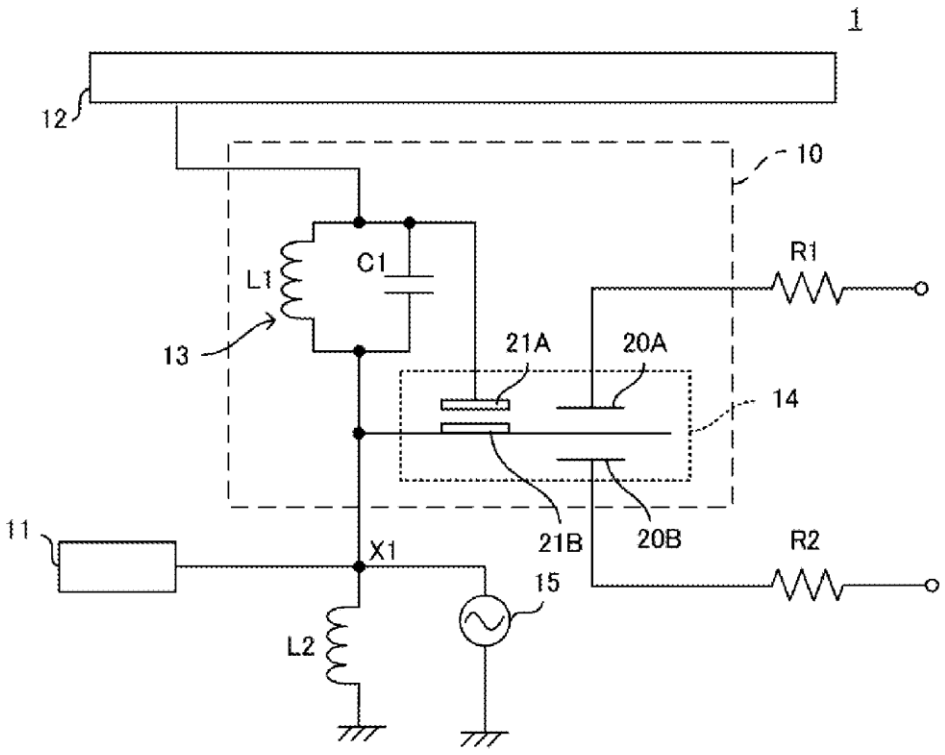
Publication Classification

(51) **Int. Cl.**
H01Q 21/30 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 21/30*** (2013.01)
USPC **343/852**

(57) **ABSTRACT**

A multi-band antenna device includes a frequency variable circuit, a first radiating element used in a first frequency band, a second radiating element used in a second frequency band lower than the first frequency band, and a power supply circuit. The frequency variable circuit includes a parallel resonant circuit in which a capacitor and an inductor are connected in parallel, and a first variable capacitance element connected in parallel with the capacitor. An end of the parallel resonant circuit and the first variable capacitance element are connected to the power supply circuit and the first radiating element. Another end of the parallel resonant circuit and the first variable capacitance element are connected to the second radiating element. The parallel resonant circuit has a resonant frequency closer to the first frequency band than to the second frequency band.



US 20130285876A1

(19) **United States**

(12) **Patent Application Publication**

CHANG et al.

(10) **Pub. No.: US 2013/0285876 A1**

(43) **Pub. Date: Oct. 31, 2013**

(54) **DUAL BAND ANTENNA WITH CIRCULAR POLARIZATION**

(71) Applicant: **National Taiwan University of Science and Technology**, (US)

(72) Inventors: **SHIH-HSUN CHANG**, Taipei (TW); **WEN-JIAO LIAO**, Taipei (TW)

(73) Assignee: **National Taiwan University of Science and Technology**, Taipei (TW)

(21) Appl. No.: **13/785,140**

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

(30) **Foreign Application Priority Data**

Apr. 27, 2012 (TW) 101115090

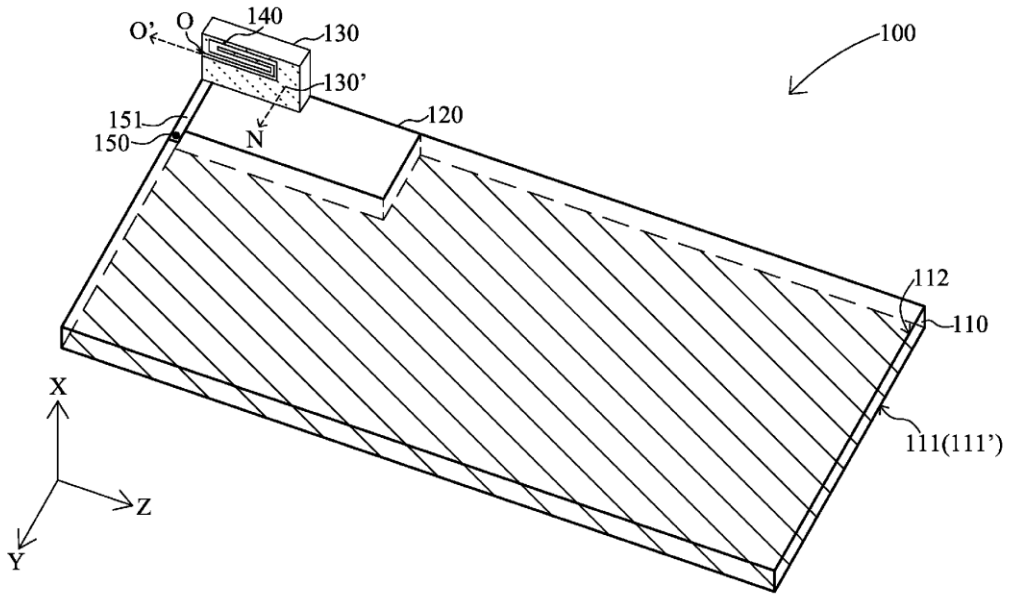
Publication Classification

(51) **Int. Cl.**
H01Q 5/01 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 5/01*** (2013.01)
USPC ..... **343/860**; 343/700 MS

(57) **ABSTRACT**

A dual band antenna with circular polarization is applied in a handheld device and includes a substrate, a radiation metal portion and a feed-in stripline. The substrate has a vacant area and a feed-in point. The feed-in point is disposed near and outside the vacant area. The radiation metal portion is disposed vertically to a surface of the substrate at the edge of the vacant area, and includes a radiation surface and a meandering structure. The radiation surface is disposed at one side of the radiation metal portion and near the substrate. The meandering structure is disposed at another side of the radiation metal portion and far from the substrate. The feed-in stripline is disposed on the substrate. One end of the feed-in stripline is electrically connected to the feed-in point, and the other end of the feed-in stripline is electrically connected to the radiation metal portion.



US 20130293249A1

(19) **United States**

(12) **Patent Application Publication**

Han et al.

(10) **Pub. No.: US 2013/0293249 A1**

(43) **Pub. Date: Nov. 7, 2013**

(54) **METHODS FOR MODELING TUNABLE RADIO-FREQUENCY ELEMENTS**

(76) Inventors: **Liang Han**, Sunnyvale, CA (US); **Jayesh Nath**, Santa Clara, CA (US); **Matthew A. Mow**, Los Altos, CA (US); **Peter Bevelacqua**, Cupertino, CA (US); **Joshua G. Nickel**, San Jose, CA (US); **Mattia Pascolini**, Campbell, CA (US); **Robert W. Schlub**, Cupertino, CA (US); **Ruben Caballero**, San Jose, CA (US)

(21) Appl. No.: **13/466,017**

(22) Filed: **May 7, 2012**

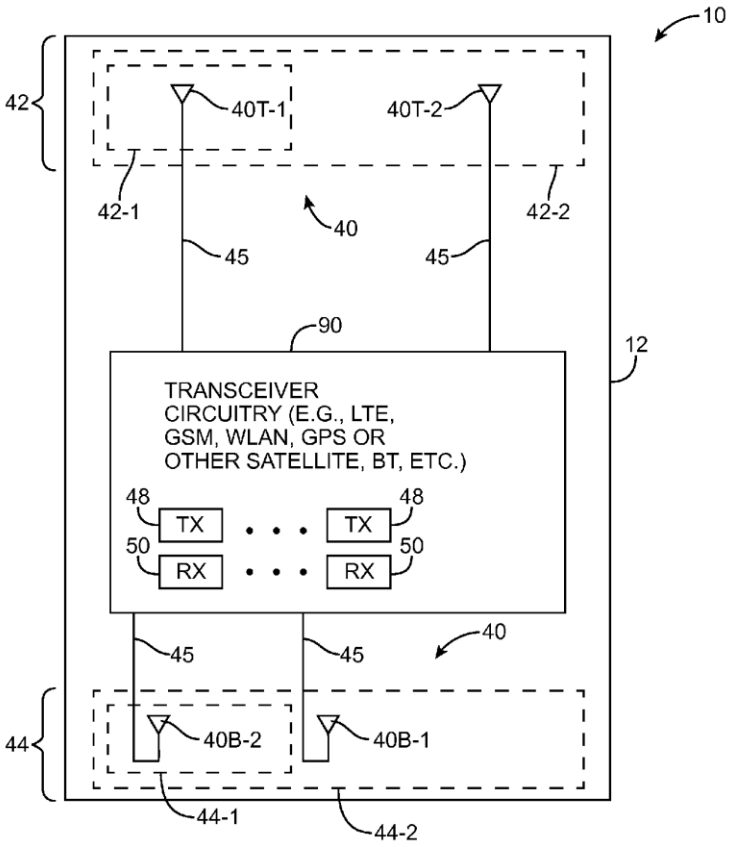
Publication Classification

(51) **Int. Cl.**
G01R 31/00 (2006.01)

(52) **U.S. Cl.**
USPC **324/750.02**

(57) **ABSTRACT**

A test system for characterizing an antenna tuning element is provided. The test system may include a test host, a radio-frequency tester, and a test fixture. The test system may calibrate the radio-frequency tester using known coaxial standards. The test system may then calibrate transmission line effects associated with the test fixture using a THRU-REFLECT-LINE calibration algorithm. The antenna tuning element may be mounted on a test socket that is part of the test fixture. While the antenna tuning element is mounted on the test socket, scattering parameter measurements may be obtained using the radio-frequency tester. An equivalent circuit model for the test socket can be obtained based on the measured scattering parameters and known characteristics of the antenna tuning element. Once the test socket has been characterized, an equivalent circuit model for the antenna tuning element can be obtained by extracting suitable modeling parameters from the measured scattering parameters.



US 20130293424A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0293424 A1

(43) Pub. Date: Nov. 7, 2013

Zhu et al.

(54) **CORNER BRACKET SLOT ANTENNAS**

(76) Inventors: **Jiang Zhu**, Sunnyvale, CA (US); **Qingxiang Li**, Mountain View, CA (US); **Robert W. Schlub**, Cupertino, CA (US); **Miroslav Samardzija**, Mountain View, CA (US); **Gordon Coutts**, Sunnyvale, CA (US); **Rodney A. Gomez Angulo**, Sunnyvale, CA (US); **Yi Jiang**, Sunnyvale, CA (US); **Boon W. Shiu**, San Jose, CA (US); **Salih Yarga**, Sunnyvale, CA (US); **Emily B. McMilin**, Mountain View, CA (US); **Ruben Caballero**, San Jose, CA (US)

(21) Appl. No.: **13/462,268**

(22) Filed: **May 2, 2012**

Publication Classification

(51) **Int. Cl.**

H01Q 13/10 (2006.01)

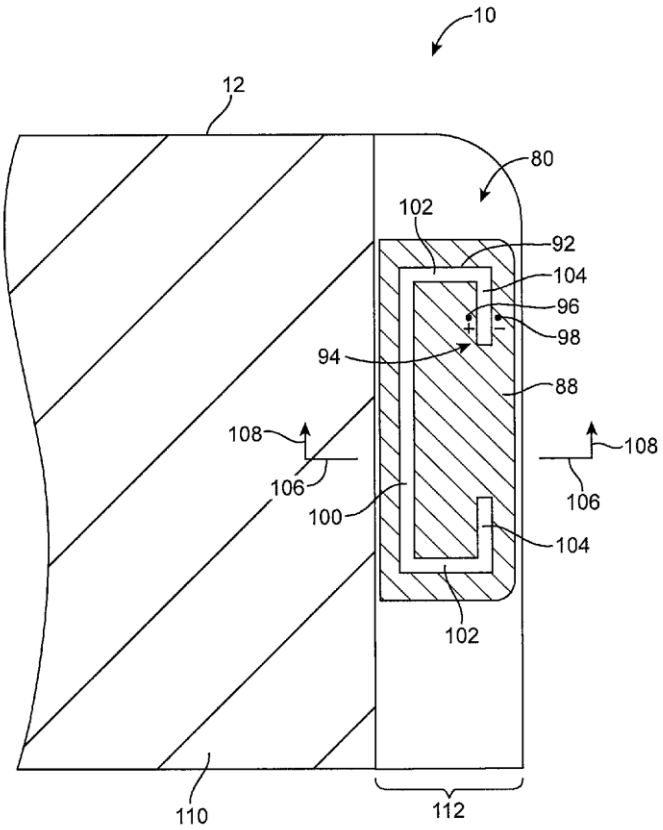
H01Q 13/18 (2006.01)

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

USPC **343/702**; 343/767

(57) **ABSTRACT**

A display cover layer may be mounted in an electronic device housing using housing structures such as corner brackets. A slot antenna may be formed from a corner bracket opening, metal traces on a hollow plastic support structure, or other conductive structures. The slot antenna may have a main portion with opposing ends. An antenna feed may be located at one of the ends. The slot antenna may have a slot with one or more bends. The bends may provide the slot antenna with a C-shaped outline. A side branch slot may extend from the main portion of the slot at a location between the two bends. The presence of the side branch slot may enhance antenna bandwidth. A hollow enclosure may serve as an antenna support structure and as a speaker box enclosing a speaker driver. The antenna feed may be positioned so as to overlap the speaker driver.



US 20130293425A1

(19) **United States**

(12) **Patent Application Publication**

Zhu et al.

(10) **Pub. No.: US 2013/0293425 A1**

(43) **Pub. Date: Nov. 7, 2013**

(54) **ANTENNA STRUCTURES HAVING SLOT-BASED PARASITIC ELEMENTS**

(76) Inventors: **Jiang Zhu**, Sunnyvale, CA (US); **Jerzy Guterman**, Mountain View, CA (US); **Mattia Pascolini**, Campbell, CA (US); **Hongfei Hu**, Santa Clara, CA (US)

(21) Appl. No.: **13/464,789**

(22) Filed: **May 4, 2012**

Publication Classification

(51) **Int. Cl.**

H01Q 1/52 (2006.01)

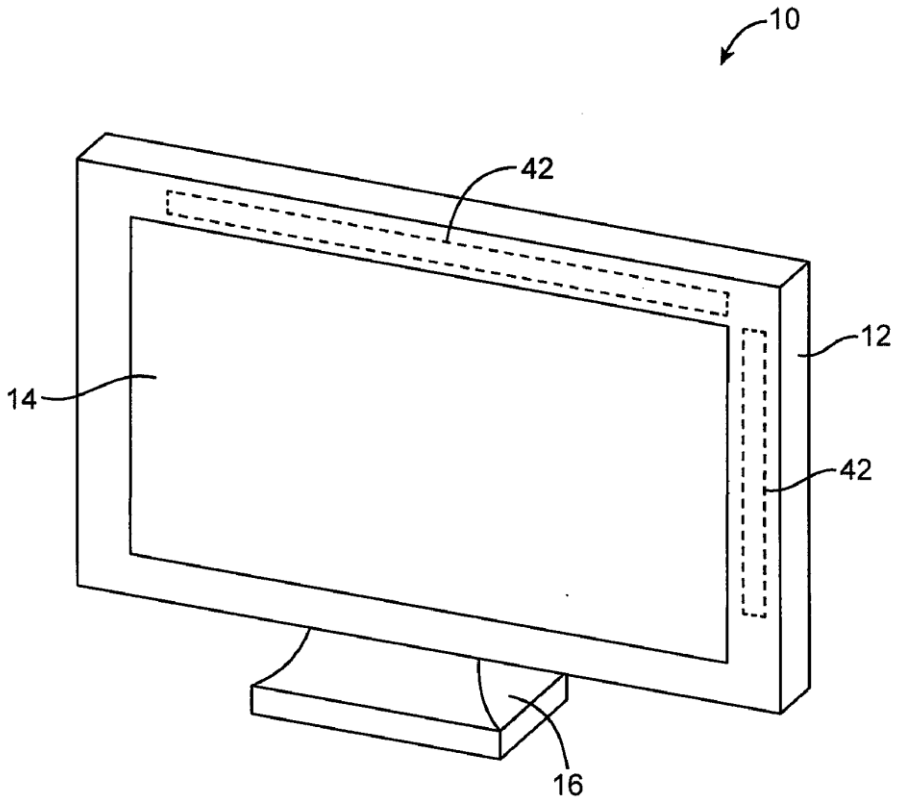
H01Q 1/24 (2006.01)

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

USPC **343/702**; 343/841

(57) **ABSTRACT**

Electronic devices may include radio-frequency transceiver circuitry and antenna structures. The antenna structures may include antenna resonating elements and antenna ground plane structures. An electronic device may have antennas formed from the antenna resonating elements and an antenna ground plane. The antenna ground plane may have slot structures. The slot structures may be configured to form a slot-based parasitic antenna element to minimize coupling between the antennas in a device. The slot-based parasitic antenna element may be located between the antennas in a device. The slots structures from which a parasitic antenna element is formed may include open slots and closed slots. Slots may have one or more arms and one or more bends. Slots may be formed in internal housing members, traces on dielectric carriers, and other conductive structures.



US 20130293426A1

(19) **United States**

(12) **Patent Application Publication**

Hung et al.

(10) **Pub. No.: US 2013/0293426 A1**

(43) **Pub. Date: Nov. 7, 2013**

(54) **ELECTRONIC DEVICE**

(71) Applicants: **Kuo-Chiang Hung**, Taipei City (TW); **Chieh-Tsao Hwang**, Taipei City (TW); **Shih-Chia Liu**, Taipei City (TW); **Chang-Chih Chen**, Taipei City (TW); **Chen-Ta Hung**, Taipei City (TW)

(72) Inventors: **Kuo-Chiang Hung**, Taipei City (TW); **Chieh-Tsao Hwang**, Taipei City (TW); **Shih-Chia Liu**, Taipei City (TW); **Chang-Chih Chen**, Taipei City (TW); **Chen-Ta Hung**, Taipei City (TW)

(21) Appl. No.: **13/670,479**

(22) Filed: **Nov. 7, 2012**

Related U.S. Application Data

(60) Provisional application No. 61/643,369, filed on May 7, 2012.

Publication Classification

(51) **Int. Cl.**

H01Q 1/52 (2006.01)

H01Q 1/22 (2006.01)

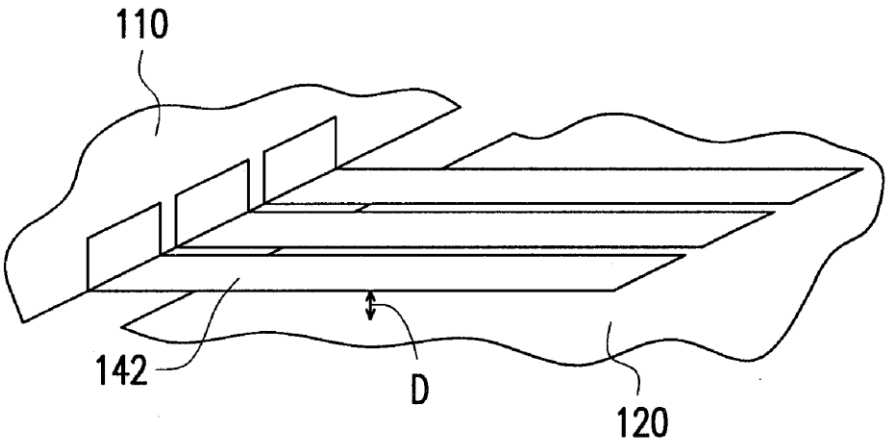
(52) **U.S. Cl.**

CPC . ***H01Q 1/521*** (2013.01); ***H01Q 1/22*** (2013.01)

USPC **343/702**

(57) **ABSTRACT**

An electronic device including a first shell, a second shell, a connecting unit, an antenna unit and an isolating unit is provided. A material of the first shell includes a conductive material. A material of the second shell includes a conductive material. The connecting unit includes two connecting portions connected to the first shell and the second shell. The antenna unit includes a first antenna and a second antenna. The first antenna and the second antenna correspond to the two connecting portions respectively and are disposed on the first shell or the second shell. The isolating unit is disposed between the first antenna and the second antenna and includes at least one isolating conductor. The isolating conductor is connected to the first shell and extends toward the second shell, such that the first shell and the second shell form a conducting circuit through the isolating conductor.



US 20130293427A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0293427 A1

(43) Pub. Date: Nov. 7, 2013

Zhang et al.

(54) **LOOPED MULTI-BRANCH PLANAR ANTENNAS HAVING A FLOATING PARASITIC ELEMENT AND WIRELESS COMMUNICATIONS DEVICES INCORPORATING THE SAME**

(75) Inventors: **Zheng Zhang**, Lund (SE); **Bangguo Zhu**, Lund (SE); **Zhinong Ying**, Lund (SE)

(73) Assignee: **SONY MOBILE COMMUNICATIONS AB**, Lund (SE)

(21) Appl. No.: **13/816,941**

(22) PCT Filed: **May 7, 2012**

(86) PCT No.: **PCT/IB12/00891**

§ 371 (c)(1),
(2), (4) Date: **Mar. 5, 2013**

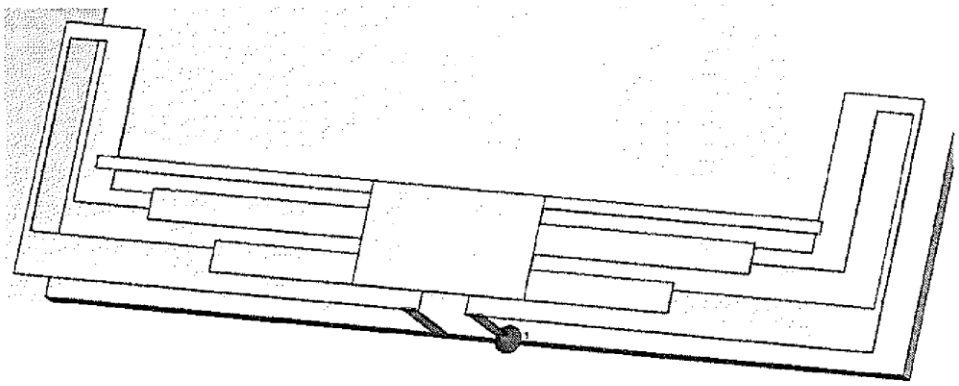
Publication Classification

(51) **Int. Cl.**
H01Q 19/28 (2006.01)
H01Q 1/24 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 19/28*** (2013.01); ***H01Q 1/243*** (2013.01)
USPC **343/702**; 343/833

(57) **ABSTRACT**

Antenna systems are provided including a ground plane; a loop antenna positioned on the ground plane on a first layer, the loop antenna having antenna feed positioned at a center of an edge of the first layer; and a multi-branch parasitic element electrically coupled to the loop antenna, the multi-branch parasitic element being parallel to and positioned above the ground plane on a second layer, different from the first layer, wherein the loop antenna on the first layer is positioned between the ground plane and the multi-branch parasitic element on the second layer. Related wireless communications devices and loop antennas are also provided herein.



US 20130293433A1

(19) **United States**

(12) **Patent Application Publication**

Ishikawa et al.

(10) **Pub. No.: US 2013/0293433 A1**

(43) **Pub. Date: Nov. 7, 2013**

(54) **ANTENNA DEVICE**

(71) Applicant: **FUJITSU LIMITED**, Kawasaki-shi (JP)

(72) Inventors: **Shohei Ishikawa**, Yokohama (JP); **Teruhisa Ninomiya**, Yokohama (JP)

(73) Assignee: **FUJITSU LIMITED**, Kawasaki-shi (JP)

(21) Appl. No.: **13/731,569**

(22) Filed: **Dec. 31, 2012**

(30) **Foreign Application Priority Data**

May 1, 2012 (JP) 2012-104617

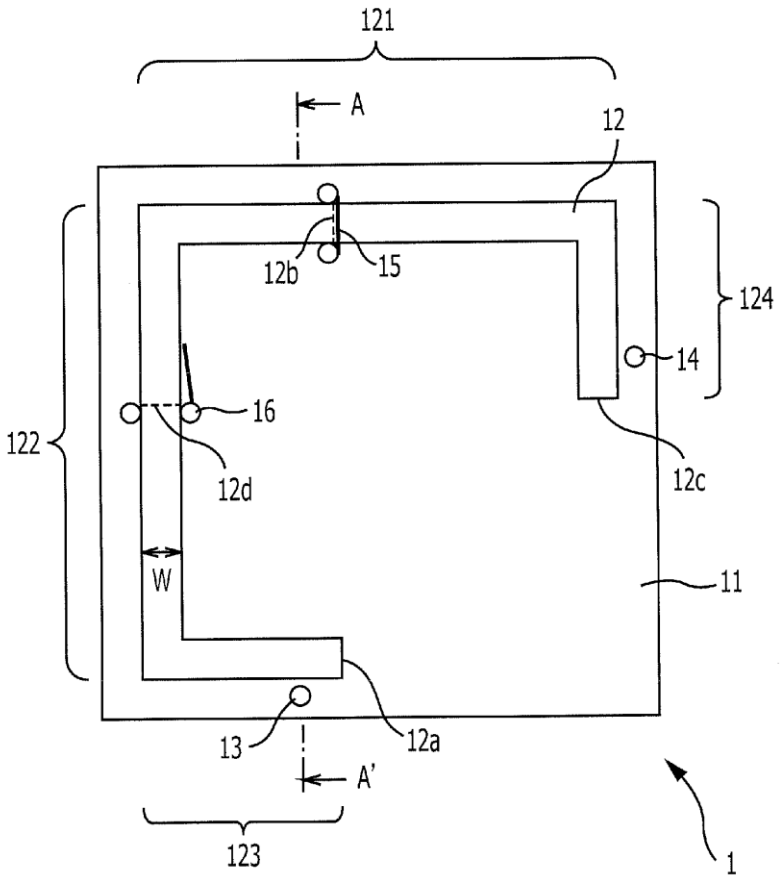
Publication Classification

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

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

(57) **ABSTRACT**

An antenna device includes: a substrate; a slot including an earth electrode, a first side, a second side, a first bent part and a second bent part, the first side and the second side being orthogonal and one end of the first side coupled to one end of the second side, the first bent part coupled to the other end of the second side and provided in parallel to the first side, the first bent part being shorter than the first side, the second bent part coupled to the other end of the first side and provided in parallel to the second side, the second bent part being shorter than the second side; a first feeding point provided on the earth electrode; a second feeding point provided on the earth electrode; a first switch provided on the first side; and a second switch provided on the second side.



US 20130293440A1

(19) **United States**

(12) **Patent Application Publication**

QI et al.

(10) **Pub. No.: US 2013/0293440 A1**

(43) **Pub. Date: Nov. 7, 2013**

(54) **MOBILE WIRELESS COMMUNICATIONS DEVICE WITH POLARIZATION DIVERSITY WIRELESS LOCAL AREA NETWORK (LAN) ANTENNA AND RELATED METHODS**

(71) Applicant: **RESEARCH IN MOTION LIMITED**, Waterloo (CA)

(72) Inventors: **YIHONG QI**, WATERLOO (CA); **YING TONG MAN**, WATERLOO (CA); **PERRY JARMUSZEWSKI**, WATERLOO (CA); **ADRIAN MATTHEW COOKE**, KITCHENER (CA)

(21) Appl. No.: **13/933,214**

(22) Filed: **Jul. 2, 2013**

Related U.S. Application Data

(63) Continuation of application No. 13/038,480, filed on Mar. 2, 2011, now Pat. No. 8,503,959, which is a continuation of application No. 12/015,844, filed on Jan. 17, 2008, now Pat. No. 7,912,435, which is a continuation of application No. 10/924,276, filed on Aug. 23, 2004, now Pat. No. 7,353,013.

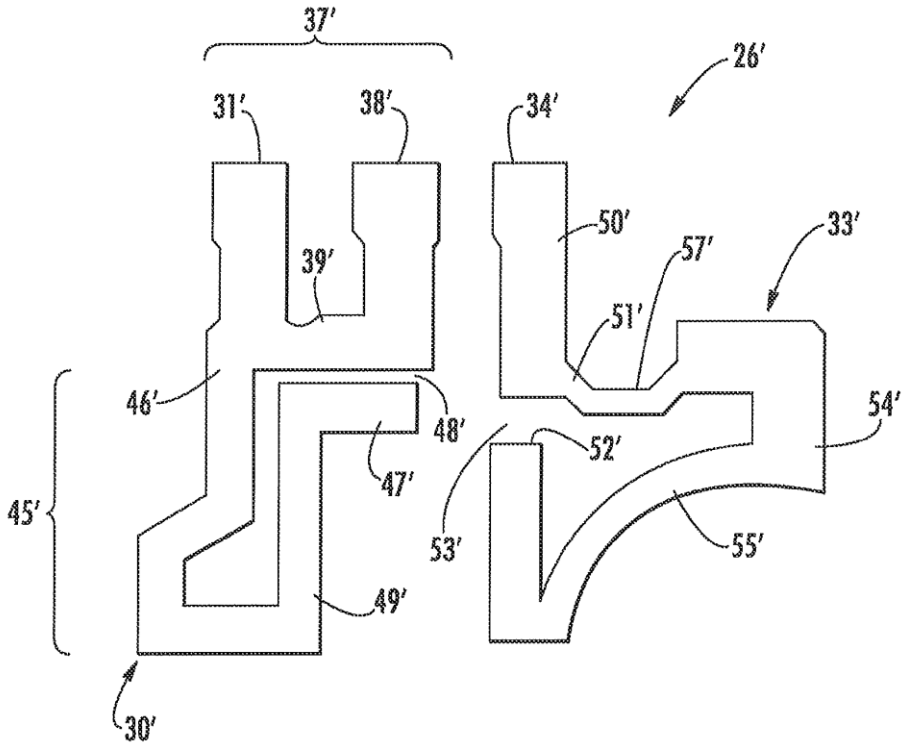
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 5/002*** (2013.01)
USPC ..... **343/860**; 343/700 MS; 29/600

(57) **ABSTRACT**

A mobile wireless LAN communications device may include a portable, handheld housing, and a wireless LAN transceiver carried by the housing. A polarization diversity wireless LAN antenna may be included for cooperating with the wireless LAN transceiver to communicate over a wireless LAN. The polarization diversity wireless LAN antenna may include a first antenna element coupled to the wireless LAN transceiver having a first shape and a first polarization, and a second antenna element coupled to the wireless LAN transceiver having a second shape different from the first shape. The second antenna element may also have a second polarization different from the first polarization.



US 20130293441A1

(19) **United States**

(12) **Patent Application Publication**

Zhang

(10) **Pub. No.: US 2013/0293441 A1**

(43) **Pub. Date: Nov. 7, 2013**

(54) **METHOD AND DEVICE FOR REALIZING SPECIFIC ABSORPTION RATE (SAR) CONTROL**

(75) Inventor: **Lu Zhang**, Shenzhen (CN)

(73) Assignee: **ZTE CORPORATION**, Shenzhen, Guangdong (CN)

(21) Appl. No.: **13/980,753**

(22) PCT Filed: **Jun. 1, 2011**

(86) PCT No.: **PCT/CN2011/075100**

§ 371 (c)(1),
(2), (4) Date: **Jul. 19, 2013**

(30) **Foreign Application Priority Data**

Jan. 24, 2011 (CN) 201110026148.9

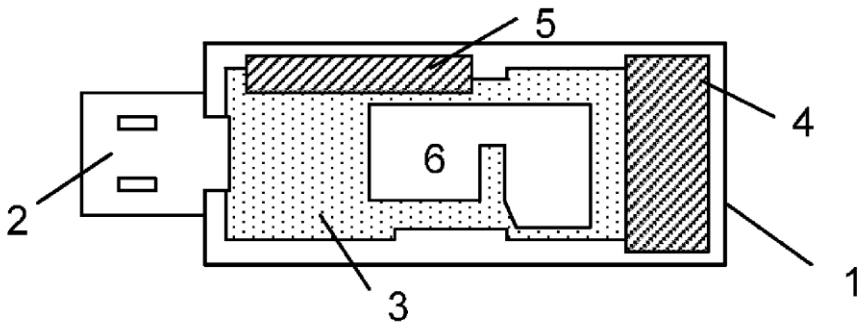
Publication Classification

(51) **Int. Cl.**
H01Q 3/00 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 3/00*** (2013.01)
USPC **343/904**

(57) **ABSTRACT**

The disclosure discloses a method and device for realizing Specific Absorption Rate (SAR) control, in both of which phase shifters can be provided on a metal ground edge of a wireless terminal, and an induced current of the metal ground edge can be altered by applying the phase shifters, so as to reduce an antenna near field radiation characteristic of an SAR. The method and device of the disclosure can alter current phase and amplitude distribution of the metal ground without affecting the reception and transmission performance of the terminal, so as to reduce a local SAR peak value and lessen the harm of radiation to human bodies. Furthermore, the disclosure does not require any major change in a structure, circuit, and, antenna of a designed model, and can save space. The disclosure bears great flexibility and adaptability in an application, thereby realizing the objective of miniaturized design of the wireless terminal.



US 20130300610A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0300610 A1

(43) Pub. Date: Nov. 14, 2013

Chou et al.

(54) **PORTABLE ELECTRONIC DEVICE, ANTENNA STRUCTURE AND RESONATOR UNIT THEREOF**

(71) Applicant: **WISTRON CORP.**, New Taipei City (TW)

(72) Inventors: **Chen-Yu Chou**, New Taipei City (TW); **Kuo-Lin Tsai**, New Taipei City (TW)

(73) Assignee: **WISTRON CORP.**, New Taipei City (TW)

(21) Appl. No.: **13/659,857**

(22) Filed: **Oct. 24, 2012**

(30) **Foreign Application Priority Data**

May 11, 2012 (TW) 101116789

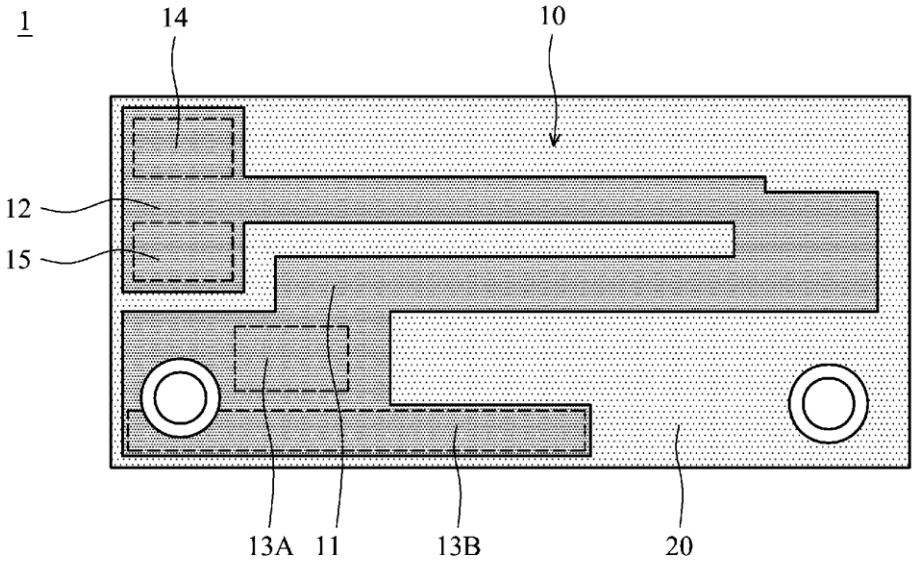
Publication Classification

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

(52) **U.S. Cl.**
USPC ..... **343/700 MS**

(57) **ABSTRACT**

An antenna resonator unit is provided. The antenna resonator unit is adapted to be selectively connected to a first radiator or a second radiator, which includes a substrate and a resonator. The shape of the resonator is formed on the substrate, wherein the shape of the resonator is U-shaped, and includes a first end portion and a second end portion, wherein a ground point is formed on the first end portion, a radiator connection point is formed on the second end portion, and a feed point is disposed on the second end portion, wherein the radiator connection point is selectively connected to the first radiator or the second radiator.



US 20130300612A1

(19) **United States**

(12) **Patent Application Publication**

Shiue et al.

(10) **Pub. No.: US 2013/0300612 A1**

(43) **Pub. Date: Nov. 14, 2013**

(54) **PATCH ANTENNA WITH THREE RECTANGULAR RINGS**

(71) Applicants: **Li-Chun Shiue**, New Taipei City (TW); **Dau-Chyrh Chang**, Pan-Chiao City (TW)

(72) Inventors: **Li-Chun Shiue**, New Taipei City (TW); **Dau-Chyrh Chang**, Pan-Chiao City (TW)

(73) Assignee: **New EA, Inc. dba Flow Mobile**, Bismarck, ND (US)

(21) Appl. No.: **13/741,095**

(22) Filed: **Jan. 14, 2013**

Related U.S. Application Data

(60) Provisional application No. 61/585,986, filed on Jan. 12, 2012.

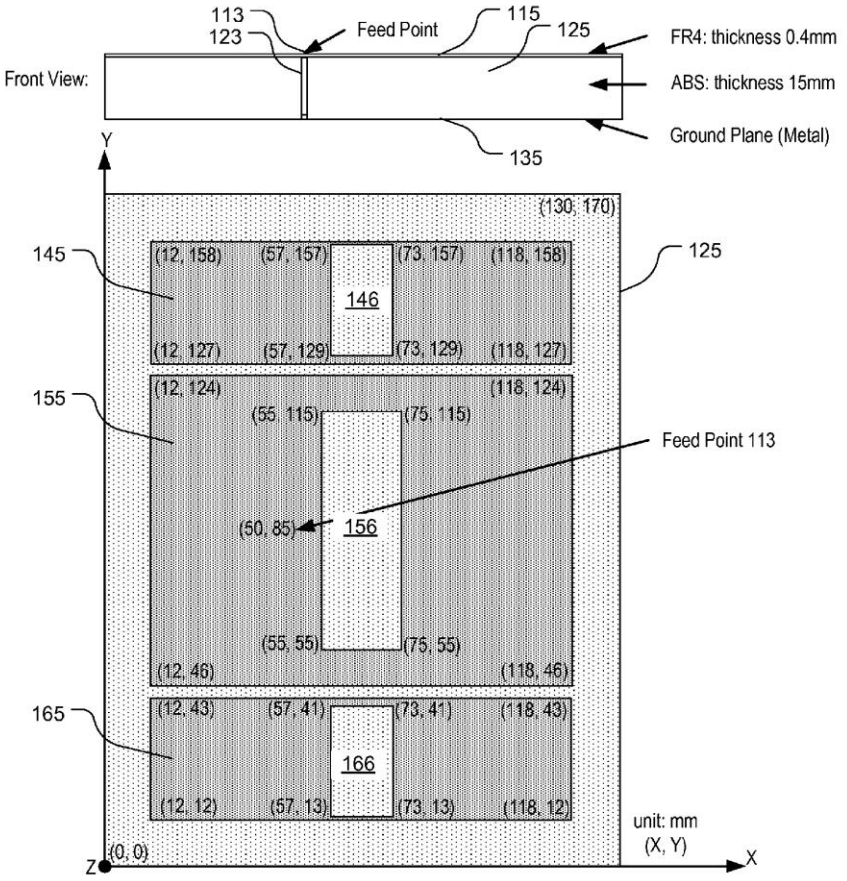
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 9/0407*** (2013.01)
USPC ..... **343/700 MS**

(57) **ABSTRACT**

The technology disclosed relates to patch antennas and methods of using a patch antenna. In particular, it relates to using a rectangular or square ring radiator and a pair of rectangular ring resonators in a patch antenna. The designs and methods described can, for instance, be applied to communications at about 698 to 746 MHz or 746 to 806 MHz, in a frequency range such as 698-806 MHz.



Top View

US 20130300613A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2013/0300613 A1**

(43) **Pub. Date: Nov. 14, 2013**

Cho

(54) **ELECTRICAL SIGNAL CONNECTING UNIT, ANTENNA DEVICE AND MOBILE COMMUNICATION DEVICE HAVING THE SAME**

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

(72) Inventor: **Young-Wan Cho**, Suwon-si (KR)

(21) Appl. No.: **13/943,611**

(22) Filed: **Jul. 16, 2013**

Related U.S. Application Data

(63) Continuation of application No. 12/231,098, filed on Aug. 29, 2008, now Pat. No. 8,508,414.

(30) **Foreign Application Priority Data**

Aug. 31, 2007 (KR) 10-2007-0088391

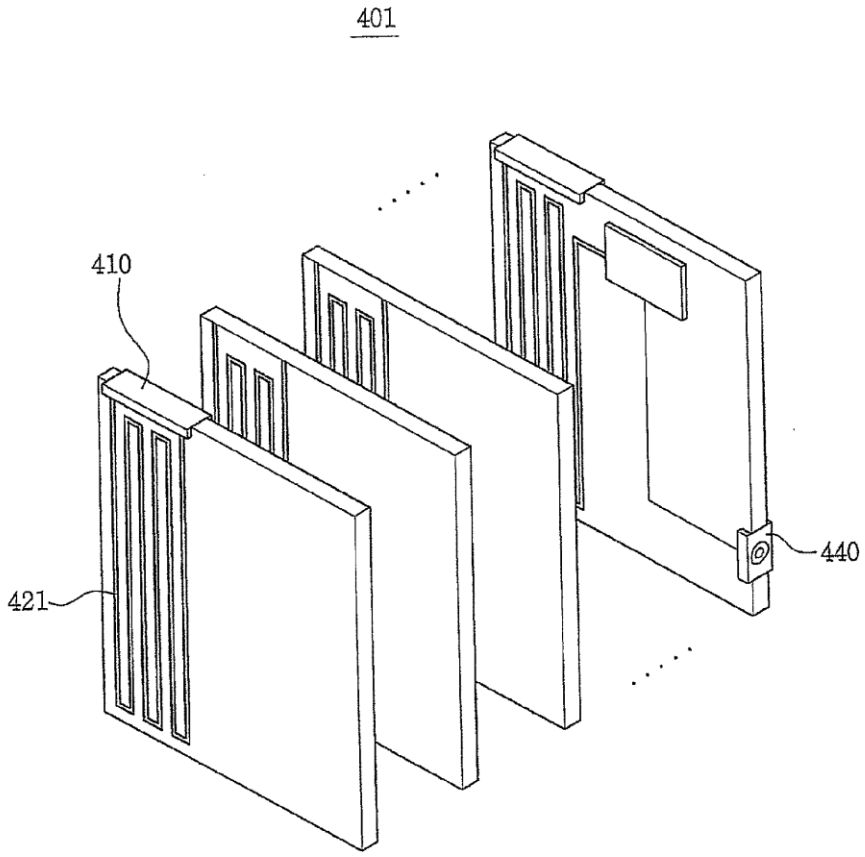
Publication Classification

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

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

(57) **ABSTRACT**

An electrical signal connecting unit includes a predetermined length of a soft connector body; a path pattern formed along one path on the connector body, with a plurality of pattern portions thereof extending in different path directions; and an antenna disposed on the path pattern, opposite ends of the antenna protruding through opposite ends of the connector body. A length of antenna is easily disposed inside a mobile communication device having the electrical signal connecting unit and an antenna device even if the mobile communication device has a plurality of boards.



US 20130300615A1

(19) **United States**

(12) **Patent Application Publication**

WONG et al.

(10) **Pub. No.: US 2013/0300615 A1**

(43) **Pub. Date: Nov. 14, 2013**

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

(75) Inventors: **Kin-Lu WONG**, Kaohsiung City (TW); **Fang-Hsien CHU**, Kaohsiung City (TW)

(73) Assignee: **ACER INCORPORATED**, Taipei Hsien (TW)

(21) Appl. No.: **13/557,839**

(22) Filed: **Jul. 25, 2012**

(30) **Foreign Application Priority Data**

May 10, 2012 (TW) 101116620

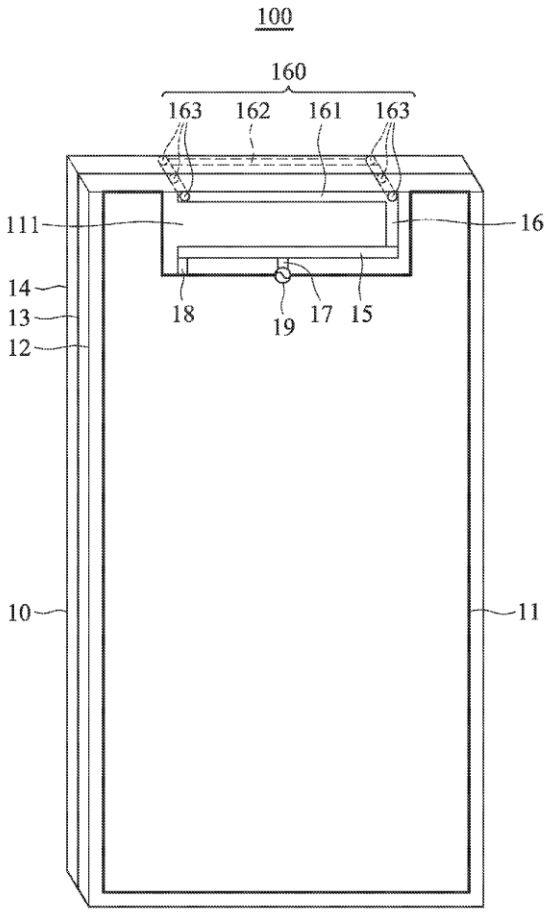
Publication Classification

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

(52) **U.S. Cl.**
USPC **343/702**

(57) **ABSTRACT**

A communication device including a multilayer circuit board and an antenna structure therein is provided. The multilayer circuit board has at least a first plane, a second plane, and a third plane. A ground plane is disposed on one of the planes, and the ground plane is in proximity to a clearance region of the multilayer circuit board. An antenna structure is disposed in the clearance region. The antenna structure includes a first metal portion and a second metal portion. The first metal portion is coupled to a signal source through a feeding portion. The second metal portion includes at least a first line segment and a second line segment. The first line segment and the second line segment are disposed respectively on any two planes of the multilayer circuit board. The first metal line and the second metal line forms a loop structure through two conductive vias.



US 20130300618A1

(19) **United States**

(12) **Patent Application Publication**

Yarga et al.

(10) **Pub. No.: US 2013/0300618 A1**

(43) **Pub. Date: Nov. 14, 2013**

(54) **ANTENNA AND PROXIMITY SENSOR STRUCTURES HAVING PRINTED CIRCUIT AND DIELECTRIC CARRIER LAYERS**

(76) Inventors: **Salih Yarga**, Sunnyvale, CA (US); **Nirali Shah**, Mountain View, CA (US); **Qingxiang Li**, Mountain View, CA (US); **Robert W. Schlub**, Cupertino, CA (US)

(21) Appl. No.: **13/468,289**

(22) Filed: **May 10, 2012**

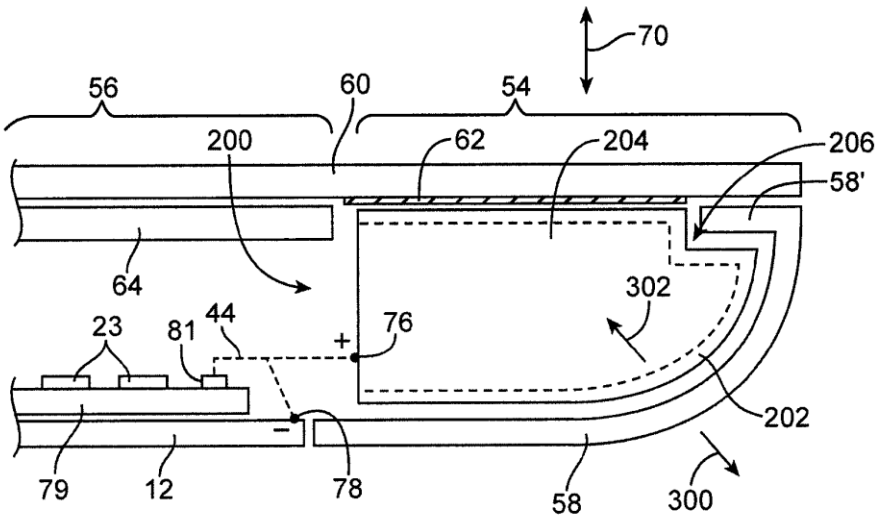
Publication Classification

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

(52) **U.S. Cl.**
CPC . ***H01Q 1/243*** (2013.01); ***H01Q 1/38*** (2013.01)
USPC ..... **343/720**; 343/700 MS

(57) **ABSTRACT**

An electronic device may have a conductive housing with an antenna window. A display cover layer may be mounted on the front face of the device. Antenna and proximity sensor structures may include a dielectric support structure with a notch. The antenna window may have a protruding portion that extends into the notch between the display cover layer and the antenna and proximity sensor structures. The antenna and proximity sensor structures may have an antenna feed that is coupled to a first conductive layer by a high pass circuit and capacitive proximity sensor circuitry that is coupled to the first conductive layer and a parallel second conductive layer by a low pass circuit. The first conductive layer may be formed from a metal coating on the support structure. The second conductive layer may be formed from patterned metal traces in a flexible printed circuit.



US 20130300624A1

(19) **United States**

(12) **Patent Application Publication**

Fakharzadeh Jahromi

(10) **Pub. No.: US 2013/0300624 A1**

(43) **Pub. Date: Nov. 14, 2013**

(54) **BROADBAND END-FIRE MULTI-LAYER ANTENNA**

(75) Inventor: **Mohammad Fakharzadeh Jahromi**, Toronto (CA)

(73) Assignee: **Peraso Technologies Inc.**, Toronto (CA)

(21) Appl. No.: **13/466,584**

(22) Filed: **May 8, 2012**

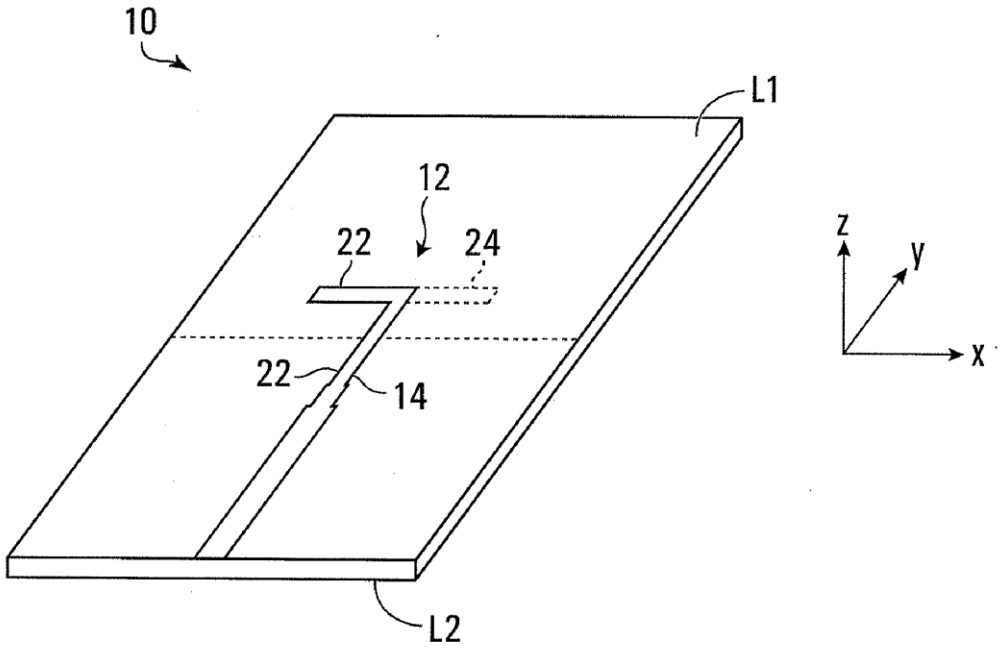
Publication Classification

(51) **Int. Cl.**
H01Q 9/16 (2006.01)

(52) **U.S. Cl.**
USPC **343/793**

(57) **ABSTRACT**

A microstrip antenna is formed on a multilayer substrate. The microstrip antenna includes a dipole formed of two dipole halves. Each of the dipole halves is formed in one of at least two layers of the multilayer substrate. Optionally, at least one passive reflector is located proximate the dipole in one of the layers, or a third layer of the substrate.



US 20130300625A1

(19) **United States**

(12) **Patent Application Publication**

WONG et al.

(10) **Pub. No.: US 2013/0300625 A1**

(43) **Pub. Date: Nov. 14, 2013**

(54) **COMMUNICATION DEVICE AND MIMO (MULTI-INPUT MULTI-OUTPUT) ANTENNA SYSTEM THEREIN**

(75) Inventors: **Kin-Lu WONG**, Kaohsiung City (TW); **Tsung-Ju WU**, Kaohsiung City (TW)

(73) Assignee: **ACER INCORPORATED**, Taipei Hsien (TW)

(21) Appl. No.: **13/557,708**

(22) Filed: **Jul. 25, 2012**

(30) **Foreign Application Priority Data**

May 11, 2012 (TW) 101116785

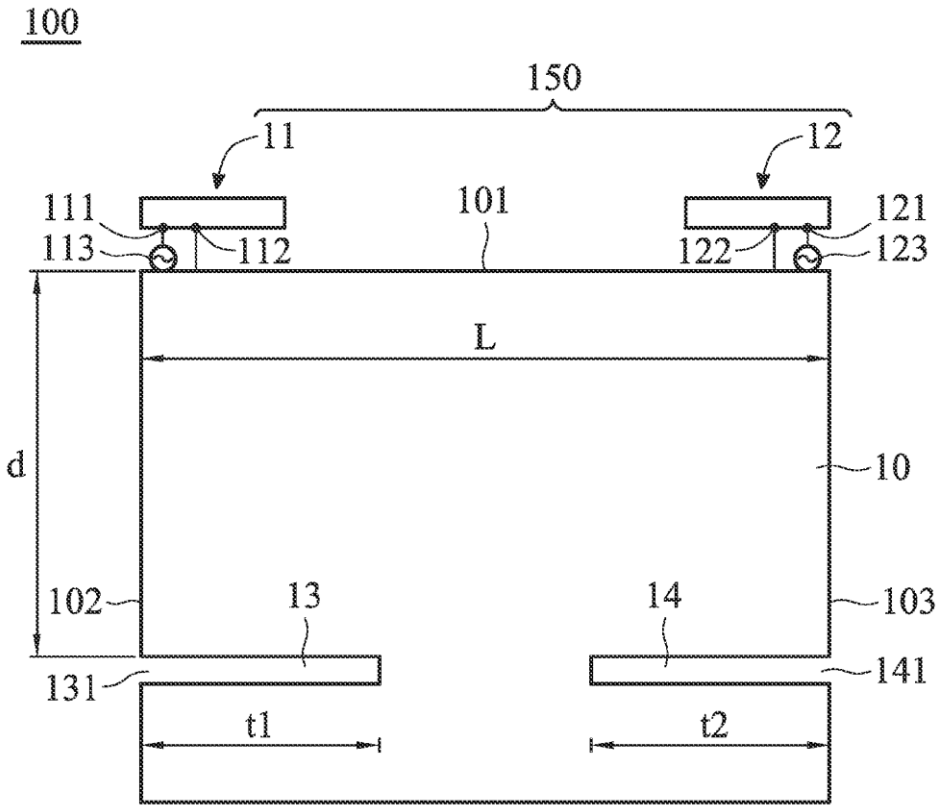
Publication Classification

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

(52) **U.S. Cl.**
USPC **343/848**

(57) **ABSTRACT**

A communication device including a ground plane and an antenna system is provided. The antenna system includes at least two antennas, which are both located at a first edge of the ground plane and operate in at least a first band. The ground plane has at least one slit, and an open end of the slit is located at a second edge adjacent to the first edge. The open end of the slit has a distance of at least 0.2 wavelength of a frequency in the first band to the first edge. When the antenna system operates in the first band, the slit can attract excited surface currents on the ground plane, thereby causing weaker surface currents flowing along the first edge of the ground plane. The coupling between the at least two antennas in the antenna system is hence decreased.



US 20130300626A1

(19) **United States**

(12) **Patent Application Publication**

LEE et al.

(10) **Pub. No.: US 2013/0300626 A1**

(43) **Pub. Date: Nov. 14, 2013**

(54) **ANTENNA APPARATUS AND MOBILE TERMINAL HAVING THE SAME**

(71) Applicant: **LG ELECTRONICS INC.**, Seoul (KR)

(72) Inventors: **Jaegon LEE**, Seoul (KR); **Chisang YOU**, Seoul (KR); **Changil KIM**, Seoul (KR)

(73) Assignee: **LG ELECTRONICS INC.**, Seoul (KR)

(21) Appl. No.: **13/889,836**

(22) Filed: **May 8, 2013**

(30) **Foreign Application Priority Data**

May 9, 2012 (KR) 10-2012-0049340

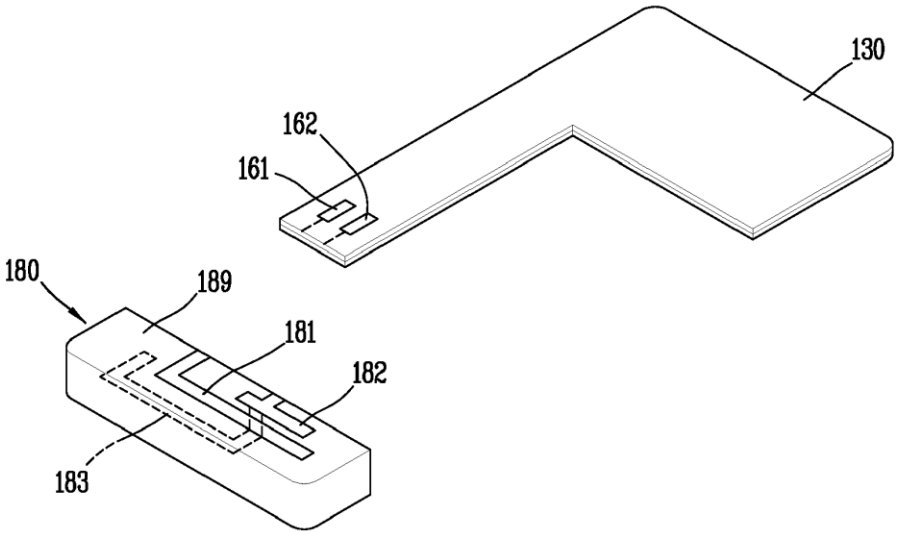
Publication Classification

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

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

(57) **ABSTRACT**

An antenna apparatus includes: a first member ground-connected to a ground of a printed circuit board (PCB); a second member spaced from the first member in parallel, and configured to capacitive coupling-feed the first member so as to transmit and receive signals of a first frequency band; and a third member extending from the second member by a prescribed length, so as to have a bandwidth extending up to a second frequency band adjacent to the first frequency band.



US 20130300628A1

(19) **United States**

(12) **Patent Application Publication**

LIU et al.

(10) **Pub. No.: US 2013/0300628 A1**

(43) **Pub. Date: Nov. 14, 2013**

(54) **MULTI-FREQUENCU ANTENNA**

(76) Inventors: **Ta-Cheng LIU**, Taoyuan County (TW); **Chung-Ta WU**, Taoyuan County (TW)

(21) Appl. No.: **13/469,521**

(22) Filed: **May 11, 2012**

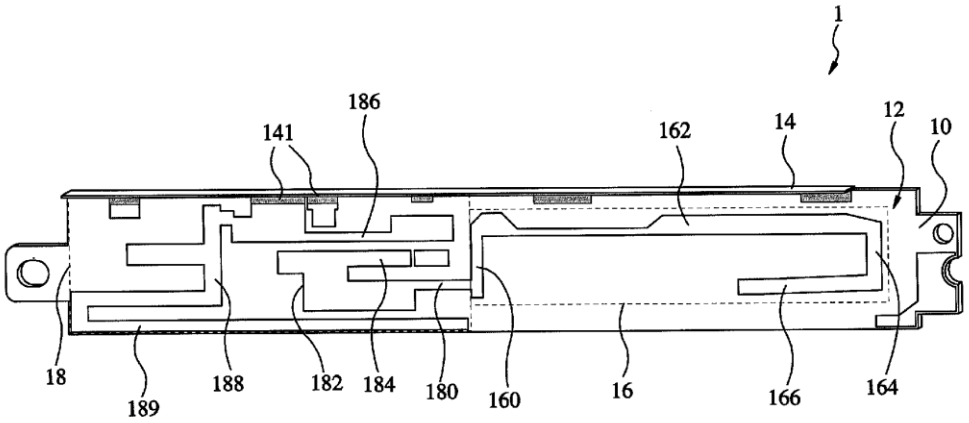
Publication Classification

(51) **Int. Cl.**
H01Q 21/30 (2006.01)

(52) **U.S. Cl.**
USPC **343/853**

(57) **ABSTRACT**

A multi-frequency antenna includes a substrate, an antenna portion and a radiator. The antenna portion has a low-frequency radiation antenna and a high-frequency radiation antenna. By selectively coupling the low-frequency radiation antenna, the high-frequency radiation antenna and the radiator, the multi-frequency antenna can work in multiple frequency bands.



US 20130300629A1

(19) **United States**

(12) **Patent Application Publication**

Jiang et al.

(10) **Pub. No.: US 2013/0300629 A1**

(43) **Pub. Date: Nov. 14, 2013**

(54) **ARRAY ANTENNA OF MOBILE TERMINAL AND IMPLEMENTING METHOD THEREOF**

(76) Inventors: **Hui Jiang**, Shenzhen City (CN); **Hao Ai**, Shenzhen City (CN); **Lu Zhang**, Shenzhen City (CN); **Ying Liu**, Shenzhen City (CN); **Chao Li**, Shenzhen City (CN)

(21) Appl. No.: **13/976,700**

(22) PCT Filed: **Jun. 13, 2011**

(86) PCT No.: **PCT/CN11/75666**

§ 371 (c)(1),
(2), (4) Date: **Jul. 30, 2013**

(30) **Foreign Application Priority Data**

Dec. 27, 2010 (CN) 20100607713

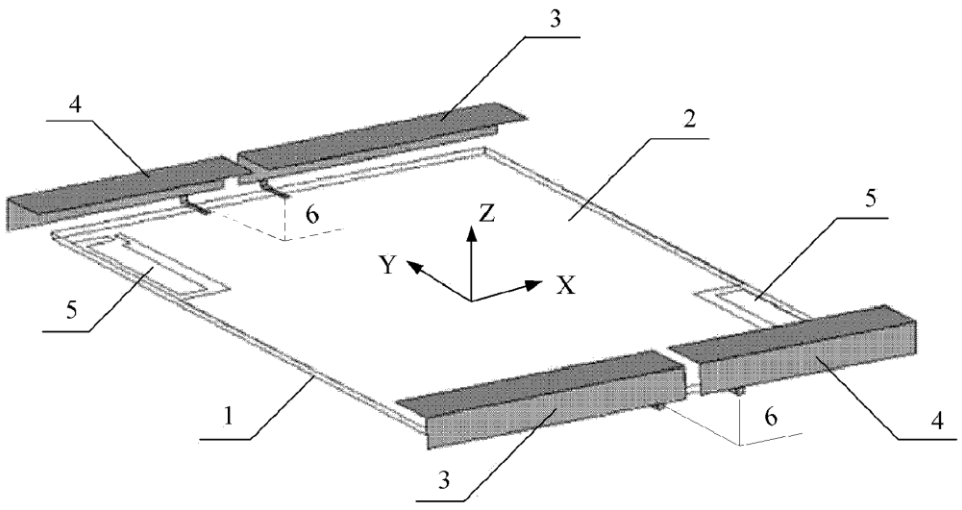
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 1/50*** (2013.01)
USPC **343/853**; 29/600

(57) **ABSTRACT**

An antenna array of a mobile terminal and an implementing method thereof are disclosed in this document. The antenna array includes: a mobile terminal floorboard, configured to act as a radiation body to radiate antenna energy coupled by multiple pairs of coupling units, and multiple pairs of coupling units corresponding to multiple antennas, each of which are fixed at two ends of the mobile terminal floorboard and are configured to inspire a waveguide mode of the mobile terminal floorboard to radiate the coupled antenna energy through feed points of feed lines of each coupling unit therein, located at the same side of a dielectric material plate; and a matching circuit located at the other side of the dielectric material plate, connected with the feed points located at the opposite side of the dielectric material plate and configured to implement impedance matching of a micro-strip feed line of each coupling unit.



US 20130300631A1

(19) **United States**

(12) **Patent Application Publication**

HSIEH

(10) **Pub. No.: US 2013/0300631 A1**

(43) **Pub. Date: Nov. 14, 2013**

(54) **ANTENNA WITH FEEDER AND ELECTRONIC DEVICE**

(71) Applicant: **HON HAI PRECISION INDUSTRY CO., LTD.**, New Taipei (TW)

(72) Inventor: **TSUNG-LIN HSIEH**, New Taipei (TW)

(73) Assignee: **HON HAI PRECISION INDUSTRY CO., LTD.**, New Taipei (TW)

(21) Appl. No.: **13/865,252**

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

(30) **Foreign Application Priority Data**

May 11, 2012 (TW) 101117011

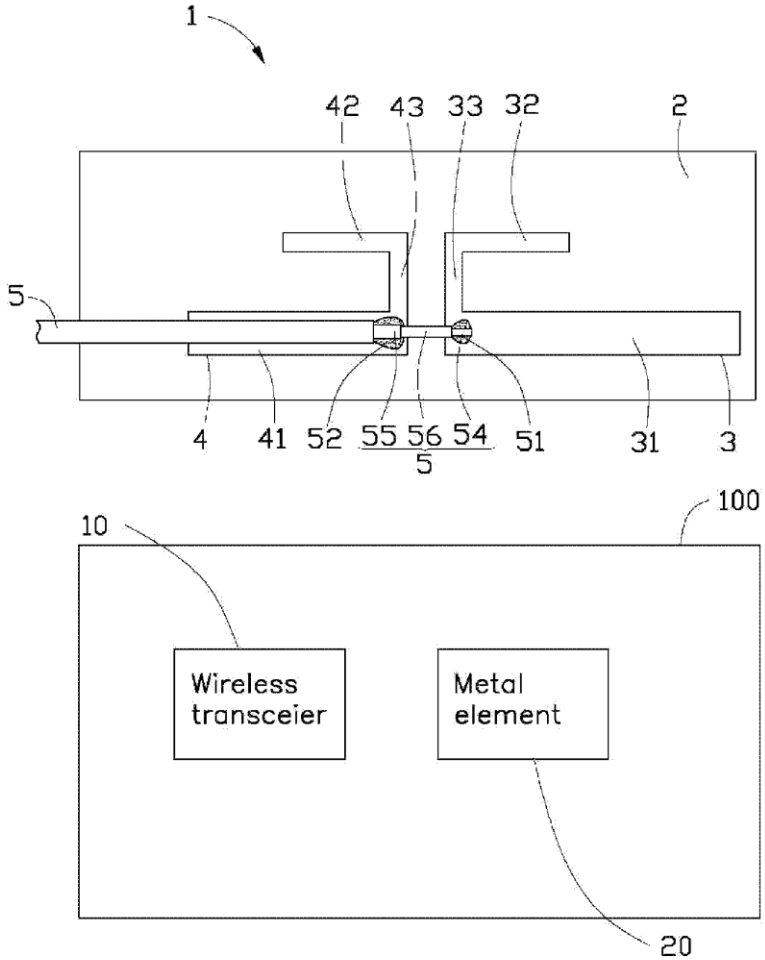
Publication Classification

(51) **Int. Cl.**
H01Q 9/06 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 9/06*** (2013.01)
USPC ..... **343/905**; 343/700 MS

(57) **ABSTRACT**

An antenna includes a circuit board, a primary antenna, a secondary antenna, and a feeder. The primary antenna is n-shaped and consists of a first middle section, and a first subsection and a second subsection which are connected to the first middle section. The first subsection and the second subsection have different lengths, the first subsection has a first feed point. The secondary antenna has a second feed point which is connected therewith. The primary antenna and the secondary antenna are disposed on the circuit board, and the feeder feeds an electrical signal to the first feed point and the second feed point.



US 20130307731A1

(19) **United States**

(12) **Patent Application Publication**

Vanjani et al.

(10) **Pub. No.: US 2013/0307731 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **WIRELESS COMMUNICATION DEVICE WITH A MULTIBAND ANTENNA, AND METHODS OF MAKING AND USING THEREOF**

(75) Inventors: **Kiran Vanjani**, San Diego, CA (US); **Balamurugan Shanmugam**, San Diego, CA (US)

(73) Assignee: **FUTUREWEI TECHNOLOGIES, INC.**, Plano, TX (US)

(21) Appl. No.: **13/604,521**

(22) Filed: **Sep. 5, 2012**

Related U.S. Application Data

(60) Provisional application No. 61/648,469, filed on May 17, 2012.

Publication Classification

(51) **Int. Cl.**

H01Q 1/36 (2006.01)

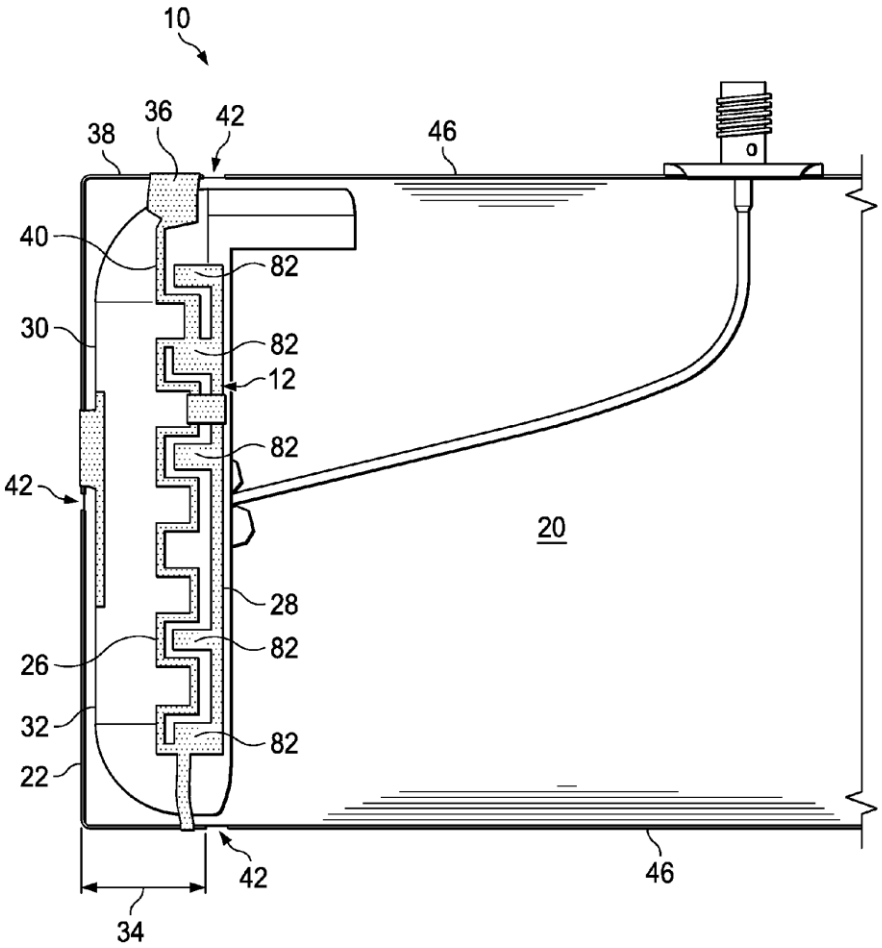
H01P 11/00 (2006.01)

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

USPC ..... **343/700 MS**; 29/600

(57) **ABSTRACT**

An antenna for a wireless device including a meander structure formed from a plurality of meanders and a conductive strip connected in parallel to the meander structure and including a plurality of tabs projecting toward the meander structure, a first group of tabs connected to a first group of meanders corresponding to the first group of tabs, a second group of tabs disconnected from a second group of meanders corresponding to the second group of tabs. In an embodiment, the antenna is incorporated into a wireless device having a transceiver and a finite ground plane.



US 20130307732A1

(19) **United States**

(12) **Patent Application Publication**

Chiu et al.

(10) **Pub. No.: US 2013/0307732 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **MULTIBAND ANTENNA**

(71) Applicant: **Advanced-Connectek Inc.**, New Taipei City (TW)

(72) Inventors: **Tsung-Wen Chiu**, New Taipei City (TW); **Fu-Ren Hsiao**, New Taipei City (TW); **Po-Yuan Liao**, New Taipei City (TW)

(73) Assignee: **Advanced-Connectek Inc.**, New Taipei City (TW)

(21) Appl. No.: **13/940,281**

(22) Filed: **Jul. 12, 2013**

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/825,080, filed on Jun. 28, 2010.

(30) **Foreign Application Priority Data**

Mar. 12, 2010 (TW) 99107222

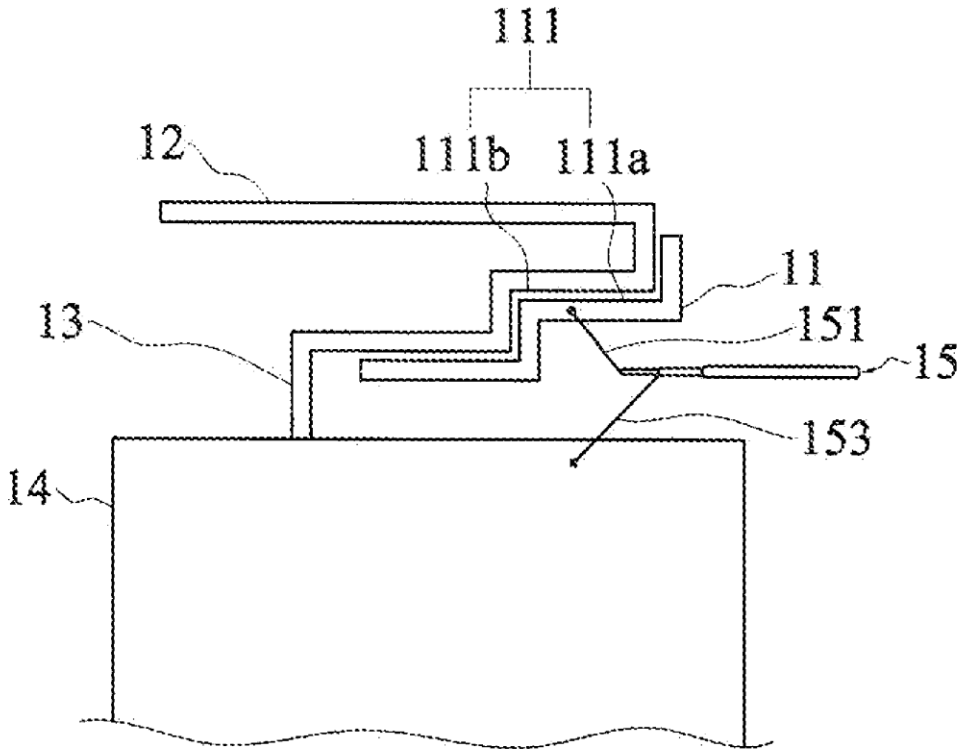
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 5/0027*** (2013.01)
USPC ..... **343/700 MS**

(57) **ABSTRACT**

A multiband antenna comprises a feeder member, a radiation conductor, a short-circuit member, a grounding plane and a feeder cable. The feeder member has a first coupling side. Two end of the short-circuit member are respectively connected with the radiation conductor and the grounding plane. The short-circuit member has a second coupling side parallel to and conformable to the first coupling side with a gap existing therebetween. The feeder cable has a central wire and an outer wire respectively connected with the feeder member and the grounding plane. The feeder member transmits a high-frequency fed-in signal to the short-circuit member in a capacitive coupling way. The multiband antenna of the present invention has a simplified antenna structure, a miniaturized size and wide frequency bands.



US 20130307733A1

(19) **United States**

(12) **Patent Application Publication**

Chiu et al.

(10) **Pub. No.: US 2013/0307733 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **MULTI-FREQUENCY ANTENNA**

(71) Applicant: **ADVANCED-CONNECTEK INC.**, New Taipei City (TW)

(72) Inventors: **Tsung-Wen Chiu**, New Taipei City (TW); **Fu-Ren Hsiao**, New Taipei City (TW); **Yao-Yuan Chang**, New Taipei City (TW); **Kuo-Chan Fu**, New Taipei City (TW)

(73) Assignee: **ADVANCED-CONNECTEK INC.**, New Taipei City (TW)

(21) Appl. No.: **13/954,747**

(22) Filed: **Jul. 30, 2013**

Related U.S. Application Data

(63) Continuation-in-part of application No. 13/025,000, filed on Feb. 10, 2011, now abandoned.

(30) **Foreign Application Priority Data**

Sep. 17, 2010 (TW) 099131559

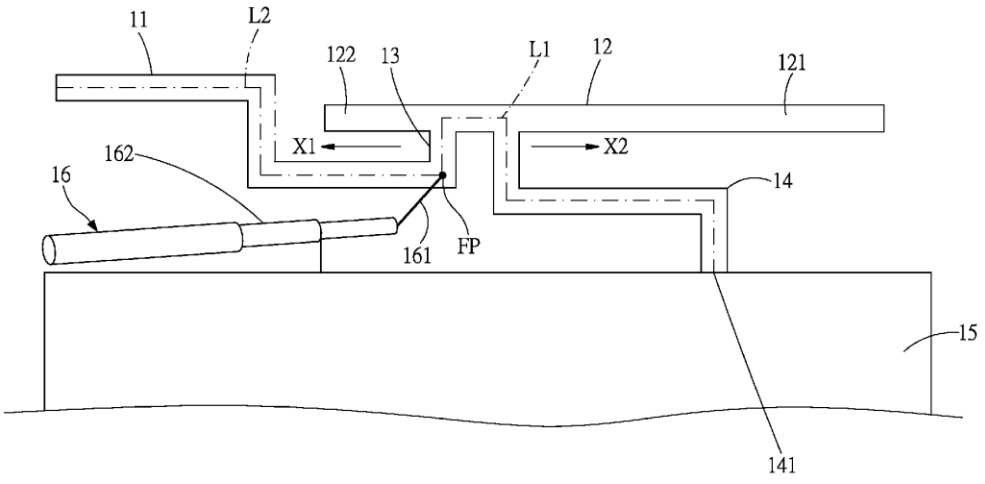
Publication Classification

(51) **Int. Cl.**
H01Q 9/16 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 9/16*** (2013.01)
USPC ..... **343/700 MS**

(57) **ABSTRACT**

A multi-frequency antenna includes a first antenna element, a second antenna element, a connection element, a third antenna element and a shorted element. The connection element is connected between the first antenna element and a neighborhood portion of the third antenna element. A feeding point is located in or nearby a first junction between the connection element and the first antenna element or located in the connection element. The shorted element is connected between the second antenna element and the grounding plane. The shorted element extends from a second junction between the second antenna element and the third antenna element to the grounding plane. The first conductive path that extends from the feeding point to the other end of the shorted element is substantially equal to a second conductive length that extends from the feeding point to the free end of the first antenna element.



US 20130307734A1

(19) **United States**

(12) **Patent Application Publication**

Azulay et al.

(10) **Pub. No.: US 2013/0307734 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **COMPACT BROADBAND ANTENNA**

(75) Inventors: **Snir Azulay**, Tiberias (IL); **Steve Krupa**, Haifa (IL)

(73) Assignee: **GALTRONICS CORPORATION LTD.**, Tiberias (IL)

(21) Appl. No.: **13/978,092**

(22) PCT Filed: **Jan. 3, 2012**

(86) PCT No.: **PCT/IL12/00001**

§ 371 (c)(1),
(2), (4) Date: **Aug. 8, 2013**

Related U.S. Application Data

(60) Provisional application No. 61/429,240, filed on Jan. 3, 2011.

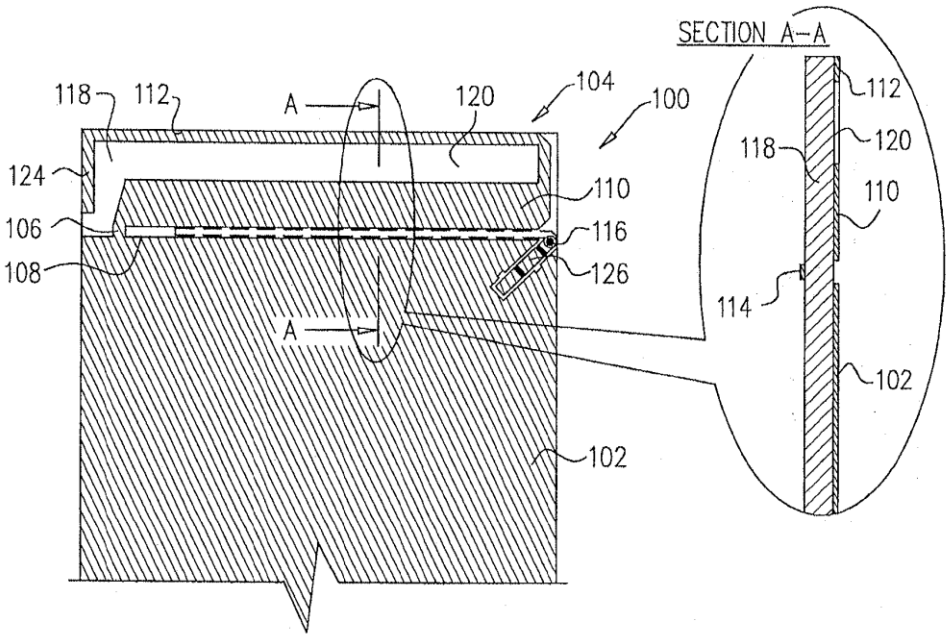
Publication Classification

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

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

(57) **ABSTRACT**

An antenna including a substrate formed of a non-conductive material, a ground plane disposed on the substrate, a wideband radiating element having one end connected to an edge of the ground plane and an elongate feed arm feeding the wideband radiating element and having a maximum width of 1/100 of a predetermined wavelength, the predetermined wavelength being defined by formula (I) wherein λ_p is the predetermined wavelength, f is a lowest operating frequency of the wideband radiating element, μ is a permeability of the substrate, ϵ_r is a relative bulk permittivity of the substrate, W is a width of a conductive trace disposed above the substrate and H is a thickness of the substrate, wherein formula (II).



US 20130307736A1

(19) **United States**

(12) **Patent Application Publication**

Larsen et al.

(10) **Pub. No.: US 2013/0307736 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **ANTENNA**

(75) Inventors: **Niels B. Larsen**, Escondido, CA (US); **Ping Hui**, San Diego, CA (US); **Yonghua Wei**, San Diego, CA (US); **Francis McGaffigan**, Escondido, CA (US); **Nan Xu**, San Diego, CA (US); **Kiril Stoynov**, San Diego, CA (US)

(73) Assignee: **Nokia Corporation**

(21) Appl. No.: **13/475,345**

(22) Filed: **May 18, 2012**

Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

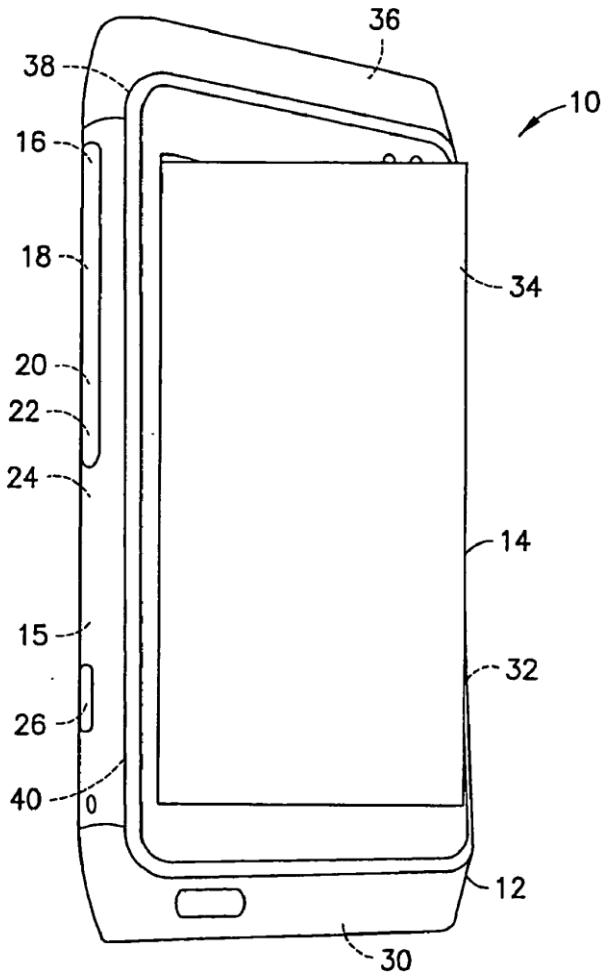
H01P 11/00 (2006.01)

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

USPC **343/702**; 29/601

(57) **ABSTRACT**

An apparatus including an antenna; a first antenna carrier forming a first support substrate for a first portion of the antenna; and a different second antenna carrier forming a second support substrate for a second portion of the antenna. The first and second antenna carriers are coupled to each other. The antenna extends across a joint between the first and second antenna carriers.



US 20130307737A1

(19) **United States**

(12) **Patent Application Publication**

Liu et al.

(10) **Pub. No.: US 2013/0307737 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **ELECTRONIC DEVICE**

(71) Applicants: **Shih-Chia Liu**, Taipei City (TW); **Chieh-Tsao Hwang**, Taipei City (TW); **Kuo-Chiang Hung**, Taipei City (TW); **Li-Chun Lee**, Taipei City (TW); **Ching-Fu Yang**, Taipei City (TW); **Chung-Yi Kao**, Taipei City (TW)

(72) Inventors: **Shih-Chia Liu**, Taipei City (TW); **Chieh-Tsao Hwang**, Taipei City (TW); **Kuo-Chiang Hung**, Taipei City (TW); **Li-Chun Lee**, Taipei City (TW); **Ching-Fu Yang**, Taipei City (TW); **Chung-Yi Kao**, Taipei City (TW)

(73) Assignee: **COMPAL ELECTRONICS, INC.**, Taipei City (TW)

(21) Appl. No.: **13/854,971**

(22) Filed: **Apr. 2, 2013**

Related U.S. Application Data

(60) Provisional application No. 61/648,609, filed on May 18, 2012.

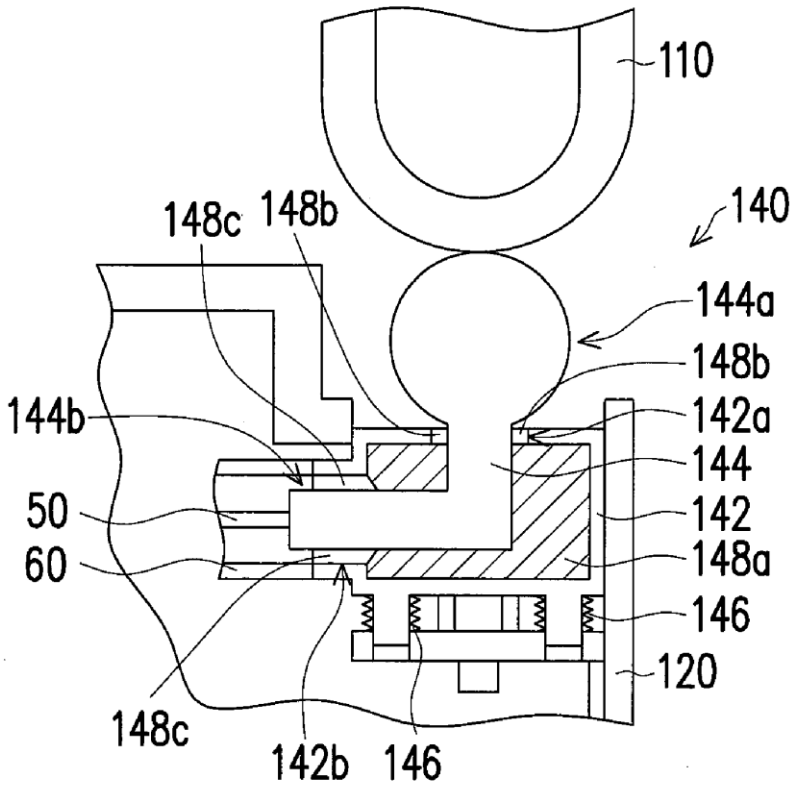
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 1/241*** (2013.01)
USPC **343/702**

(57) **ABSTRACT**

An electronic device including a first casing, a second casing, at least one first connecting unit and at least one feeding unit is provided. The first casing includes a conductive material. The second casing includes a conductive material. The first casing and the second casing are conducted with each other through the first connecting unit. The feeding unit is electrically connected to the first casing and the second casing, wherein the electronic device forms an antenna structure with the first casing, the second casing, the first connecting unit and the feeding unit and transmits an electromagnetic signal via the feeding unit.



US 20130307738A1

(19) **United States**

(12) **Patent Application Publication**

Baba et al.

(10) **Pub. No.: US 2013/0307738 A1**

(43) **Pub. Date: Nov. 21, 2013**

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

(76) Inventors: **Junnei Baba**, Fukuoka (JP); **Tetsuya Ashizuka**, Fukuoka (JP); **Ichiro Komaki**, Fukuoka (JP)

(21) Appl. No.: **13/981,906**

(22) PCT Filed: **Jan. 26, 2012**

(86) PCT No.: **PCT/JP2012/000499**

§ 371 (c)(1),
(2), (4) Date: **Jul. 25, 2013**

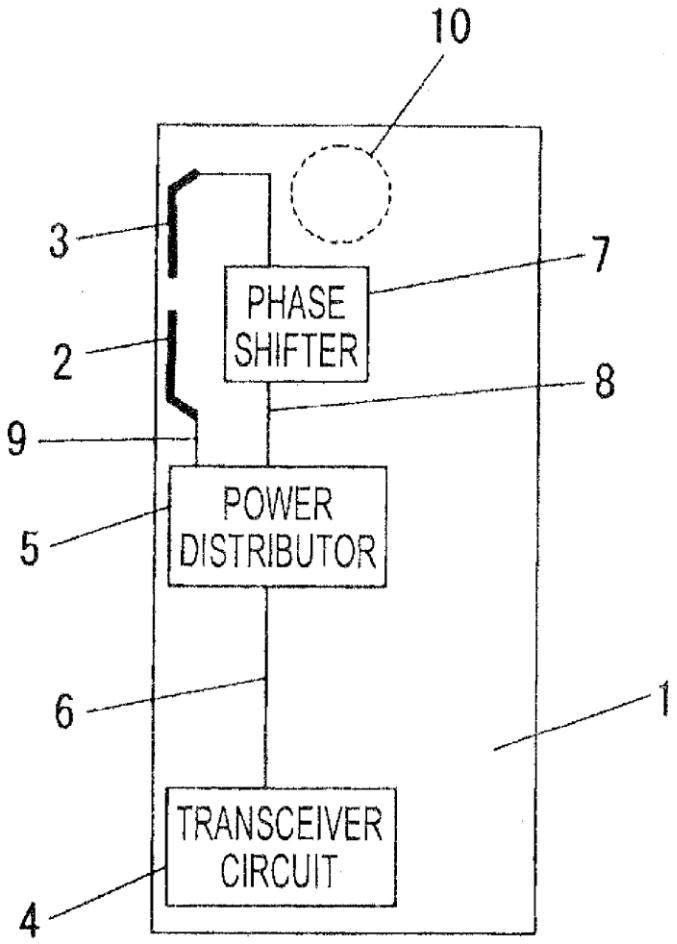
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 21/0006*** (2013.01)
USPC **343/720**; 343/851

(57) **ABSTRACT**

The antenna device includes a first antenna **11** that includes a first ground terminal **12**; a second antenna **18** that includes a second ground terminal **20**; a ground conductor **28** to which the first antenna **11** is connected through the first ground terminal **12** and the second antenna **18** is connected through the second ground terminal **20**; and a phase shifter **24** that controls a phase difference between a first current ie**1** and a second current ie**2**. The phase shifter **24** controls the phase difference between the first current ie**1** and the second current ie**2** so that the first current ie**1** and the second current ie**2** have components to cancel each other.



US 20130307740A1

(19) **United States**

(12) **Patent Application Publication**

Pajona et al.

(10) **Pub. No.: US 2013/0307740 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **LOOP ANTENNA WITH SWITCHABLE FEEDING AND GROUNDING POINTS**

(71) Applicants: **Olivier Pajona**, San Diego, CA (US); **Laurent Desclos**, San Diego, CA (US)

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

(21) Appl. No.: **13/868,093**

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

Related U.S. Application Data

(60) Provisional application No. 61/636,553, filed on Apr. 20, 2012.

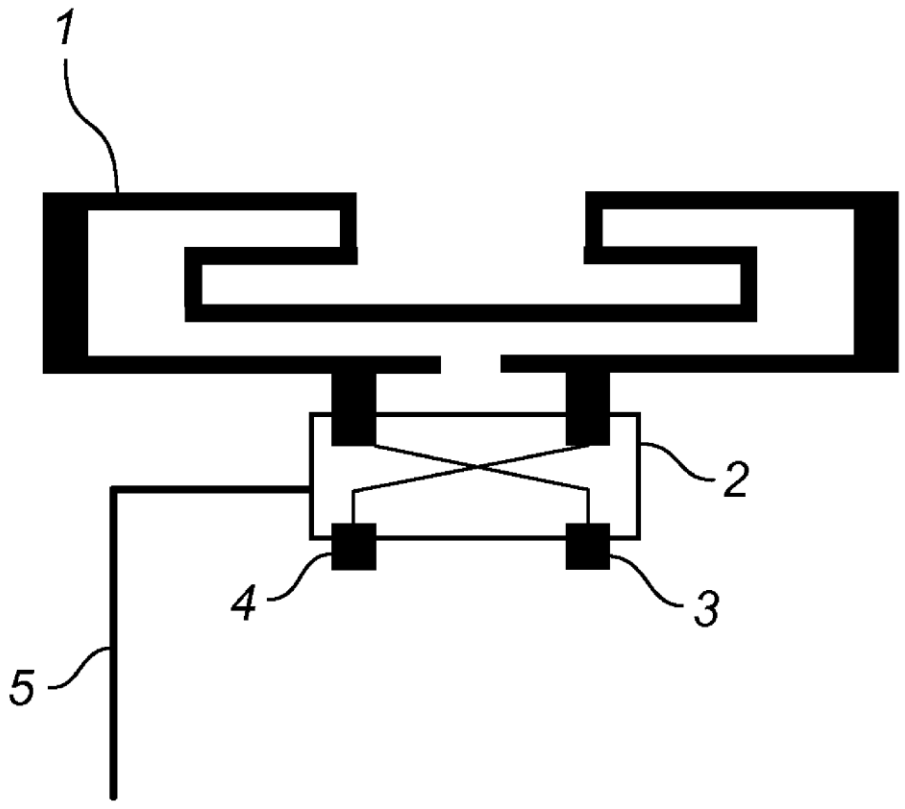
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 7/00*** (2013.01)
USPC **343/748**; 343/866

(57) **ABSTRACT**

An active differential antenna is described that provides for improved performance for wireless communication systems across a wide set of use cases and environments. A balanced antenna structure along with switch assembly provides the differential mode radiation which results in minimal coupling to the components and items in the near field of the antenna. This results in an efficient antenna that is well isolated from the local environment of the antenna. The switch assembly is configured to switch the feed and ground connections of the differential design when needed to provide similar antenna performance for both "against head left" and "against head right" use cases for a cellular handset application for example. An active component or circuit can be integrated or coupled to the antenna design to provide the capability to dynamically balance the antenna to maintain pattern symmetry and efficiency.



US 20130307741A1

(19) **United States**

(12) **Patent Application Publication**

Hozouri

(10) **Pub. No.: US 2013/0307741 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **WIDE BEAM ANTENNA**

(75) Inventor: **Behzad Tavassoli Hozouri**, Sunnyvale, CA (US)

(73) Assignee: **SPACE SYSTEMS/LORAL, INC.**, Palo Alto, CA (US)

(21) Appl. No.: **13/474,084**

(22) Filed: **May 17, 2012**

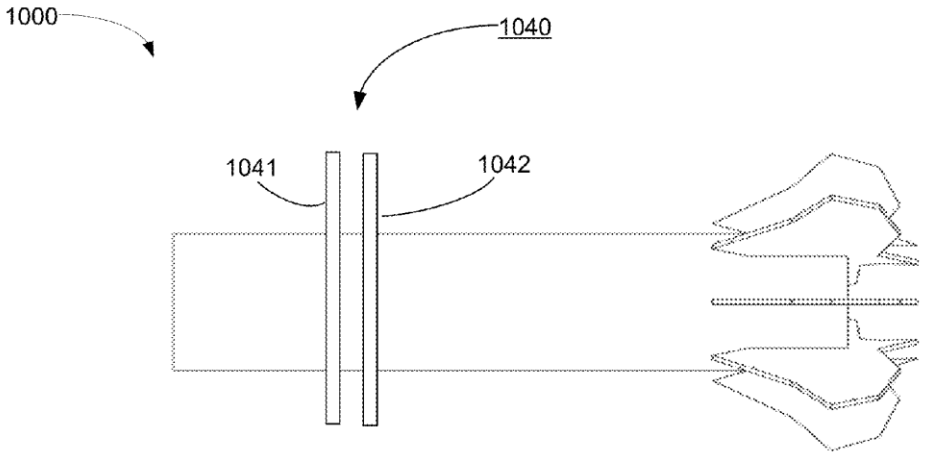
Publication Classification

(51) **Int. Cl.**
H01Q 13/00 (2006.01)

(52) **U.S. Cl.**
USPC ..... **343/781 R**; 343/772

(57) **ABSTRACT**

A wide beam radio frequency (RF) antenna includes a waveguide and one or more electrically conductive protrusions. The waveguide has at least one electrically conductive interior wall surface, a boresight defined by a longitudinal axis, and an aperture plane, transverse to the longitudinal axis, disposed at a distal end of the waveguide. A first proximal portion of each protrusion is electrically coupled to the electrically conductive interior wall surface, a distal portion of the protrusion being outside the aperture plane.



US 20130307744A1

(19) **United States**

(12) **Patent Application Publication**

Choi et al.

(10) **Pub. No.: US 2013/0307744 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **MIMO/DIVERSITY ANTENNA FOR IMPROVING THE ISOLATION OF A SPECIFIC FREQUENCY BAND**

(75) Inventors: **Sang-Hoon Choi**, Anyang-shi (KR); **Young-Sang Kim**, Seoul (KR); **Bu-Seok Shim**, Seoul (KR)

(73) Assignee: **MOBITECH CORP.**, Seoul (KR)

(21) Appl. No.: **13/983,568**

(22) PCT Filed: **Feb. 8, 2012**

(86) PCT No.: **PCT/KR2012/000912**

§ 371 (c)(1),
(2), (4) Date: **Aug. 4, 2013**

(30) **Foreign Application Priority Data**

Feb. 9, 2011 (KR) 10-2011-0011420

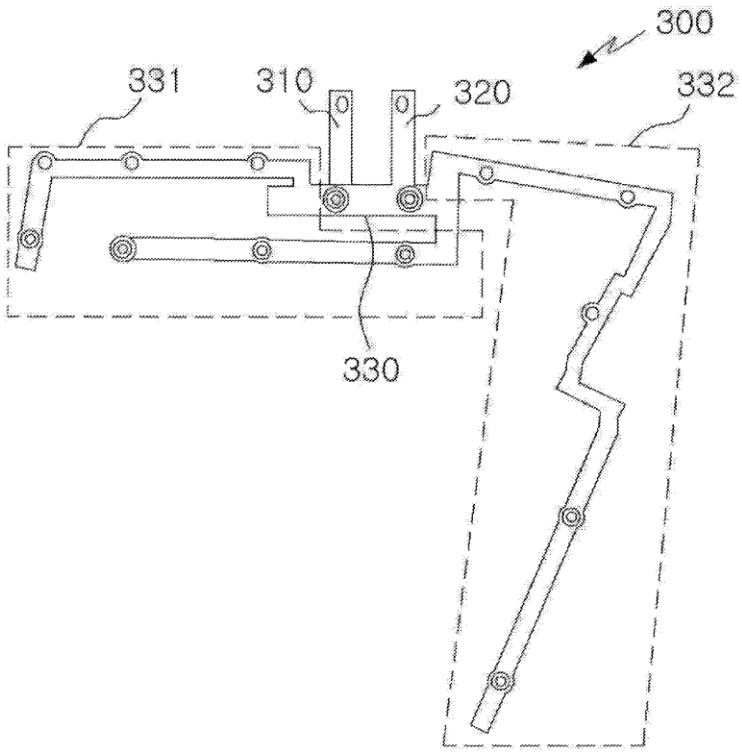
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 1/523*** (2013.01)
USPC **343/844**; 343/893

(57) **ABSTRACT**

A MIMO/diversity antenna for improving isolation of a frequency band includes: a ground surface formed on a printed circuit board; planar inverted F antennas having the ground surface therebetween and disposed on the printed circuit board having no ground surface formed, each F antenna having an antenna pattern that includes a radiation unit, a power supply unit, and a ground unit; power supply pads and ground pads formed on the printed circuit board having no ground surface formed corresponding to the power supply unit and the ground unit of the antenna pattern in the planar inverted F antennas; and connection patterns connecting the ground surface with each ground pad to electrically connect the ground surface to each ground unit of the antenna pattern in the planar inverted F antennas. At least one of the connection patterns is formed with a strip line of a meandering shape.



US 20130307745A1

(19) **United States**

(12) **Patent Application Publication**

Mizoguchi et al.

(10) **Pub. No.: US 2013/0307745 A1**

(43) **Pub. Date: Nov. 21, 2013**

(54) **ANTENNA FOR WIRELESS APPARATUS**

(75) Inventors: **Miyuki Mizoguchi**, Obu-City (JP); **Yuji Sugimoto**, Kariya-city (JP); **Tadao Suzuki**, Kariya-city (JP)

(73) Assignee: **DENSO CORPORATION**, Kariya-city, Aichi-pref. (JP)

(21) Appl. No.: **13/997,849**

(22) PCT Filed: **Feb. 1, 2012**

(86) PCT No.: **PCT/JP2012/000656**

§ 371 (c)(1),
(2), (4) Date: **Jun. 25, 2013**

(30) **Foreign Application Priority Data**

Feb. 8, 2011 (JP) 2011-025108

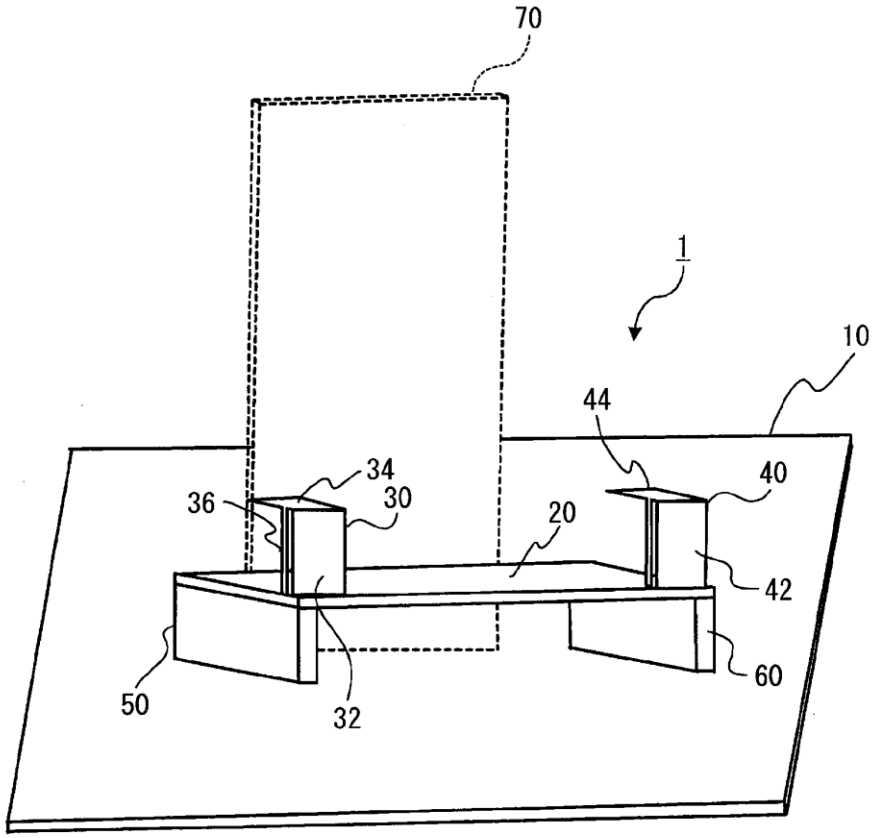
Publication Classification

(51) **Int. Cl.**
H01Q 21/12 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 21/12*** (2013.01)
USPC **343/844**

(57) **ABSTRACT**

An antenna for wireless apparatus which is placed in the vicinity of a conductive object is disclosed. The antenna for wireless apparatus includes a GND plate, a conductive plate parallel to the GND plate, two antenna elements, and two raising conductive plates. Each of the antenna elements includes a short-circuit conductive body and a radiation plate placed at an edge of the short-circuit conductive body. The two antenna elements are placed substantially parallel to a side surface of the conductive object with a distance of a half wavelength of a radio wave to be transmitted and received. The two raising conductive plates are placed close to the two antenna elements respectively and raise the conductive plate from the GND plate to a predetermined height.



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

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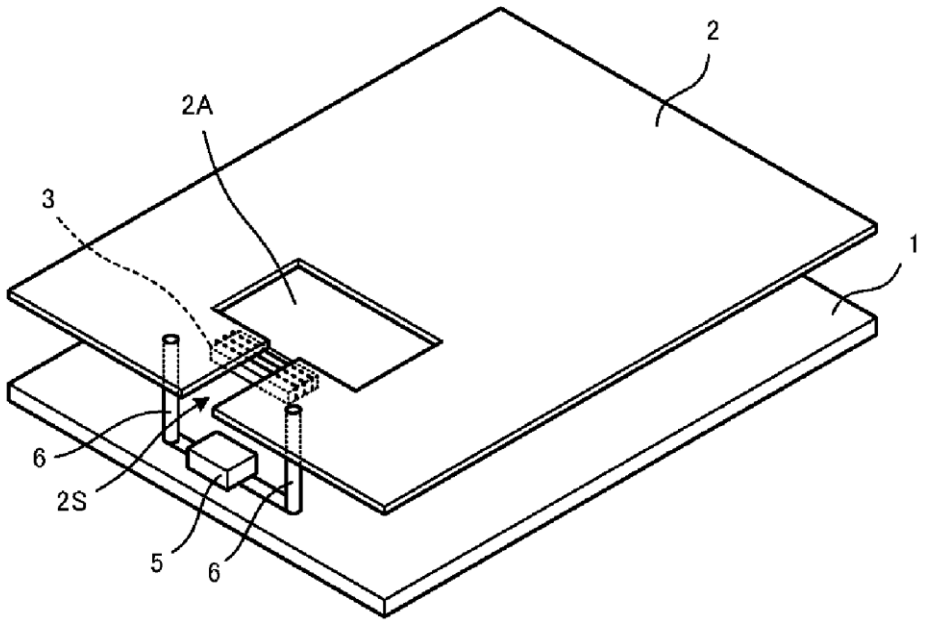
(57) **ABSTRACT**

An antenna device includes a feed coil and a sheet conductor. The feed coil includes a magnetic core and a coil-shaped conductor, which is provided around the magnetic core. An RFIC is connected to the feed coil. The sheet conductor has a larger area than the feed coil. A slit that extends from a portion of the edge of the sheet conductor toward the inner side of the sheet conductor is provided in the sheet conductor. The feed coil is arranged such that the direction of the axis around which the feed coil is disposed is parallel or substantially parallel to the directions in which the sheet conductor extends. The feed coil is arranged such that the feed coil is close to the slit and one of coil openings at the ends of the feed coil faces the slit.



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(54) **COMPACT MULTI-BAND ANTENNA FOR WORLDWIDE MOBILE HANDSET APPLICATIONS**

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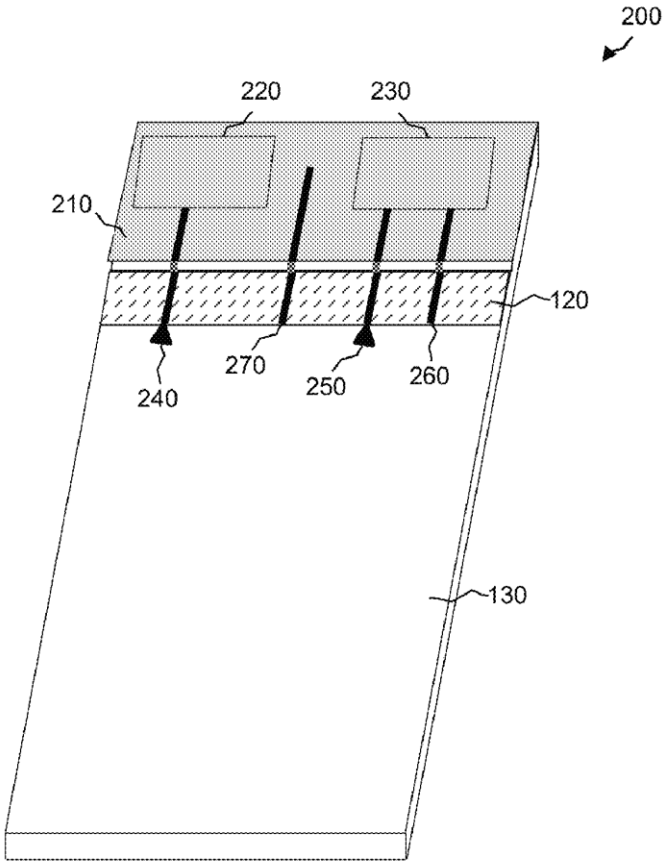
(57) **ABSTRACT**

A multi-band antenna component is provided. The multi-band antenna component comprises a carrier, a first antenna array, and a second antenna array. The carrier is composed of a ceramic material characterized by a permittivity of at least about 6, said carrier having a first region and a second region distinct from the first region. The first antenna array is disposed on the first region and comprises one or more antennas selected from the group consisting of a first antenna adapted for about 2.4 GHz wireless communication, a second antenna adapted for about 5 GHz wireless communication, and a third antenna adapted for wireless communication for a global positioning system. The second antenna array is disposed on the second region and comprises at least one of a fourth antenna adapted for about 850 MHz wireless communication or a fifth antenna adapted for about 1800/1900 MHz wireless communication.



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(54) **MULTIBAND ANTENNA**

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(57) **ABSTRACT**

The reconfigurable multiband antenna includes the main antenna element connected to a feeding point to receive and transmit a radio signal, the at least one parasitic antenna element being placed on the side of the main antenna element. The at least one parasitic antenna is connected to the main antenna element or they are connected to each other by at least one RF switch. By changing the ON-OFF combination of the RF switches, the connection between the main antenna element and the parasitic antenna element is changed, thereby changing the resonance frequencies of the entire antenna. By this technique, the entire antenna functions as a reconfigurable multiband antenna.