



US 20130314283A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0314283 A1**

(43) **Pub. Date: Nov. 28, 2013**

(54) **APERTURE-COUPLED MICROSTRIP ANTENNA AND MANUFACTURING METHOD THEREOF**

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

(30) **Foreign Application Priority Data**

(71) Applicants: **Young Jun HONG**, Seoul (KR); **Kun Kook PARK**, Suwon-si (KR); **Kun Soo SHIN**, Seongnam-si (KR); **Tae Wan KOO**, Seongnam-si (KR); **Ji Kwon KIM**, Seoul (KR); **Jong Gwan YOOK**, Seoul (KR)

May 23, 2012 (KR) 10-2012-0054722

Publication Classification

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01P 11/00 (2006.01)

(72) Inventors: **Young Jun HONG**, Seoul (KR); **Kun Kook PARK**, Suwon-si (KR); **Kun Soo SHIN**, Seongnam-si (KR); **Tae Wan KOO**, Seongnam-si (KR); **Ji Kwon KIM**, Seoul (KR); **Jong Gwan YOOK**, Seoul (KR)

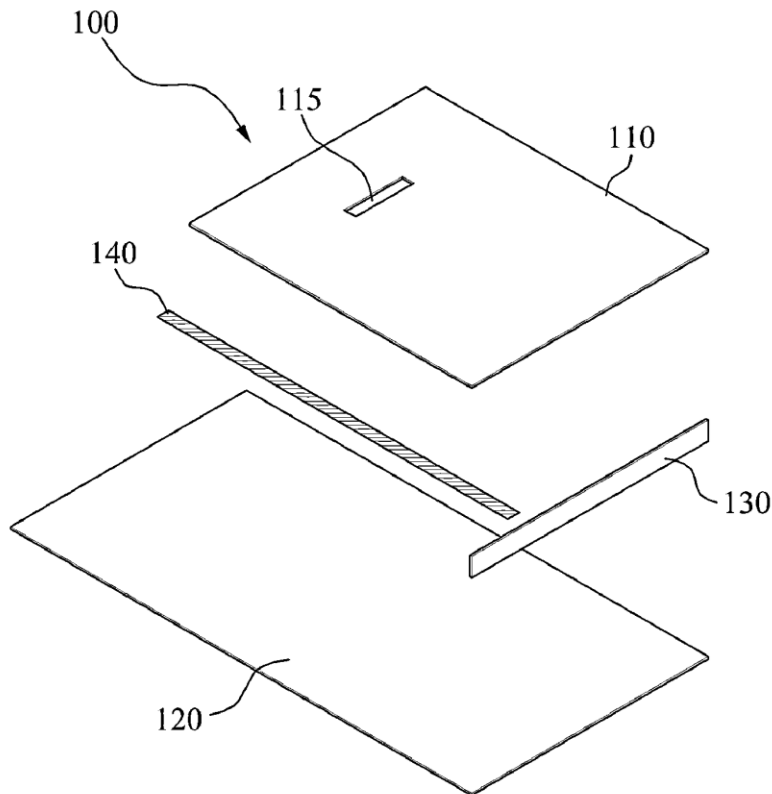
(52) **U.S. Cl.**
CPC **H01Q 9/0421** (2013.01); **H01P 11/008** (2013.01)
USPC **343/700 MS; 29/600**

(73) Assignees: **INDURSTRY-ACADEMIC COOPERATION FOUNDATION, YONSEI UNIVERSITY**, Seoul (KR); **SUMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(57) **ABSTRACT**

An aperture-coupled microstrip antenna and a manufacturing method thereof are provided. The aperture-coupled microstrip antenna includes a radiating patch including an aperture, and a ground plane disposed below the radiating patch. The aperture-coupled microstrip antenna further includes a shorting wall connecting the radiating patch with the ground plane, and a microstrip feeder configured to apply electromagnetic waves to the aperture.

(21) Appl. No.: **13/826,515**





US 20130314285A1

(19) **United States**

(12) **Patent Application Publication**
Takasaki

(10) **Pub. No.: US 2013/0314285 A1**

(43) **Pub. Date: Nov. 28, 2013**

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

Publication Classification

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

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

(72) Inventor: **Atsushi Takasaki,** Tokyo (JP)

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

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

(57) **ABSTRACT**

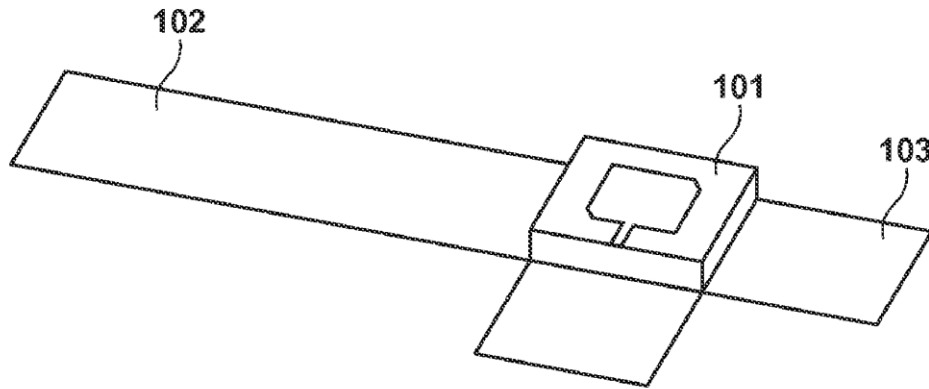
(21) Appl. No.: **13/868,834**

An antenna device comprises a patch antenna element having a conductor plate, a ground conductor plate provided in opposition to one face of the conductor plate and spaced a predetermined distance away from this face, and a power-supply point for supplying electric power to the conductor plate; and at least one additional conductor plate high-frequency coupled to the ground conductor plate and having a shape that extends in a direction orthogonal to a straight line connecting the center of the conductor plate and the power-supply point.

(22) Filed: **Apr. 23, 2013**

(30) **Foreign Application Priority Data**

May 25, 2012 (JP) 2012-120139



OVERALL CONFIGURATION



US 20130314287A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0314287 A1**

(43) **Pub. Date: Nov. 28, 2013**

(54) **ANTENNA ARRANGEMENT**

(75) Inventors: **Wanbo Xie**, Beijing (CN); **Jie Zhang**,
Espoo (FI); **Wei He**, Beijing (CN)

(73) Assignee: **Nokia Corporation**, Espoo (FI)

(21) Appl. No.: **13/984,624**

(22) PCT Filed: **Feb. 10, 2011**

(86) PCT No.: **PCT/CN11/70905**

§ 371 (c)(1),

(2), (4) Date: **Aug. 9, 2013**

Publication Classification

(51) **Int. Cl.**

H01Q 13/10

(2006.01)

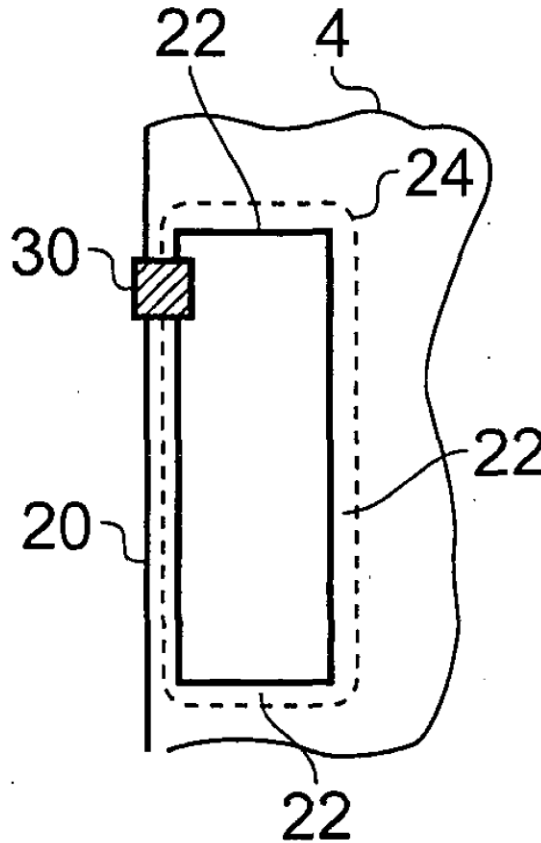
(52) **U.S. Cl.**

CPC **H01Q 13/106** (2013.01)

USPC **343/770**

(57) **ABSTRACT**

The Figures illustrate an apparatus 2 comprising: a conductive element 4 comprising an area of conductive material 5 defined by a plurality of edges 6, 7 including a first edge 7 wherein the conductive element 4 comprises an interior aperture 12 in the area of conductive material 5 and an elongate portion 20 defined by a gap 14 at the first edge 7 of the conductive element 4 and by at least a portion of the interior aperture 12. The apparatus 2 may comprise a further interior aperture in the area of conductive material and a second elongate portion defined by a second gap, by at least a portion of the interior aperture and by at least a portion of the further interior aperture.





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(19) **United States**

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

(10) **Pub. No.: US 2013/0314293 A1**

(43) **Pub. Date: Nov. 28, 2013**

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

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

(75) Inventors: **Kin-Lu WONG**, Kaohsiung City (TW);
Huan-Jynu JIANG, Kaohsiung City (TW)

(57) **ABSTRACT**

(73) Assignee: **Acer Incorporated**, Taipei Hsien (TW)

A communication device including a first conductive plane and an antenna system is provided. The antenna system includes at least a first antenna, a second antenna and a ground plane, and the antenna system is located at a first edge of the first conductive plane. Both the first antenna and the second antenna operate in at least a first band. The ground plane substantially has an inverted T-shape and includes a main ground plane and a protruded ground plane. The main ground plane is coupled to the first conductive plane. The protruded ground plane is located between the first antenna and the second antenna. The ground plane has at least a first slot. A portion of the first slot is located in the protruded ground plane, and two closed ends of the first slot are located in the main ground plane and extend away from each other.

(21) Appl. No.: **13/592,790**

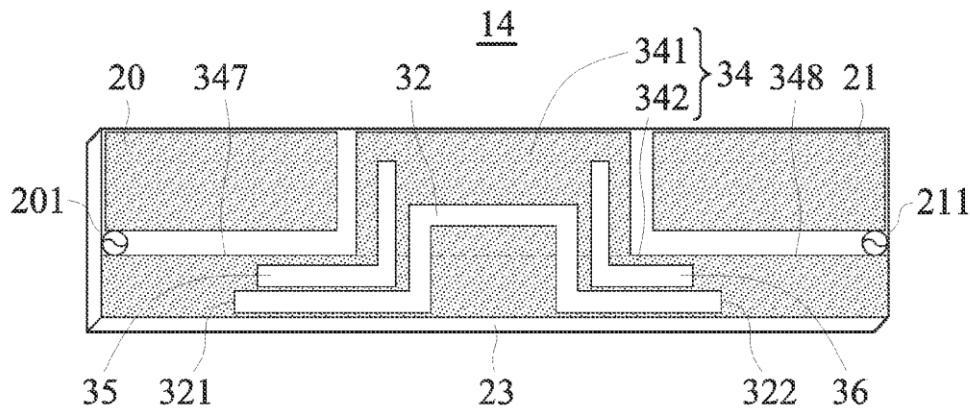
(22) Filed: **Aug. 23, 2012**

(30) **Foreign Application Priority Data**

May 25, 2012 (TW) 101118655

Publication Classification

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





US 20130314294A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0314294 A1**

(43) **Pub. Date: Nov. 28, 2013**

(54) **PORTABLE COMMUNICATION APPARATUS**

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

USPC 343/852

(71) Applicant: **Cho-Yi Lin**, (US)

(57) **ABSTRACT**

(72) Inventors: **Shih-Wei Hsieh**, Taipei City (TW);
Cho-Yi Lin, New Taipei City (TW)

(73) Assignee: **Cho-Yi Lin**, New Taipei City (TW)

(21) Appl. No.: **13/668,324**

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

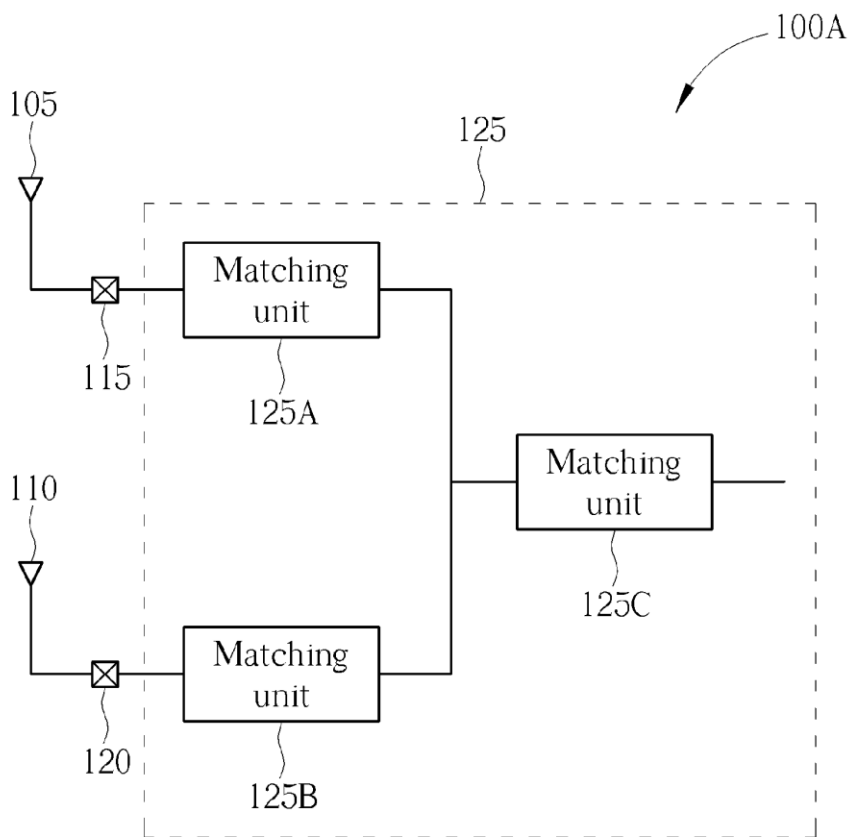
(30) **Foreign Application Priority Data**

May 23, 2012 (TW) 101118314

Publication Classification

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

A portable communication apparatus includes a first antenna radiator, a second antenna radiator, a first feeding point, a second feeding point, and a matching circuit. The first antenna radiator is used for radiating a high-frequency band signal. The second antenna radiator is used for radiating a low-frequency band signal. The first feeding point is coupled to the first antenna radiator and is utilized for processing feed-in or feed-out of the signal of first antenna radiator. The second feeding point is coupled to the second antenna radiator and is utilized for processing feed-in or feed-out of the signal of second antenna radiator. The first feeding point is separate from the second feeding point. The matching circuit is coupled to the first and second feeding points, and used for impedance matching with the first antenna radiator and the second antenna radiator.





US 20130314297A1

(19) **United States**

(12) **Patent Application Publication**
HAMABE

(10) **Pub. No.: US 2013/0314297 A1**

(43) **Pub. Date: Nov. 28, 2013**

(54) **ANTENNA APPARATUS INCLUDING TWO PAIRS OF ANTENNAS PROVIDED RESPECTIVELY TO BE SYMMETRIC WITH RESPECT TO SYMMETRIC LINE**

Publication Classification

(51) **Int. Cl.**
H01Q 21/28 (2006.01)
(52) **U.S. Cl.**
CPC **H01Q 21/28** (2013.01)
USPC **343/893**

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

(72) Inventor: **Taichi HAMABE**, Osaka (JP)

(73) Assignee: **Panasonic Corporation**, Osaka (JP)

(57) **ABSTRACT**

(21) Appl. No.: **13/955,510**

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

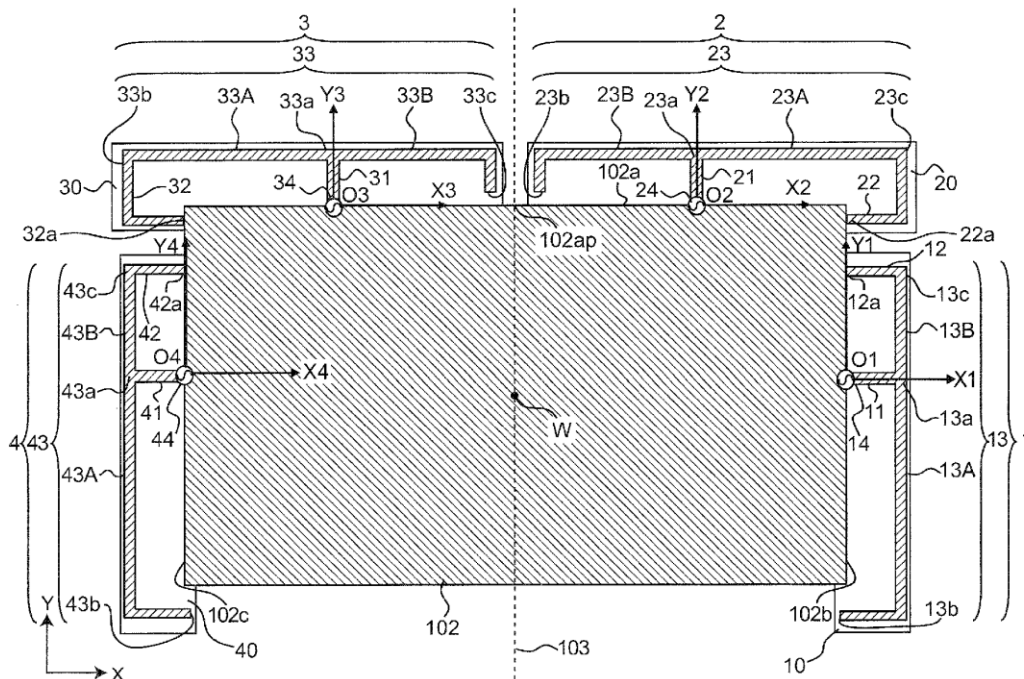
Related U.S. Application Data

(63) Continuation of application No. PCT/JP2013/000401, filed on Jan. 25, 2013.

(30) **Foreign Application Priority Data**

Jan. 31, 2012 (JP) 2012-017703
Jan. 31, 2012 (JP) 2012-017704
Feb. 10, 2012 (JP) 2012-027266

An antenna apparatus is configured to include first, second, third and fourth antennas. The first and fourth antennas are provided to be symmetrical with respect to a predetermined symmetry line on the grounding conductor, and the second and third antennas are arranged to be symmetrical with respect to the symmetry line so that the second and third feeding points are separated apart by a predetermined distance. A first antenna element of the first antenna and a fourth antenna element of the fourth antenna are formed to be substantially parallel to a Y-axis direction, and a second antenna element of the second antenna and a third antenna element of the third antenna are formed to be substantially parallel to an X-axis direction.





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(19) **United States**

(12) **Patent Application Publication**
CHEN

(10) **Pub. No.: US 2013/0315511 A1**

(43) **Pub. Date: Nov. 28, 2013**

(54) **PACKAGE BAG WITH EXTERNALLY ATTACHED COMMUNICATION DEVICE**

(52) **U.S. Cl.**
CPC *G06K 19/07745* (2013.01); *G06K 19/07773* (2013.01)

(71) Applicant: **TAIWAN LAMINATION INDUSTRIES, INC.**, Chung Li City (TW)

USPC **383/116**

(72) Inventor: **Yung-Shun CHEN**, Chung Li City (TW)

(57) **ABSTRACT**

(73) Assignee: **TAIWAN LAMINATION INDUSTRIES, INC.**, Chung Li City (TW)

The present invention is to provide a package bag having a metal layer, wherein the metal layer is formed with a first groove and a second groove, and the second groove has a first side extending to one edge of the metal layer and a second side away from said edge and communicating vertically with a central section of a first side of the first groove. The second side of the second groove is shorter than the first side of the first groove, such that the portions of the metal layer adjacent to the first side of the first groove form two first impedance-matching portions respectively, and the two corresponding portions of the metal layer adjacent to the first groove form two second impedance-matching portions respectively. Thus, due to the impedance-matching portions, a slot antenna can be formed on the metal layer for coupling with a communication device attached thereto.

(21) Appl. No.: **13/693,467**

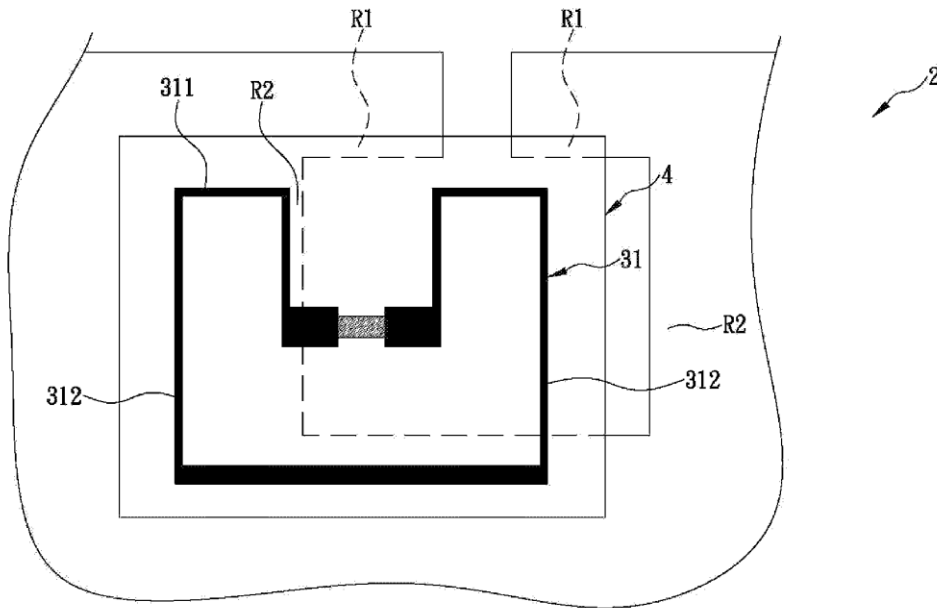
(22) Filed: **Dec. 4, 2012**

(30) **Foreign Application Priority Data**

May 23, 2012 (TW) 101118280

Publication Classification

(51) **Int. Cl.**
G06K 19/077 (2006.01)





US 20130318273A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0318273 A1**

(43) **Pub. Date: Nov. 28, 2013**

(54) **WIRELESS COMMUNICATION DEVICE AND METHOD FOR MANUFACTURING WIRELESS COMMUNICATION DEVICE**

(52) **U.S. Cl.**
CPC *G06F 13/4068* (2013.01)
USPC *710/305*

(71) Applicant: **Huawei Device Co., LTD.**, Shenzhen (CN)

(57) **ABSTRACT**

(72) Inventors: **Liang Ma**, Shenzhen (CN); **Jie Qi**, Shenzhen (CN)

The present invention provides a wireless communication device and a method for manufacturing a wireless communication device. The wireless communication device includes: an antenna; a main board, including a ground part, where the ground part is connected to the antenna; at least one matching network, connected to the ground part; a USB connector, including a shell and at least one first pin extending from the shell, where the at least one first pin is connected to the at least one matching network, and at least one first pin is one-to-one corresponding to at least one matching network. According to the present invention, a matching network may be connected between a pin of the USB connector of the wireless communication device and the ground part of the main board, and is configured to control wireless performance of an antenna radiation system of the wireless communication device.

(21) Appl. No.: **13/895,783**

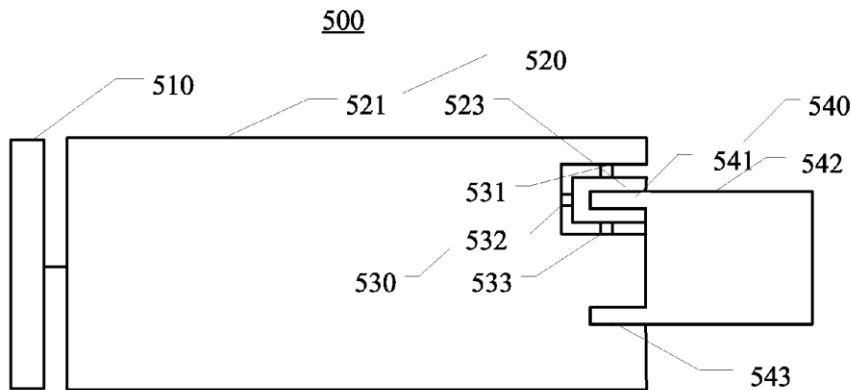
(22) Filed: **May 16, 2013**

(30) **Foreign Application Priority Data**

May 16, 2012 (CN) 201210152066.3

Publication Classification

(51) **Int. Cl.**
G06F 13/40 (2006.01)





US 20130321212A1

(19) **United States**

(12) **Patent Application Publication**
O'Shea et al.

(10) **Pub. No.: US 2013/0321212 A1**

(43) **Pub. Date: Dec. 5, 2013**

(54) **VOLUMETRICALLY CONFIGURABLE
MONOPOLE ANTENNAS AND RELATED
METHODS**

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

(75) Inventors: **Dermot O'Shea**, San Diego, CA (US);
Ronan Quinlan, Zhongli City (TW)

(57) **ABSTRACT**

(73) Assignee: **TAOGLAS GROUP HOLDINGS
LIMITED**, Wexford (IE)

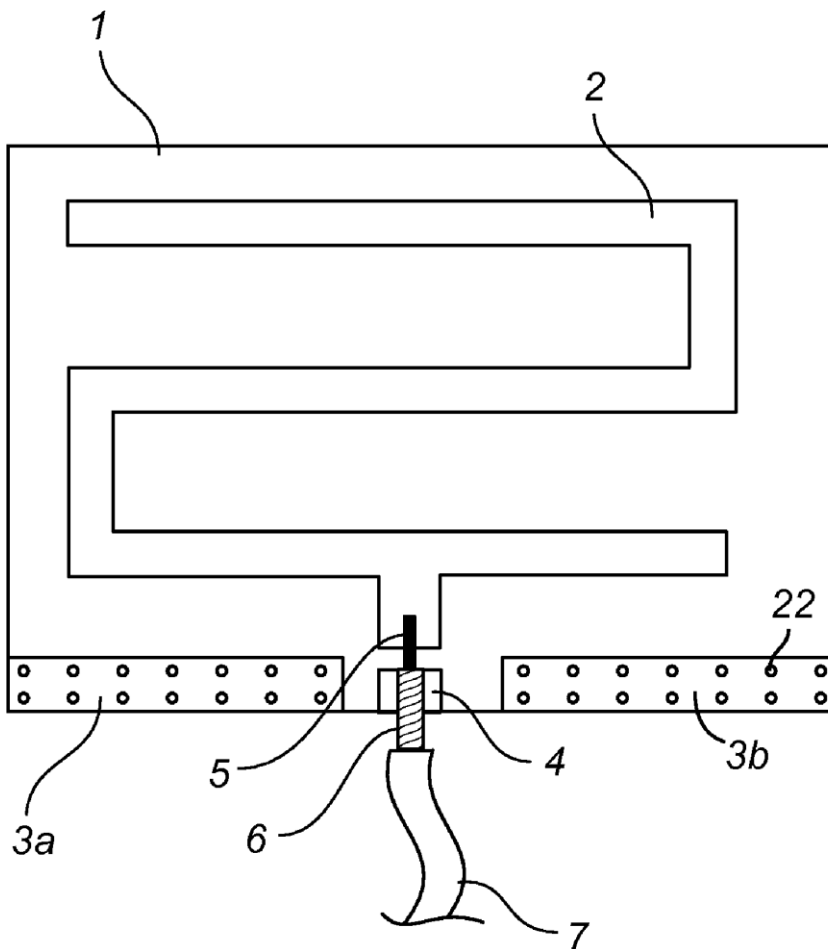
A dual resonance monopole antenna is described wherein the antenna structure, ground connection conductor and transmission line are integrated onto a single substrate. The substrate can be of a thin, flexible type that provides for positioning one or both resonant sections of the dual resonant monopole in the plane of or orthogonal to the ground plane of the host device to provide flexibility in selecting impedance and radiation characteristics. The ground connection conductor is configured to work in conjunction with features etched into the ground layer of the host device to form a method of altering the impedance properties of one or multiple resonances of the monopole.

(21) Appl. No.: **13/488,306**

(22) Filed: **Jun. 4, 2012**

Publication Classification

(51) **Int. Cl.**
H01Q 9/14 (2006.01)





US 20130321213A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0321213 A1**

(43) **Pub. Date: Dec. 5, 2013**

(54) **MULTI-BAND ANTENNA**

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

USPC 343/700 MS

(75) Inventors: **Yi-Feng Huang**, New Taipei City (TW);
Jia-Hung Su, New Taipei City (TW);
Kai Shih, New Taipei City (TW)

(57) **ABSTRACT**

(73) Assignee: **Chen Uei Precision Industry Co., LTD.**, New Taipei City (TW)

A multi-band antenna includes a base plate of which a feeding portion, a connection section and a ground portion are connected with rear, front and left edges of the base plate respectively, a first radiating element connected with a right edge of the base plate and coplanar with the base plate, a second radiating element coplanar with the base plate and the connection section and connected with an upper portion of a left rim of the connection section with a free end thereof adjacent to the ground portion, and a third radiating element connected with a lower end of the left rim of the connection section. Wherein the second radiating element is apart located between the ground portion and the third radiating element.

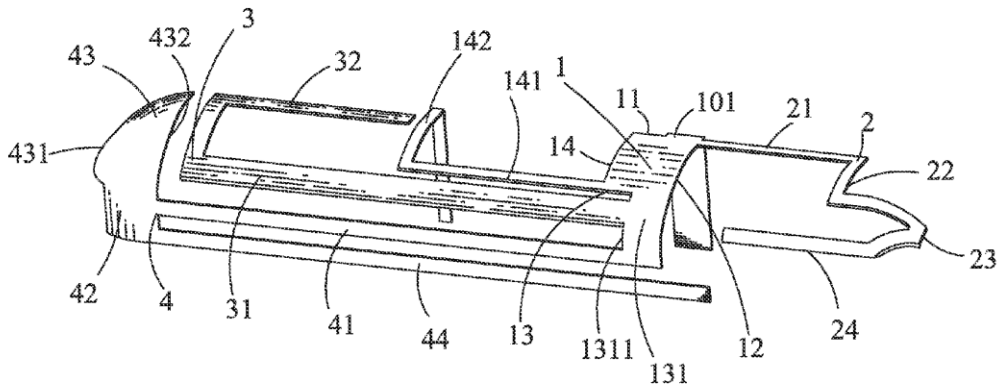
(21) Appl. No.: **13/489,448**

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

Publication Classification

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

100





US 20130321215A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0321215 A1**

(43) **Pub. Date: Dec. 5, 2013**

(54) **ANTENNA AND METHOD FOR MAKING THE ANTENNA**

(30) **Foreign Application Priority Data**

Jun. 5, 2012 (CN) 201210181704.4

(71) Applicants: **SHENZHEN FUTAIHONG PRECISION INDUSTRY CO., LTD.**, (US); **FIH (HONG KONG) LIMITED**, Kowloon (HK)

Publication Classification

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

(72) Inventors: **HAI-TAO JIANG**, Shenzhen (CN); **ZHAN LI**, Santa Clara, CA (US); **MEI-WEN FU**, Shenzhen (CN); **YE XIONG**, Shenzhen (CN); **XUE-LI ZHANG**, Shenzhen (CN)

(52) **U.S. Cl.**
CPC **H01Q 1/38** (2013.01)
USPC **343/700 MS; 29/600**

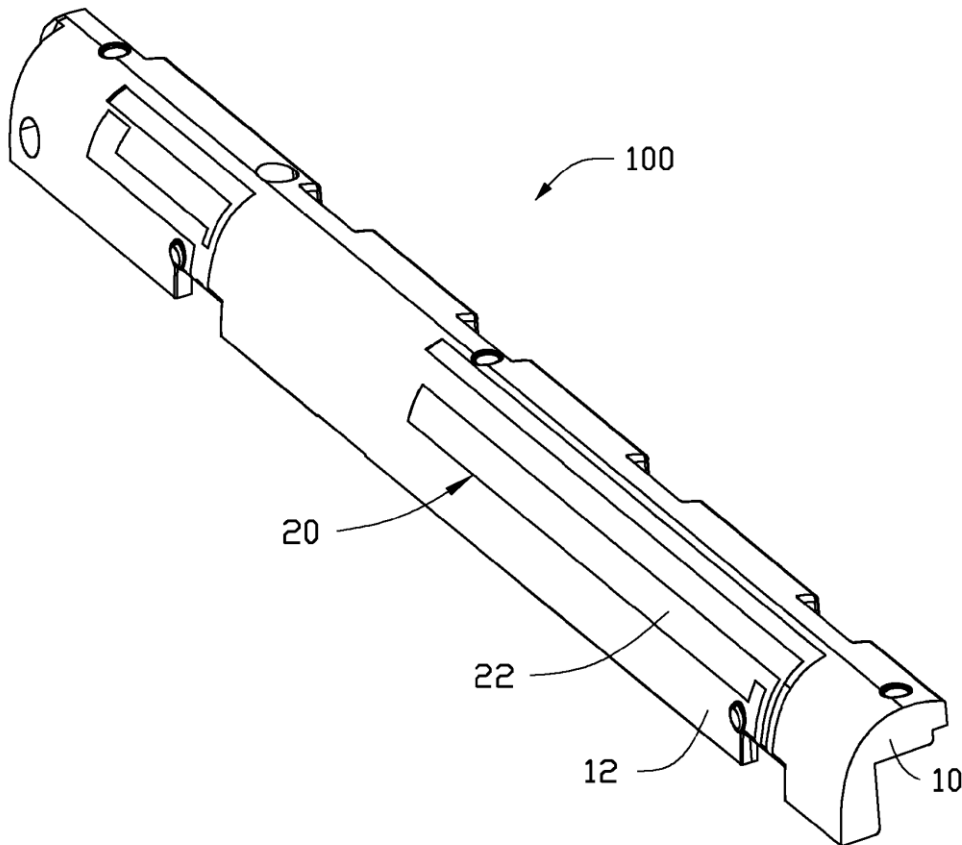
(73) Assignees: **FIH (HONG KONG) LIMITED**, Kowloon (HK); **SHENZHEN FUTAIHONG PRECISION INDUSTRY CO., LTD.**, Shenzhen (CN)

(57) **ABSTRACT**

An antenna includes a substrate and an antenna body disposed on the substrate. The substrate includes a first surface and a second surface connecting to the first surface. The antenna body includes a first radiator and a second radiator. The first radiator is disposed on the first surface of the substrate, the second radiator is disposed on the second surface. The first radiator is disposed by pad printing a conductive slurry, the second radiator is disposed by dispensing the conductive slurry.

(21) Appl. No.: **13/855,888**

(22) Filed: **Apr. 3, 2013**





US 20130321216A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0321216 A1**

(43) **Pub. Date: Dec. 5, 2013**

(54) **ANTENNA STRUCTURES IN ELECTRONIC DEVICES WITH HINGED ENCLOSURES**

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

(76) Inventors: **James W. Jervis**, Santa Clara, CA (US);
Jayesh Nath, Milpitas, CA (US); **Erdinc Irci**, Sunnyvale, CA (US); **Jerzy Guterman**, Mountain View, CA (US);
Mattia Pascolini, Campbell, CA (US);
Robert W. Schlub, Cupertino, CA (US)

(57) **ABSTRACT**

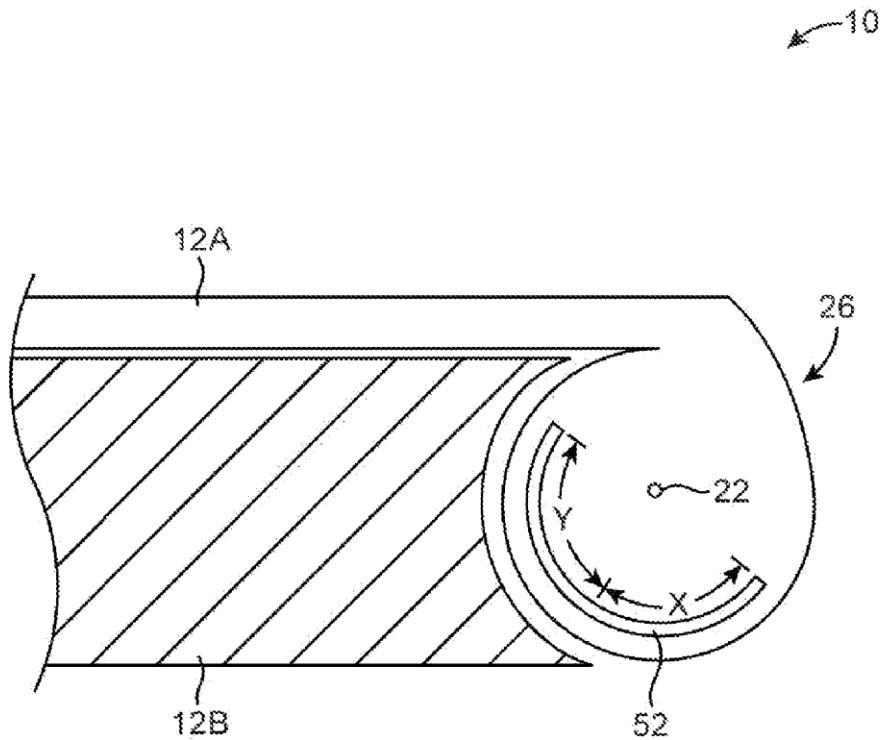
Electronic devices may include radio-frequency transceiver circuitry and antenna structures. The antenna structures may include antenna resonating elements, parasitic antenna resonating elements, and antenna ground structures. The antenna structures may include metal traces that are wrapped around an elongated plastic carrier. The plastic carrier may have metal traces that are coupled to a metal bracket using solder that protrudes through a hole in the metal bracket. A printed circuit board may be mounted between the metal bracket and a metal housing. The metal housing may have a protruding ridge portion that is gripped between prongs on the metal bracket. A cover may cover the metal traces on the elongated plastic carrier. The antenna structures may be mounted between hinge structures that couple upper and lower housing structures. The antenna structures may be configured to operate with comparable performance when the upper and lower housing structures are open and closed.

(21) Appl. No.: **13/484,040**

(22) Filed: **May 30, 2012**

Publication Classification

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





US 20130321221A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0321221 A1**

(43) **Pub. Date: Dec. 5, 2013**

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

(30) **Foreign Application Priority Data**

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

Jun. 20, 2008 (KR) 10-2008-0058619

Publication Classification

(72) Inventors: **Sang Bong SUNG**, Gyeongsangbuk-do (KR); **In Jin HWANG**, Gyeongsangbuk-do (KR); **Seung Hwan KIM**, Gyeonggi-do (KR); **Jae Ho LEE**, Gyeonggi-do (KR)

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

(52) **U.S. Cl.**
CPC **H01Q 1/24** (2013.01)
USPC **343/702**

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

(57) **ABSTRACT**

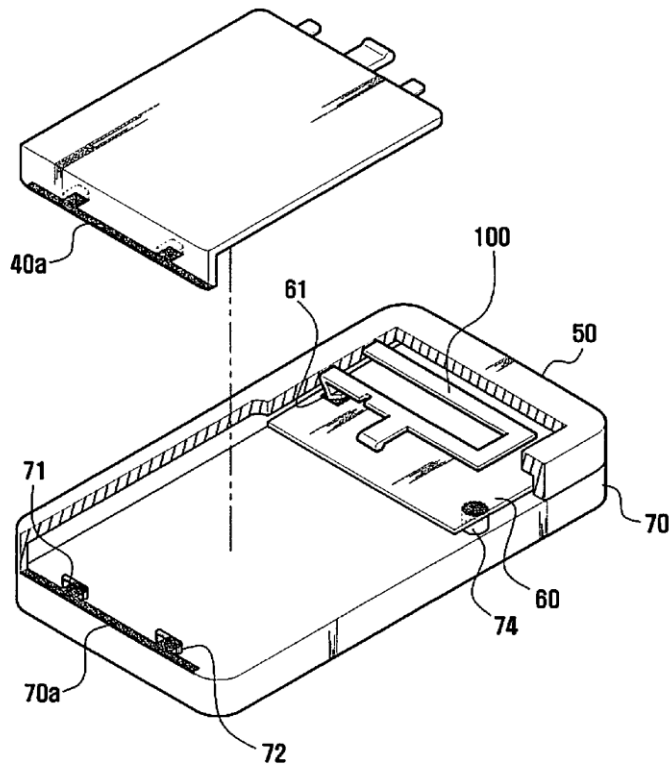
(21) Appl. No.: **13/962,483**

An antenna device of a mobile terminal that can secure radiation performance is provided. The antenna device having a battery cover composed of a metal material includes a radiation unit for transmitting and receiving a signal, a feeding unit formed at an end portion of a first side of the radiation unit for electrically connecting the radiation unit to a Printed Circuit Board (PCB), and a ground part disposed a predetermined distance from the feeding unit and formed at a second side of the radiation unit. When the battery cover is fastened to the mobile terminal, the ground part contacts a first side of the battery cover.

(22) Filed: **Aug. 8, 2013**

Related U.S. Application Data

(63) Continuation of application No. 13/458,453, filed on Apr. 27, 2012, now Pat. No. 8,531,342, which is a continuation of application No. 12/489,044, filed on Jun. 22, 2009, now Pat. No. 8,188,930.





US 20130321226A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0321226 A1**

(43) **Pub. Date: Dec. 5, 2013**

(54) **ANTENNA DEVICE FOR PORTABLE TERMINAL**

(52) **U.S. Cl.**
USPC 343/767; 343/700 MS; 343/860; 343/906

(75) Inventors: **Bum-Jin Cho**, Hwaseong-si (KR);
Gyu-Sub Kim, Suwon-si (KR);
Joon-Ho Byun, Seongnam-si (KR)

(57) **ABSTRACT**

(73) Assignee: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR)

(21) Appl. No.: **13/619,965**

(22) Filed: **Sep. 14, 2012**

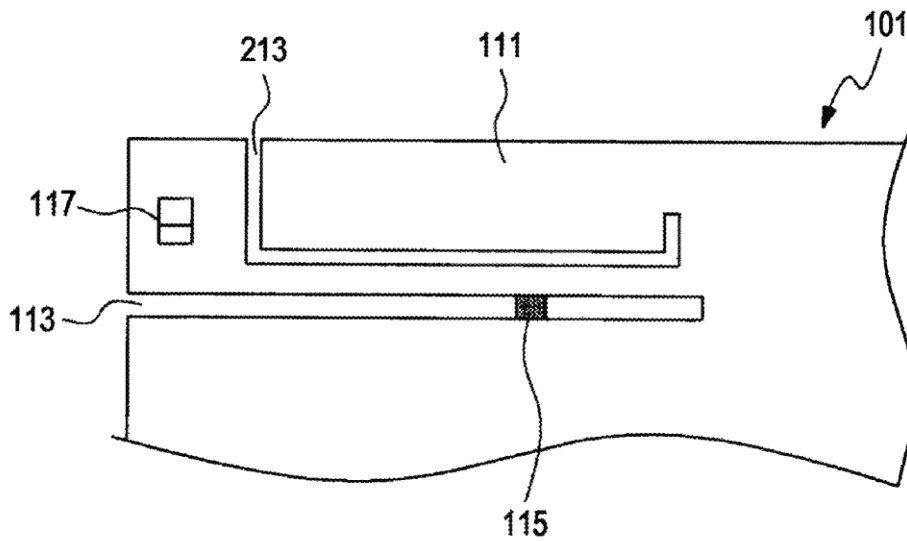
(30) **Foreign Application Priority Data**

May 29, 2012 (KR) 10-2012-0056451

Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 1/50 (2006.01)
H01Q 13/10 (2006.01)

A portable terminal includes an antenna device having a circuit board on a surface of which a conductive layer is formed, a slit that removes a portion of the conductive layer and extends in a direction, an auxiliary board positioned on the slit to face a surface of the circuit board, and a radiation pattern formed on the auxiliary board, in which the radiation pattern is disposed to partially enclose the slit. Even when the radiation pattern is disposed on the conductive layer, induced current generated around the slit can be controlled in the same direction as signal power, thereby preventing radiation performance from being degraded by an inverse current phenomenon in spite of disposition of the radiation pattern on the conductive layer.





US 20130321234A1

(19) **United States**

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

(10) **Pub. No.:** US 2013/0321234 A1

(43) **Pub. Date:** Dec. 5, 2013

(54) **MIMO ANTENNA DEVICE, ANTENNA AND ANTENNA PACKAGE**

(76) Inventors: **Ken-Huang LIN**, Kaohsiung (TW);
Tzzy-Sheng Horng, Kaohsiung (TW);
Tzu-Chun Tang, Kaohsiung (TW)

(21) Appl. No.: 13/608,922

(22) Filed: Sep. 10, 2012

(30) **Foreign Application Priority Data**

May 30, 2012 (TW) 101119355

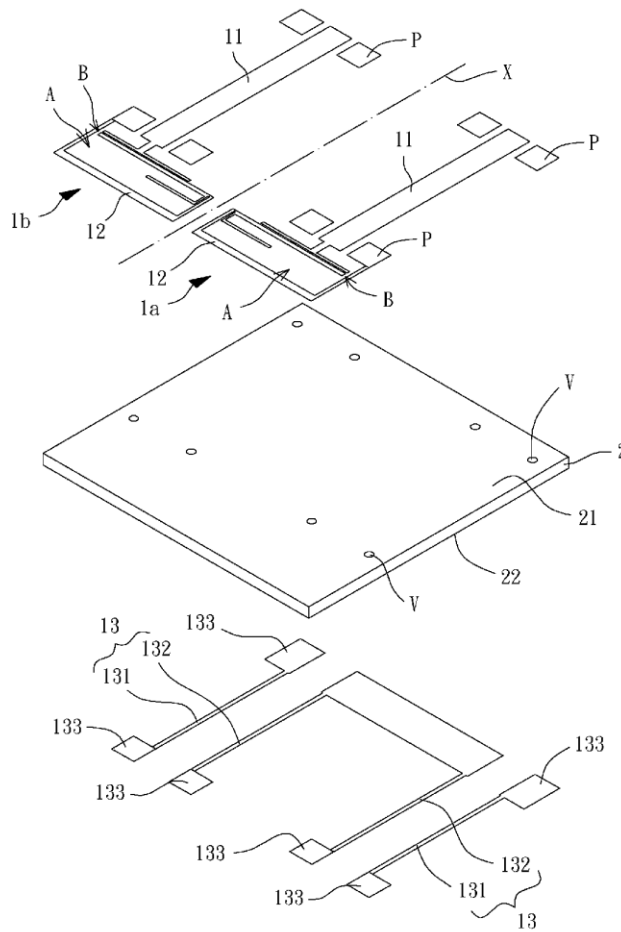
Publication Classification

(51) **Int. Cl.**
H01Q 21/28 (2006.01)
H01Q 21/00 (2006.01)

(52) **U.S. Cl.**
CPC **H01Q 21/28** (2013.01); **H01Q 21/0075** (2013.01)
USPC **343/848**; 343/893

(57) **ABSTRACT**

A multi-input and multi-output antenna device is disclosed. The MIMO antenna device comprises two antennas symmetrically disposed on a substrate. Each antenna comprises a T-shaped feeding unit, a radiation unit and a ground unit. The T-shaped feeding unit and the radiation unit are disposed on a first surface of the substrate. The T-shaped feeding unit forms a strip portion and a top portion. The radiation unit has first and second ends. The radiation unit extends from the first end to the second end to form a rectangular region and a spacing. The first end extends parallel to the top portion. The ground unit is disposed along two sides of the strip portion and electrically coupled to the second end. The two strip portions of the two T-shaped feeding units are parallel to and aligned with each other. The two ground units are electrically connected to each other.





US 20130321240A1

(19) **United States**

(12) **Patent Application Publication**
O'Shea et al.

(10) **Pub. No.: US 2013/0321240 A1**

(43) **Pub. Date: Dec. 5, 2013**

(54) **INTEGRATED MIMO ANTENNA SYSTEM**

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

USPC **343/893**; 216/13; 216/6

(75) Inventors: **Dermot O'Shea**, San Diego, CA (US);
Ronan Quinlan, Zhongli City (TW)

(57) **ABSTRACT**

(73) Assignee: **TAOGLAS GROUP HOLDINGS LIMITED**, Wexford (IE)

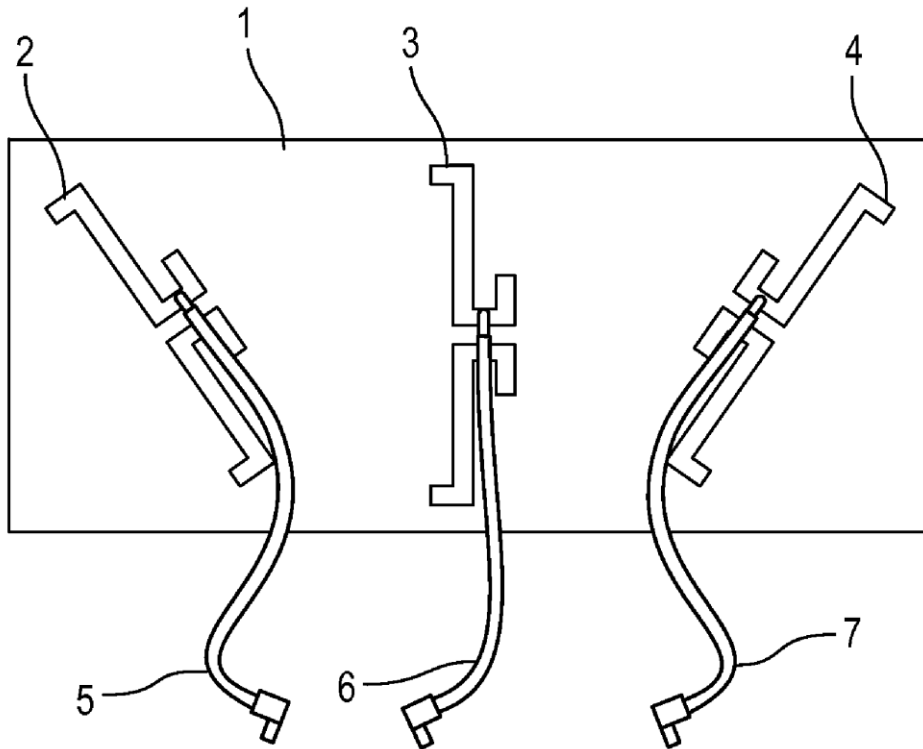
An integrated MIMO antenna system is described wherein multiple antennas are fabricated on a single substrate. Antenna spacing and alignment is enhanced and controlled to a finer degree than with conventional discrete antenna fabrication techniques. Rotation of one or multiple antennas in relation to the other antennas in the system can be performed to within the accuracy of current photo-etching techniques. Metalized traces can be designed and etched on the single substrate and positioned between antenna elements to enhance inter-element isolation. The integrated MIMO antenna system can be fabricated on flexible printed circuit (FPC) material, or can be fabricated on rigid metallized substrate such as common FR4 materials. Portions of one or multiple antenna elements can be photo-etched on opposite sides of the substrate to provide an additional degree of freedom in terms of antenna placement, spacing, and rotation angle.

(21) Appl. No.: **13/485,857**

(22) Filed: **May 31, 2012**

Publication Classification

(51) **Int. Cl.**
H01Q 21/28 (2006.01)
H01G 4/33 (2006.01)
H01B 13/00 (2006.01)





US 20130322038A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0322038 A1**

(43) **Pub. Date: Dec. 5, 2013**

(54) **PORTABLE WIRELESS DEVICE**

Publication Classification

(75) Inventors: **Kenji Ogawa**, Osaka (JP); **Yoshio Koyanagi**, Kanagawa (JP); **Kouta Aoki**, Kanagawa (JP)

(51) **Int. Cl.**
H05K 5/00 (2006.01)

(52) **U.S. Cl.**
CPC **H05K 5/0086** (2013.01)
USPC **361/752**

(73) Assignee: **PANASONIC CORPORATION**, Osaka (JP)

(57) **ABSTRACT**

An antenna includes two elements having an antenna element which resonates by a frequency $f1$ and a ground wire element which resonates by a frequency $f2$ higher than the frequency $f1$. The antenna element is directed so that an antenna radiation part is located to be substantially parallel to a surface of a casing on which an operating part is provided. The ground wire element is directed so that a ground wire radiation part is located substantially vertically to the surface of the casing on which the operating part is provided. Further, a space between a feeding terminal connecting part of the antenna element and a ground terminal connecting part of the ground wire element is set to be equal to a space between a feeding terminal and a ground terminal and the feeding terminal connecting part is arranged to be parallel to the ground terminal connecting part.

(21) Appl. No.: **13/985,353**

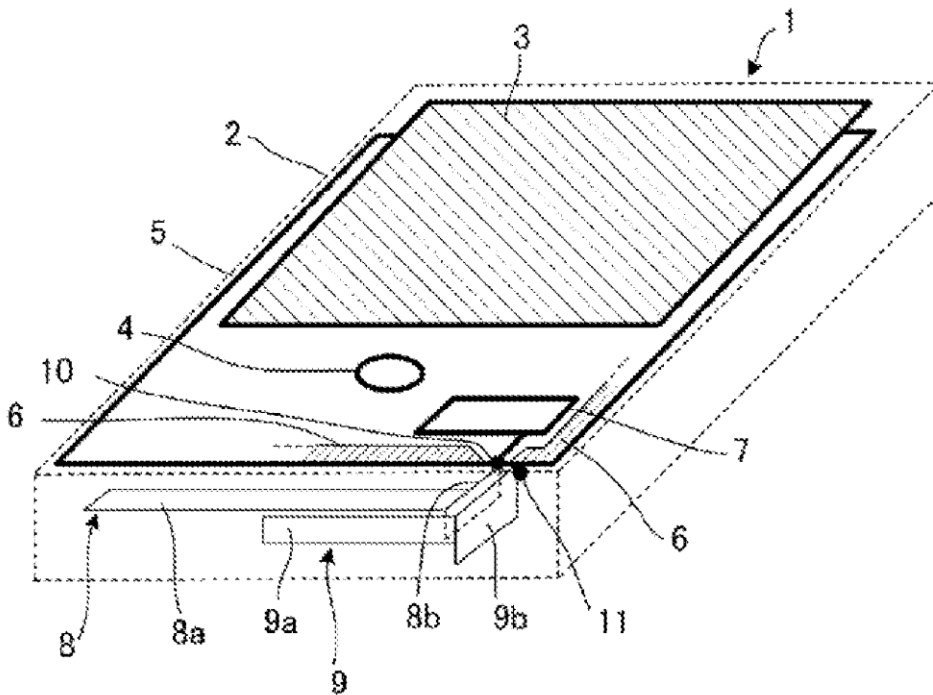
(22) PCT Filed: **Feb. 16, 2012**

(86) PCT No.: **PCT/JP2012/001039**

§ 371 (c)(1),
(2), (4) Date: **Aug. 14, 2013**

(30) **Foreign Application Priority Data**

Feb. 25, 2011 (JP) 2011-040671





US 20130324197A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0324197 A1**

(43) **Pub. Date: Dec. 5, 2013**

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE WITH SLIDABLE CONFIGURATION
PROVIDING HEARING AID COMPATIBILITY
FEATURES AND RELATED METHODS**

Publication Classification

(51) **Int. Cl.**
H04M 1/02 (2006.01)
(52) **U.S. Cl.**
CPC *H04M 1/0235* (2013.01)
USPC *455/575.4*

(71) Applicant: **BLACKBERRY LIMITED**, Waterloo
(CA)

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

(57) **ABSTRACT**

A mobile wireless communications device is for a user wearing an electronic hearing aid adjacent an ear of the user and may include an upper housing and a lower housing being slidably connected together for sliding between a retracted position and an extended use position. An audio output transducer may be carried by the upper housing and accessible to the hearing aid of the user adjacent a top end of the upper housing, and an audio input transducer may be carried by the lower housing and accessible to a mouth of the user adjacent a bottom end of the lower housing. An antenna may be carried by the lower housing adjacent the bottom end thereof so that the hearing aid is further separated from the antenna when the upper and lower housings are in the extended use position to reduce undesired coupling from the antenna to the hearing aid.

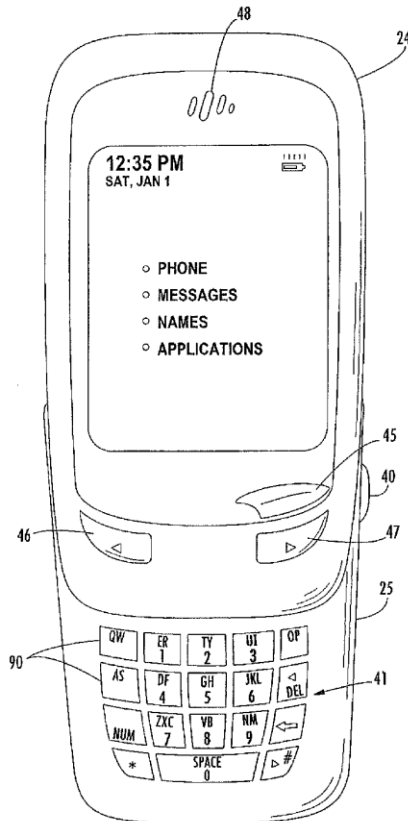
(73) Assignee: **BLACKBERRY LIMITED**, Waterloo
(CA)

(21) Appl. No.: **13/959,783**

(22) Filed: **Aug. 6, 2013**

Related U.S. Application Data

(63) Continuation of application No. 12/758,478, filed on Apr. 12, 2010, now Pat. No. 8,538,051, which is a continuation of application No. 11/025,752, filed on Dec. 29, 2004, now Pat. No. 7,706,556.





US 20130328582A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0328582 A1**

(43) **Pub. Date: Dec. 12, 2013**

(54) **METHODS AND APPARATUS FOR PERFORMING WAFER-LEVEL TESTING ON ANTENNA TUNING ELEMENTS**

(52) **U.S. Cl.**
USPC 324/750.02; 324/750.01

(76) Inventors: **Liang Han**, Sunnyvale, CA (US);
Matthew A. Mow, Los Altos, CA (US);
Ming Tsai, Cupertino, CA (US);
Thomas E. Biedka, San Jose, CA (US);
Robert W. Schlub, Cupertino, CA (US);
Ruben Caballero, San Jose, CA (US)

(57) **ABSTRACT**

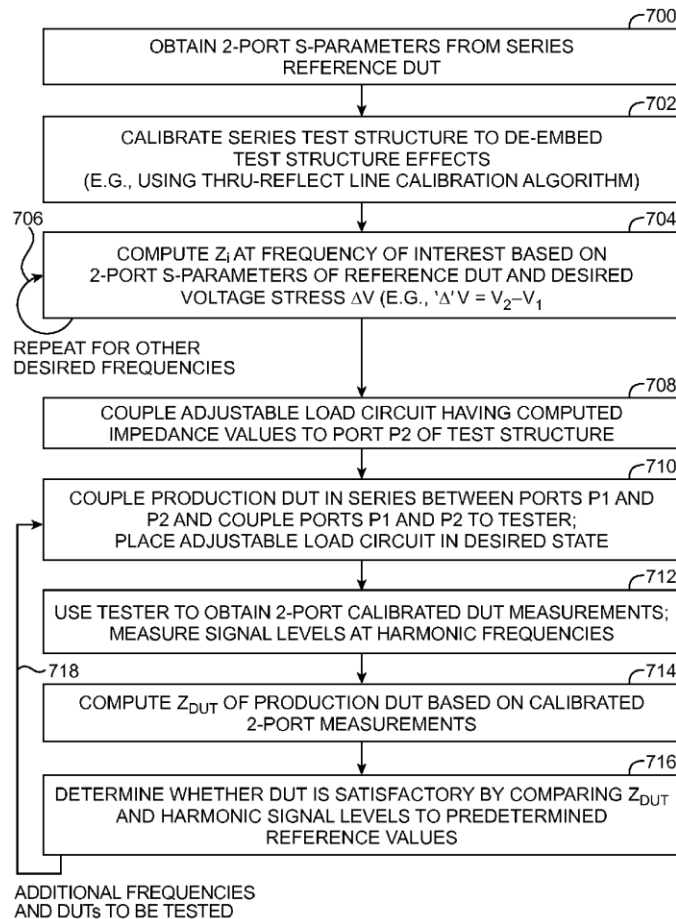
A test system for testing an antenna tuning element is provided. The test system may include a tester, a test fixture, and a probing structure. The probing structure may include probe tips configured to mate with corresponding solder bumps formed on a device under test (DUT) containing an antenna tuning element. The DUT may be tested in a shunt or series configuration. The tester may be electrically coupled to the test probe via first and second connectors on the test fixture. An adjustable load circuit that is coupled to the second connector may be configured in a selected state so that a desired amount of electrical stress may be presented to the DUT during testing. The tester may be used to obtain measurement results on the DUT. Systematic effects associated with the test structures may be de-embedded from the measured results to obtain calibrated results.

(21) Appl. No.: 13/494,663

(22) Filed: Jun. 12, 2012

Publication Classification

(51) **Int. Cl.**
G01R 31/00 (2006.01)
G01R 31/26 (2006.01)
G01R 35/00 (2006.01)





US 20130328640A1

(19) **United States**

(12) **Patent Application Publication**
TSUTSUMI

(10) **Pub. No.: US 2013/0328640 A1**

(43) **Pub. Date: Dec. 12, 2013**

(54) **FILTER MODULE AND DUPLEXER MODULE**

Publication Classification

(71) Applicant: **TAIYO YUDEN CO., LTD.**, Tokyo (JP)

(51) **Int. Cl.**
H03H 9/72 (2006.01)

(72) Inventor: **Jun TSUTSUMI**, Tokyo (JP)

(52) **U.S. Cl.**
CPC **H03H 7/463** (2013.01); **H03H 9/70** (2013.01)
USPC **333/133**; 333/132; 333/195

(21) Appl. No.: **13/912,991**

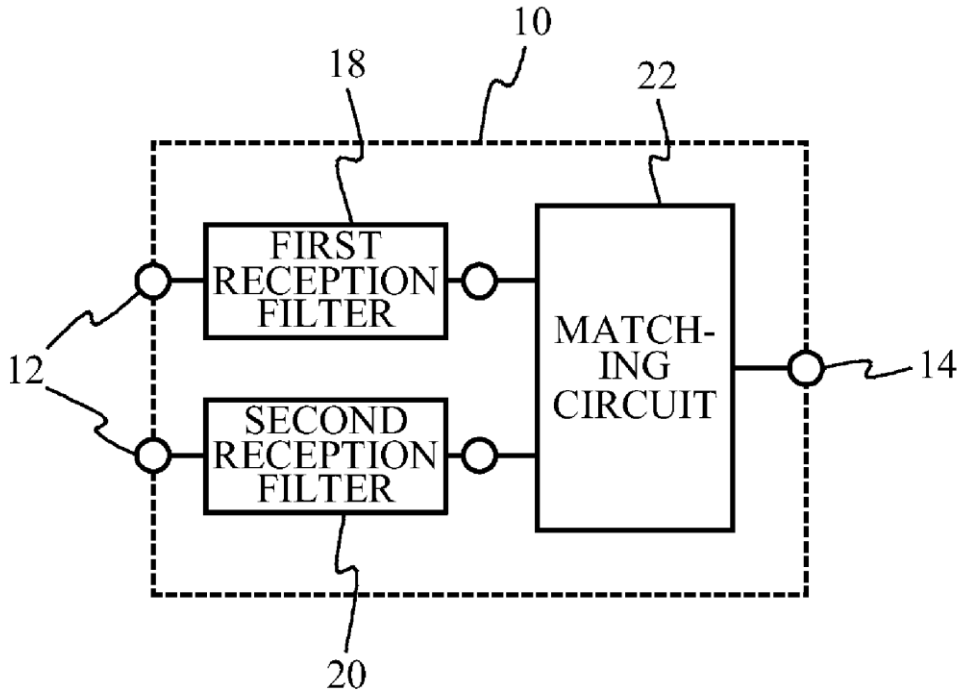
(57) **ABSTRACT**

(22) Filed: **Jun. 7, 2013**

A filter module includes: reception filters connected between an antenna terminal and a reception terminal; and a module substrate, wherein a first reception filter that is at least one reception filter of the reception filters is embedded in the module substrate, and a second reception filter that is at least another one reception filter is mounted on a surface of the module substrate so as to overlap the first reception filter.

(30) **Foreign Application Priority Data**

Jun. 12, 2012 (JP) 2012-132611





US 20130328723A1

(19) **United States**

(12) **Patent Application Publication**
Rappaport

(10) **Pub. No.: US 2013/0328723 A1**

(43) **Pub. Date: Dec. 12, 2013**

(54) **STEERABLE ANTENNA DEVICE**

(71) Applicant: **Theodore S. Rappaport**, Riner, VA
(US)

(72) Inventor: **Theodore S. Rappaport**, Riner, VA
(US)

(21) Appl. No.: **13/966,853**

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

Related U.S. Application Data

(63) Continuation-in-part of application No. 13/713,804, filed on Dec. 13, 2012, which is a continuation of application No. 12/541,764, filed on Aug. 14, 2009, now Pat. No. 8,350,763.

(60) Provisional application No. 61/088,829, filed on Aug. 14, 2008.

Publication Classification

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

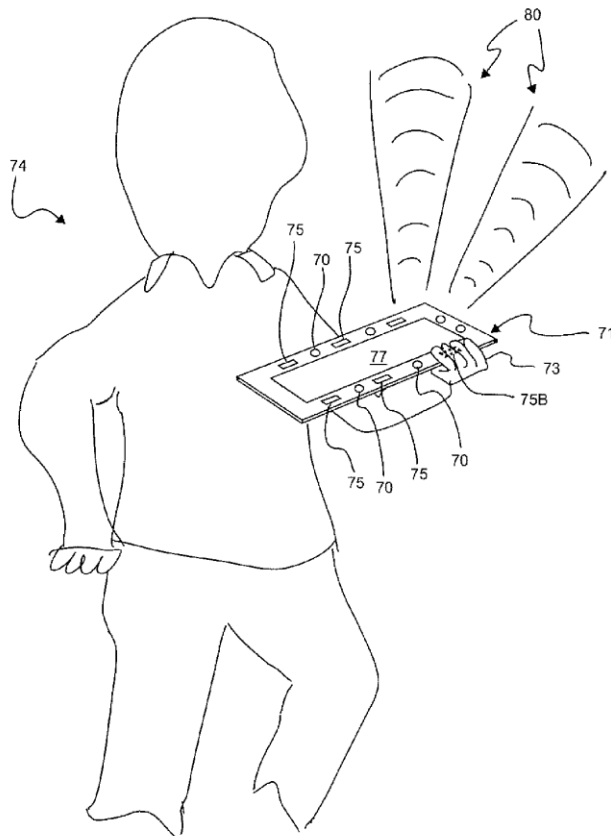
(52) **U.S. Cl.**

CPC **H04B 1/3838** (2013.01)

USPC **342/372**

(57) **ABSTRACT**

Wireless devices, and particularly mobile devices such as cellphones, PDAs, computers, navigation devices, etc., as well as other devices which transmit or receive data or other signals at multiple frequency bands utilize at least one antenna to transmit and receive and a plurality of different bands (e.g., GSM cellular communication band; Bluetooth short range communication band; ultrawideband (UWB) communications, etc.). These wireless devices can simultaneously transmit or receive at a plurality of different bands, or simultaneously transmit and receive at different bands. The wireless devices have the ability to use a single physical structure (e.g., an antenna) for transmission and reception of many different bands. The antenna can be either actively tuned or passively tuned using one or more elements. The antenna may comprise a plurality of antenna elements or antennas, and at least one antenna may be a steerable antenna.





US 20130328728A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0328728 A1**

(43) **Pub. Date: Dec. 12, 2013**

(54) **MULTI-BAND ANTENNA**

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

USPC 343/700 MS

(76) Inventors: **Yi-Feng Huang**, New Taipei (TW);
Jia-Hung Su, New Taipei (TW); **Kai Shih**, New Taipei (TW)

(57) **ABSTRACT**

A multi-band antenna includes a base portion, a substantially lying U-shaped first radiating portion, a substantially lying L-shaped second radiating portion and a third radiating portion. A rear edge of the base portion extends rearward to form a ground portion with a ground point being defined thereon. A top of the base portion defines a feeding point. The first radiating portion of which one end is connected with a first side edge of the base portion and the mouth faces to the first side edge of the base portion. The second radiating portion is connected with a second side edge of the base portion. The third radiating portion tortuously extends downward from a front edge of the base portion, then extends transversely, and further circuitously extends rearward to be located substantially near under a free arm of the second radiating portion.

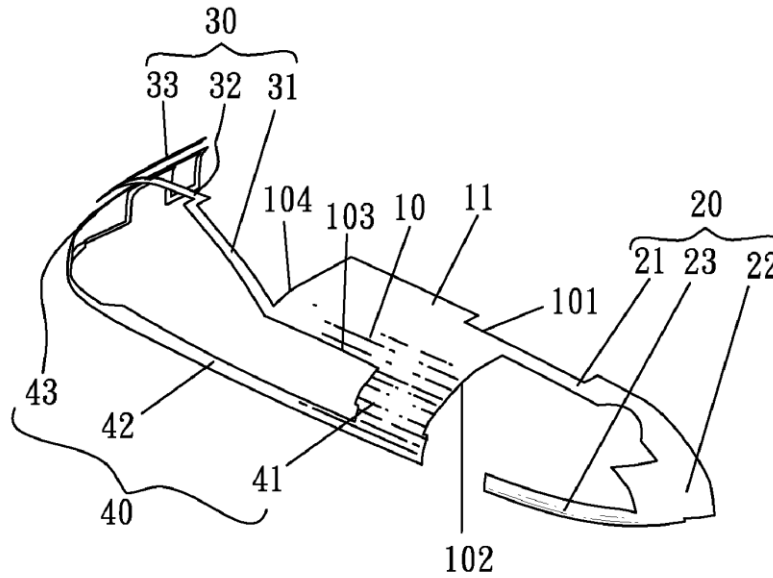
(21) Appl. No.: 13/490,627

(22) Filed: Jun. 7, 2012

Publication Classification

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

100





US 20130328742A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0328742 A1**

(43) **Pub. Date: Dec. 12, 2013**

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

(30) **Foreign Application Priority Data**

Apr. 20, 2011 (JP) 2011-093744

Publication Classification

(75) Inventors: **Takanori Hirobe**, Ishikawa (JP); **Hiroyuki Uejima**, Ishikawa (JP); **Yoshio Koyanagi**, Kanagawa (JP); **Hiroshi Satou**, Kanagawa (JP)

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

(52) **U.S. Cl.**
CPC **H01Q 21/28** (2013.01)
USPC **343/853**

(73) Assignee: **PANASONIC CORPORATION**, Osaka (JP)

(57) **ABSTRACT**

A first connection circuit (108) is adjusted to cancel out mutual coupling impedance occurring between a first antenna element (106) in a first frequency band and a second antenna element (107) in a second frequency band, and reduces a degradation occurring due to the coupling between the antenna elements. A second frequency band cutoff circuit (111) for the second frequency band is provided between the first antenna element (106) and the first feeding portion (104).

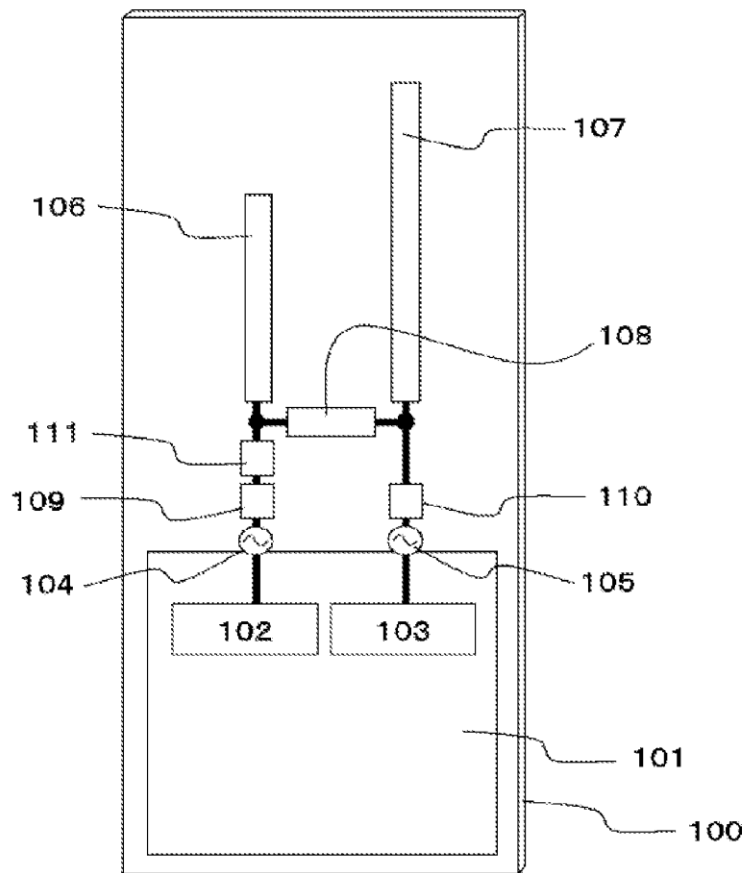
(21) Appl. No.: **14/001,664**

(22) PCT Filed: **Apr. 17, 2012**

(86) PCT No.: **PCT/JP2012/002654**

§ 371 (c)(1),

(2), (4) Date: **Aug. 26, 2013**





US 20130335277A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0335277 A1**

(43) **Pub. Date: Dec. 19, 2013**

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

Publication Classification

(71) Applicants: **TZE-HSUAN CHANG**, Tu-Cheng (TW); **CHO-KANG HSU**, Tu-Cheng (TW)

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

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

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

(57) **ABSTRACT**

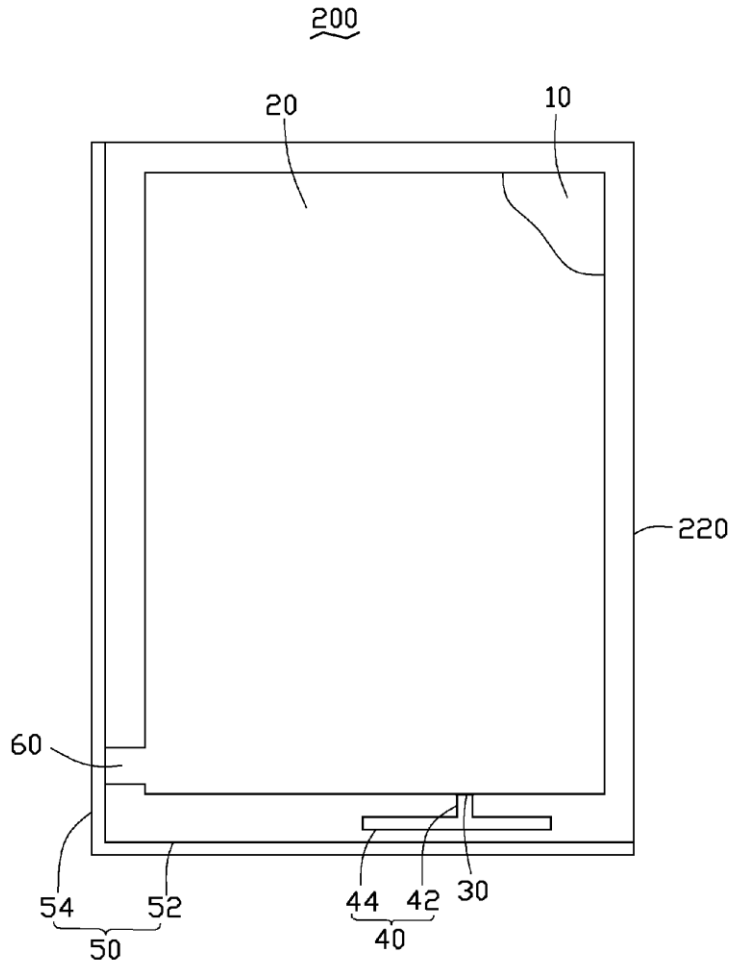
An antenna assembly employed by a wireless communication device having a housing includes a base board, a grounding member secured on the base board and grounding the antenna assembly, a first radio member electrically connected to the base board to receive and transmit wireless signals having a first central frequency, and a second radio member forming a portion of the housing and electrically connected to the grounding member. The second radio member couples with the first radio member to receive and transmit wireless signals having a second central frequency.

(21) Appl. No.: **13/663,507**

(22) Filed: **Oct. 30, 2012**

(30) **Foreign Application Priority Data**

Jun. 15, 2012 (TW) 101121518





US 20130335278A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0335278 A1**

(43) **Pub. Date: Dec. 19, 2013**

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

Publication Classification

(71) Applicant: **Chi Mei Communication Systems, Inc.**, New Taipei (TW)

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H01Q 1/12 (2006.01)

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

(52) **U.S. Cl.**
CPC ... *H01Q 1/22* (2013.01); *H01Q 1/12* (2013.01)
USPC **343/702**; 343/878

(21) Appl. No.: **13/911,321**

(57) **ABSTRACT**

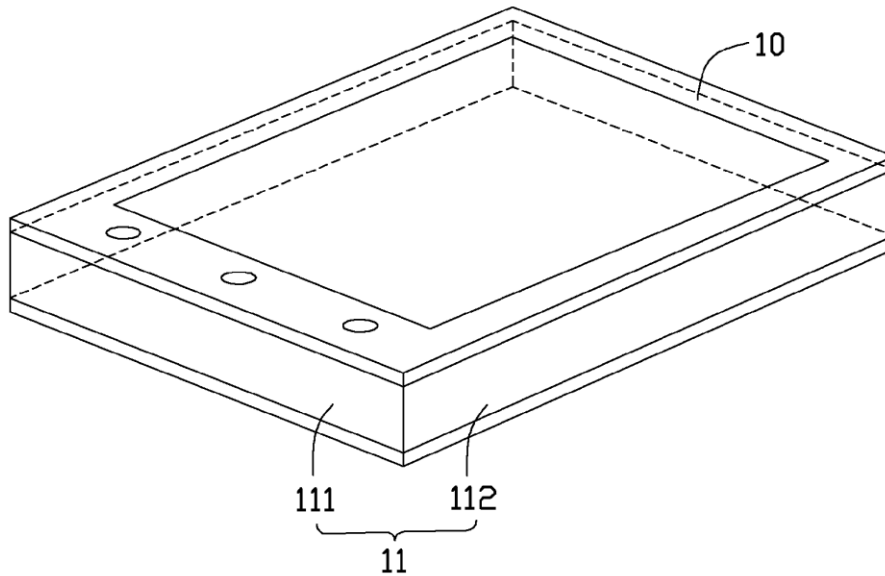
(22) Filed: **Jun. 6, 2013**

A wireless communication device includes a housing and an antenna. The housing includes a frame. The frame includes a metal portion and a non-metal portion connected to the metal portion. The antenna includes a base board and a radiating body. The radiating body is partially surrounding the base and electrically connected to the base board. The radiating body is formed by the metal portion.

(30) **Foreign Application Priority Data**

Jun. 15, 2012 (TW) 101121516

100





US 20130335280A1

(19) **United States**

(12) **Patent Application Publication**
Chen, III et al.

(10) **Pub. No.: US 2013/0335280 A1**

(43) **Pub. Date: Dec. 19, 2013**

(54) **MULTIMODE ANTENNA STRUCTURES AND METHODS THEREOF**

(71) Applicant: **Skycross, Inc.**, Fremont, CA (US)

(72) Inventors: **Li Chen, III**, Melbourne, FL (US);
Frank M. Caimi, Vero Beach, FL (US);
Mark T. Montgomery, Melbourne Beach, FL (US)

(21) Appl. No.: **13/912,331**

(22) Filed: **Jun. 7, 2013**

Related U.S. Application Data

(60) Provisional application No. 61/659,223, filed on Jun. 13, 2012, provisional application No. 61/793,856, filed on Mar. 15, 2013.

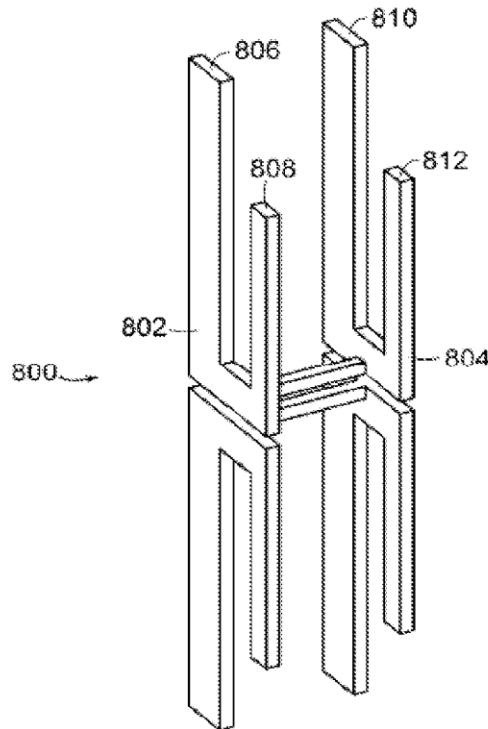
Publication Classification

(51) **Int. Cl.**
H01Q 21/28 (2006.01)
H01Q 1/52 (2006.01)
H01Q 21/30 (2006.01)
H01Q 1/50 (2006.01)

(52) **U.S. Cl.**
CPC **H01Q 21/28** (2013.01); **H01Q 1/50** (2013.01); **H01Q 1/521** (2013.01); **H01Q 21/30** (2013.01)
USPC **343/725**; 343/853; 343/841; 343/745

(57) **ABSTRACT**

A system that incorporates the subject disclosure may include, for example, a method for electrically coupling a first lower frequency radiator of a first antenna to a first upper frequency radiator of a second antenna via a shared first port, electrically coupling a second lower frequency radiator of the first antenna to a second upper frequency radiator of the second antenna via a shared second port, suppressing, at least in part, with at least one first filter, first signals of the first lower frequency radiator from entering the first upper frequency radiator, second signals of the first upper frequency radiator from entering the first lower frequency radiator, or both, and suppressing, at least in part, with at least one second filter, third signals of the second upper frequency radiator from entering the second upper frequency radiator, fourth signals of the second upper frequency radiator from entering the second lower frequency radiator, or both. Other embodiments are disclosed.





US 20130335284A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0335284 A1**

(43) **Pub. Date: Dec. 19, 2013**

(54) **EDGE-EMITTING ANTENNAS FOR ULTRA SLIM WIRELESS MOBILE DEVICES**

(76) Inventors: **Hao-Han Hsu**, Portland, OR (US);
Dong-Ho Han, Beaverton, OR (US);
Songnan Yang, San Jose, CA (US);
Anand S. Konanur, San Jose, CA (US);
Chung-Hao Joseph Chen, Portland, OR (US)

(21) Appl. No.: **13/527,015**

(22) Filed: **Jun. 19, 2012**

Publication Classification

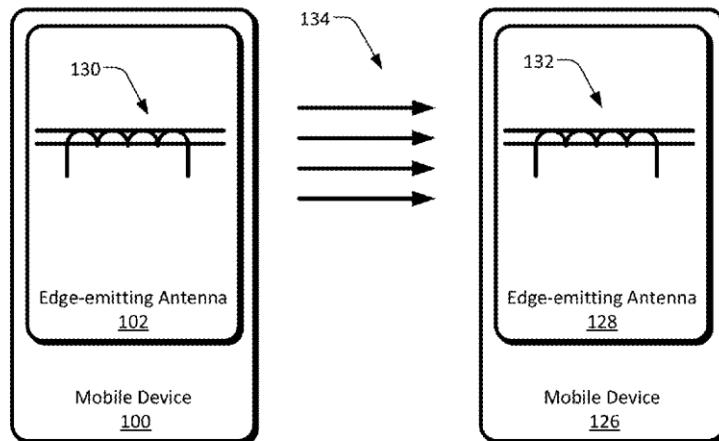
(51) **Int. Cl.**
H01Q 7/08 (2006.01)

(52) **U.S. Cl.**
USPC **343/788**

(57) **ABSTRACT**

Described herein are techniques related to near field coupling and wireless power transfers. A mobile device may include an edge-emitting antenna that offers ultra slim, all-metallic chassis packaging option with no cutout, uses lesser area, has robust mechanical strength, and provides EMI/ESD protection. In one example, an inductor coil is wrapped around a magnetic core and a pair of conductive layers is configured to interpose the magnetic core and the inductor coil between them to expose an edge of the magnetic core. The inductor coil being operable in a transmit mode to generate a magnetic field in response to a current passing through it. The edge is configured to enhance outward radiation of the magnetic field. Based on simulation results, the edge-emitting antenna occupies less space and provides an acceptable level of performance for coupling coefficients compared to conventional antenna.

124 ↘





US 20130335286A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0335286 A1**

(43) **Pub. Date: Dec. 19, 2013**

(54) **DECOUPLING CIRCUIT AND ANTENNA DEVICE**

(52) **U.S. Cl.**
USPC **343/841**

(76) Inventors: **I-Shan Chen**, Hsinchu (TW); **Tien-Min Lin**, Hsinchu (TW); **Cheng-Hsiung Hsu**, Hsinchu (TW); **Yi-Chieh Wang**, Hsinchu (TW)

(57) **ABSTRACT**

(21) Appl. No.: **13/603,438**

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

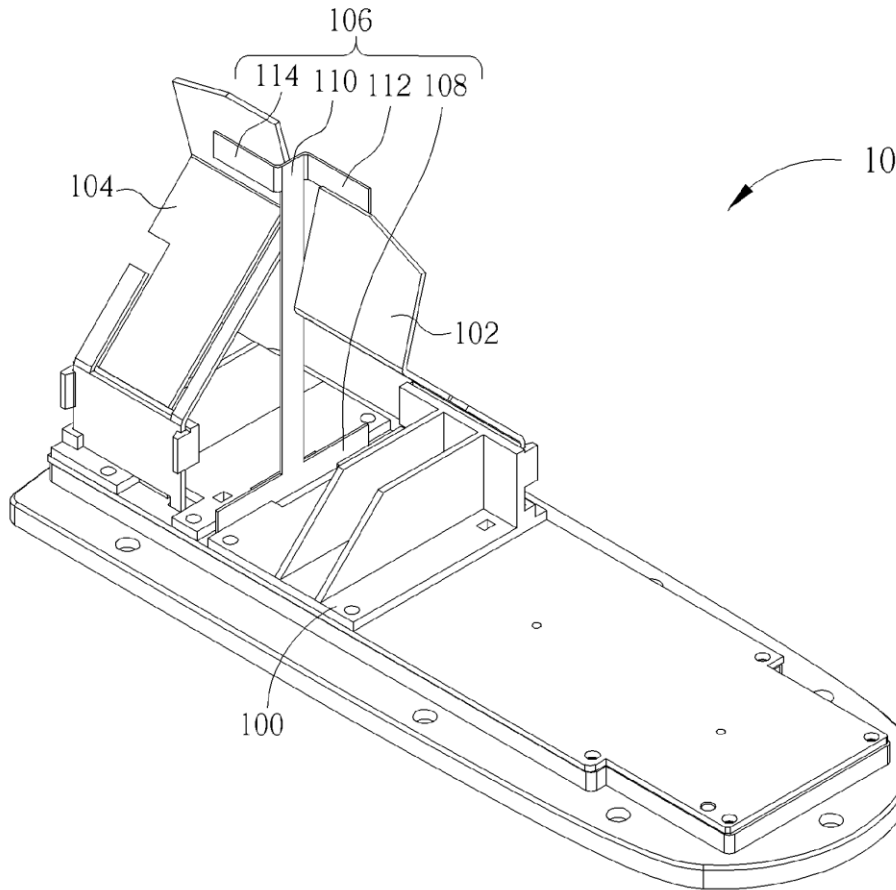
(30) **Foreign Application Priority Data**

Jun. 18, 2012 (TW) 101121721

Publication Classification

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

A decoupling circuit for enhancing isolation of two monopole antennas is disclosed. The two monopole antennas substantially symmetrically stand on a bottom, and a gap is formed between the two monopole antennas. The decoupling circuit includes a grounding element located on the bottom and electrically connected to a ground, a connection bar substantially perpendicular to the bottom, including a first terminal electrically connected to the grounding element, a second terminal extending to the gap, a first branch extending from the second terminal of the connection bar to a first monopole antenna of the two monopole antennas, and a second branch extending from the second terminal of the connection bar to a second monopole antenna of the two monopole antennas.





US 20130335287A1

(19) **United States**

(12) **Patent Application Publication**
ZANG

(10) **Pub. No.: US 2013/0335287 A1**

(43) **Pub. Date: Dec. 19, 2013**

(54) **HAC COMPATIBLE ANTENNA STRUCTURE**

Publication Classification

(71) Applicant: **NING-FENG ZANG**, Shenzhen City (CN)

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

(72) Inventor: **NING-FENG ZANG**, Shenzhen City (CN)

(52) **U.S. Cl.**
USPC **343/841**

(57) **ABSTRACT**

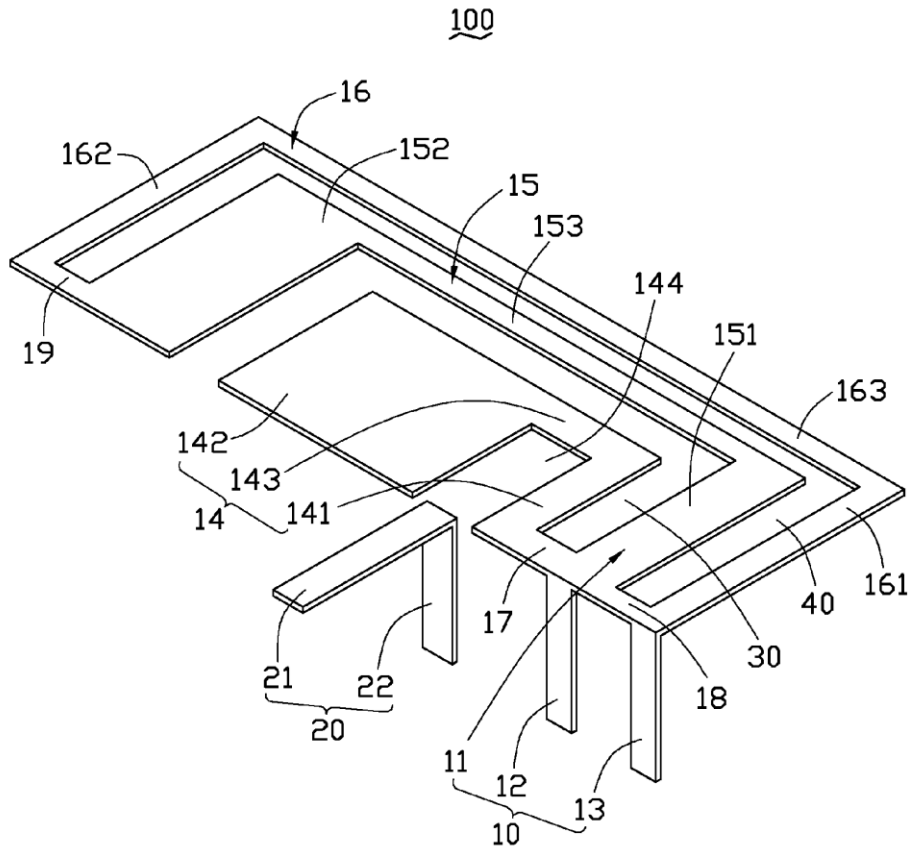
(21) Appl. No.: **13/662,875**

An antenna structure includes an antenna and a radiation blocking member. The antenna includes a main radiating body, a ground end and a feed end. The main radiating body comprises a first radiating portion, a second radiating portion, and a third radiating portion interconnected together. The first radiating portion defines an opening. The ground end and the feed end are extended from the main radiating body. The radiation blocking member is positioned at one side of the antenna and aligned with the opening to block a portion of signal radiation of the antenna.

(22) Filed: **Oct. 29, 2012**

(30) **Foreign Application Priority Data**

Jun. 18, 2012 (CN) 201210200774X





US 20130335289A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0335289 A1**

(43) **Pub. Date: Dec. 19, 2013**

(54) **ANTENNA DEVICE**

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

(72) Inventors: **Yasuyuki HARA**, Tokyo (JP); **Kenji ENDOU**, Tokyo (JP); **Tetsuya SHIBATA**, Tokyo (JP)

(21) Appl. No.: **13/896,594**

(22) Filed: **May 17, 2013**

(30) **Foreign Application Priority Data**

Jun. 14, 2012 (JP) 2012-135037

Publication Classification

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

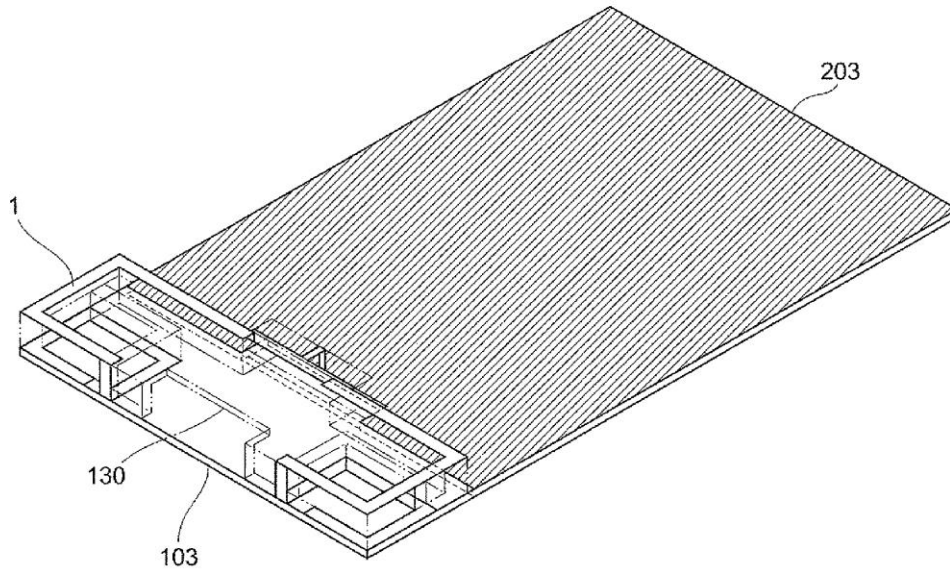
(52) **U.S. Cl.**

CPC **H01Q 1/52** (2013.01)

USPC **343/848; 343/700 MS**

(57) **ABSTRACT**

The present invention is to provide an antenna device with the isolation among feedpoints being further improved. In order to achieve this goal, the present invention provides an antenna device provided with a substrate having a ground area, and a first conductor, a second conductor and a third conductor. In the antenna, one end of the second conductor is connected to the ground area via a first feedpoint and the other end of the second conductor is connected to the first conductor. A second feedpoint is included serially in the third conductor at any position. Further, at least part of the third conductor is disposed opposite to the first conductor, and both ends of the third conductor are connected to the ground area.





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

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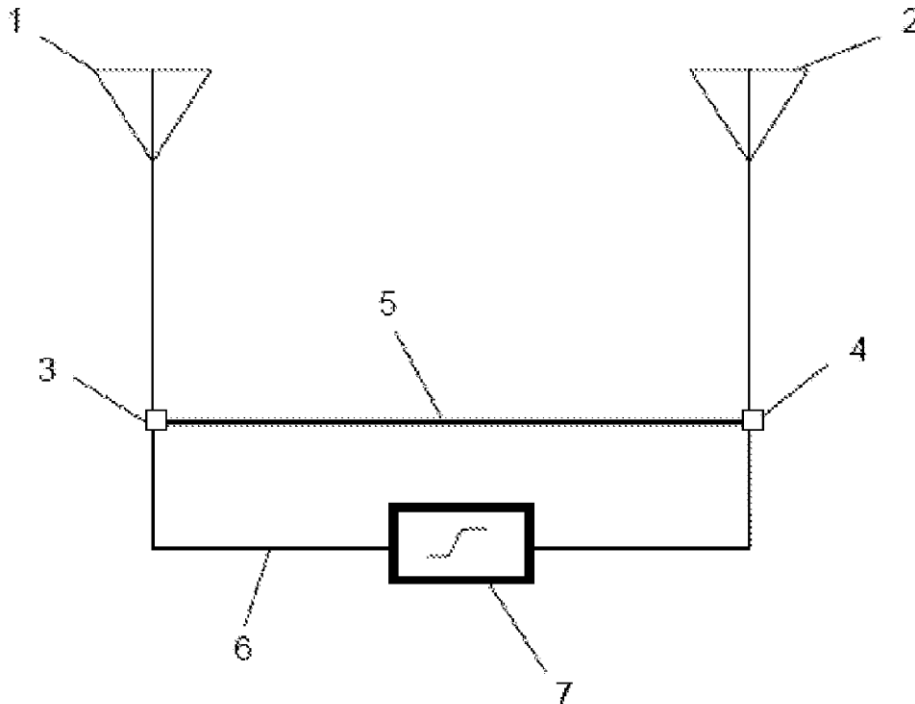
2010, now Pat. No. 8,077,116, Continuation of appli-
cation No. 11/841,207, filed on Aug. 20, 2007, now
Pat. No. 7,830,320, Division of application No.
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158.

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H01Q 21/28 (2006.01)
(52) **U.S. Cl.**
CPC **H01Q 21/28** (2013.01)
USPC **343/853**

(57) **ABSTRACT**

A multi-band antenna system for MIMO applications is adapted to provide high isolation between antennas across a wide range of frequencies. Multiple Isolated Magnetic Dipole (IMD) antennas are co-located and connected with a feed network that can include switches that adjust phase length for transmission lines connecting the antennas. Filtering is integrated into the feed network to improve rejection of unwanted frequencies. Filtering can also be implemented on the antenna structure. Either one or multi-port antennas can be used.





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(54) **CIRCUIT BOARD HAVING ANTENNA STRUCTURE**

(52) **U.S. Cl.**
USPC **343/866; 343/700 MS**

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(57) **ABSTRACT**

(73) Assignee: **ASKEY COMPUTER CORP.**

A circuit board having antenna structure for use with portable communication devices includes a substrate and an antenna body provided on the substrate. The substrate has a first, a second and a third surface that adjoin one another, and has a ground metallic element mounted thereon parallel to the third surface. The antenna body includes a radiation portion located on the first and second surfaces, a feed-in portion located on the third surface and connected to the radiation portion, and a ground portion located on the third surface and connected to the radiation portion and the ground metallic element. With these arrangements, the antenna structure provided on the circuit board overcomes the problems of limited antenna position and insufficient antenna area without being hindered by other electronic components or structural elements on the circuit board, and is operable at both higher and lower frequency bands.

(21) Appl. No.: **13/611,221**

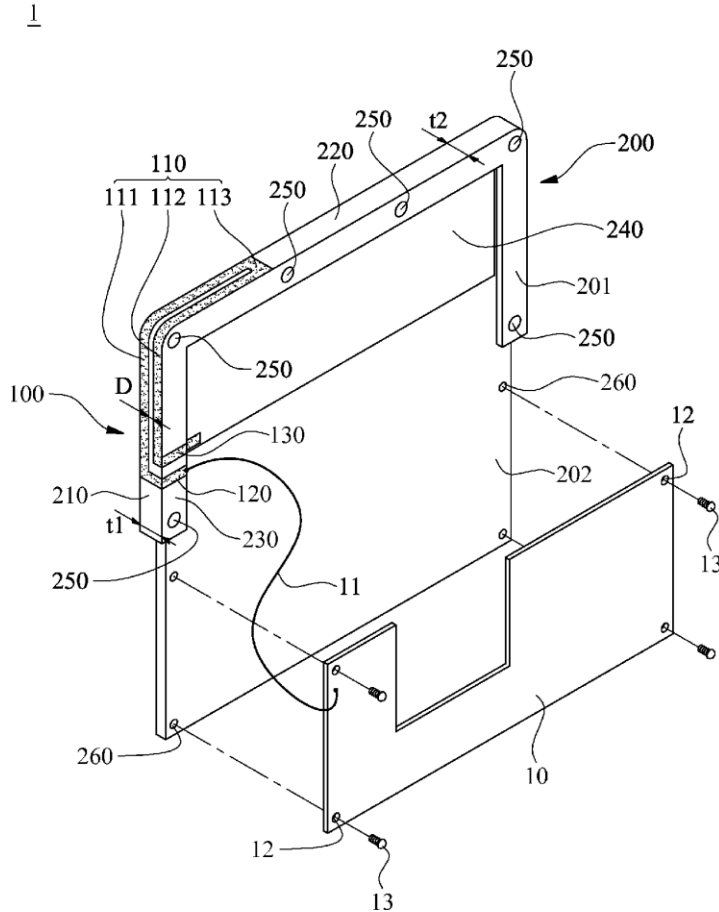
(22) Filed: **Sep. 12, 2012**

(30) **Foreign Application Priority Data**

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Publication Classification

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H01Q 7/00 (2006.01)





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(54) **ANTENNA MODULE**

Publication Classification

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(51) **Int. Cl.**
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(52) **U.S. Cl.**
CPC **H01Q 1/50** (2013.01)
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(73) Assignee: **WISTRON CORP.**, New Taipei City (TW)

(57) **ABSTRACT**

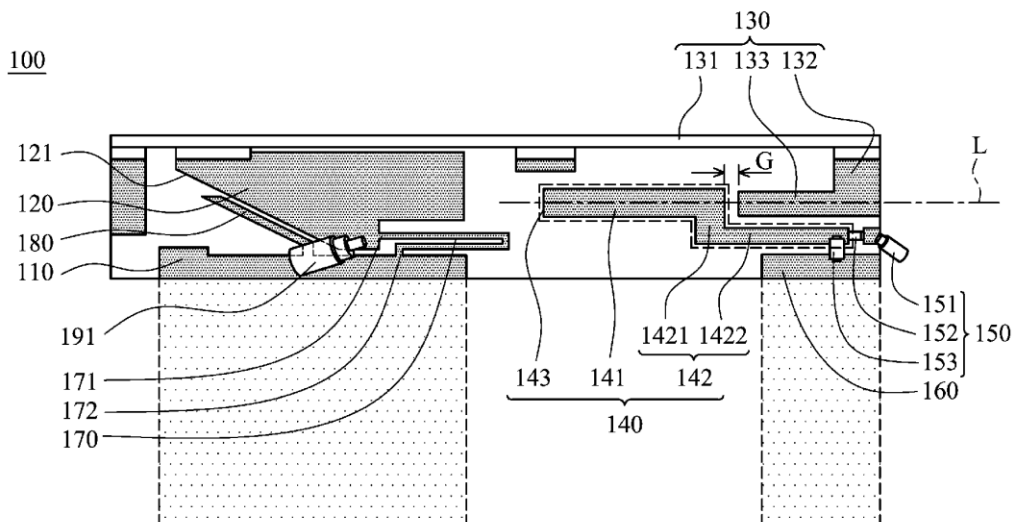
An antenna module is provided. The antenna module includes a first ground element, a body, a radiator and a parasitic element. The body is electrically connected to the first ground element. The radiator is connected to the body, wherein the radiator includes an extending portion, a bending portion and a terminal portion, and the bending portion is connected to the extending portion, and the terminal portion is connected to the bending portion. The parasitic element includes a parasitic extending portion and a parasitic conductive portion, wherein the parasitic extending portion is connected to the parasitic conductive portion, and the terminal portion and the parasitic extending portion is located on a same straight line, and the terminal portion is separated from the parasitic extending portion.

(21) Appl. No.: **13/714,271**

(22) Filed: **Dec. 13, 2012**

(30) **Foreign Application Priority Data**

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(54) **PANEL ANTENNA**

Publication Classification

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(51) **Int. Cl.**
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(52) **U.S. Cl.**
CPC **H01Q 1/38** (2013.01)
USPC **343/905**

(57) **ABSTRACT**

A panel antenna includes a panel portion and a feeder cable. The panel portion includes a first portion and a second portion connected with the first portion to form a L-shape. A first metal sheet is disposed on the first portion. A second metal sheet is disposed on the second portion. The first and second metal sheets connect with each other. The first metal sheet has a feeding point and the second metal sheet has an elongate connecting arm. The overall structure of the first and second metal sheets forms a L-shape. The feeder cable includes an inner conductor electrically connecting with the feeding point and an outer conductor extending along the connecting arm. The outer conductor has an exposed part contacted with the connecting arm.

(21) Appl. No.: **13/919,157**

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

(30) **Foreign Application Priority Data**

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