



US 20130241777A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0241777 A1**

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

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

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

USPC 343/700 MS

(75) Inventors: **CHING-WEI CHANG**, NEW TAIPEI CITY (TW); **YEN-CHAO LI**, TAOYUAN COUNTY (TW); **JIAN-MIN TSAI**, NEW TAIPEI CITY (TW)

(57)

ABSTRACT

The instant disclosure relates to a multi-band antenna structure for accepting a feed signal. The antenna structure includes a grounding portion, a radiating portion, and a tuning portion. The radiating portion is spaced apart from the grounding portion and disposed on one side thereof. The radiating portion has a first and a second radiating segments interconnected perpendicularly. The tuning portion is connected between the first radiating segment and the grounding portion. The tuning portion has a hairpin segment and a grounding segment. The hairpin segment is substantially U-shaped and one end thereof is connected to one end of the first radiating segment proximate to the grounding portion. The opposite ends of the grounding segment are connected to the other end of the hairpin segment and the grounding portion. The connecting location between the first radiating segment and the hairpin segment is used for accepting the feed signal.

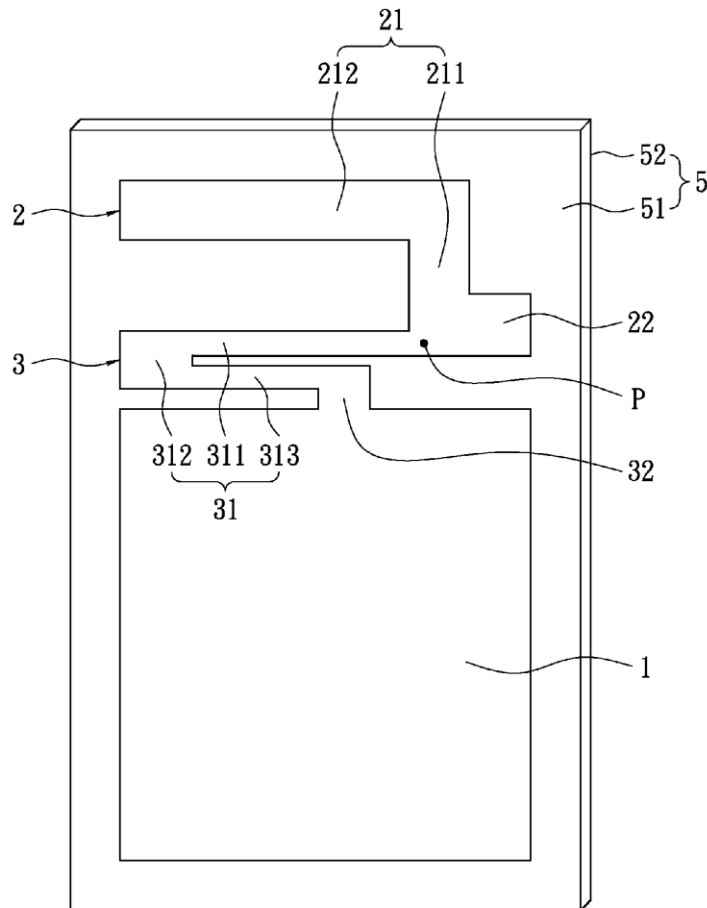
(73) Assignee: **AUDEN TECHNO CORP.**, TAOYUAN COUNTY (TW)

(21) Appl. No.: **13/418,396**

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

Publication Classification

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





US 20130241779A1

(19) **United States**

(12) **Patent Application Publication**
Korva

(10) **Pub. No.: US 2013/0241779 A1**

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

(54) **MULTI-RESONANCE ANTENNA, ANTENNA
MODULE, RADIO DEVICE AND METHODS**

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

CPC *H01Q 9/04* (2013.01)

USPC **343/700 MS**

(75) Inventor: **Heikki Korva**, Tuusula (FI)

(73) Assignee: **Pulse Finland Oy**, Kempele (FI)

(57)

ABSTRACT

(21) Appl. No.: **13/989,404**

(22) PCT Filed: **Jan. 12, 2012**

(86) PCT No.: **PCT/FI2012/050025**

§ 371 (c)(1),

(2), (4) Date: **May 23, 2013**

An internal dual band antenna meant for small radio devices. In one embodiment, the antenna contains two radiators and a parasite element, which is shared between them. The parasite element is implemented on three sides of the antenna module, which are perpendicular to the side where the two radiators are implemented. The short-circuit conductor of the parasite element extends close to the supply point/points of the antenna on the circuit board of the radio device and is connected to the ground plane of the radio device. The antenna structure is dimensioned such that the two resonance frequencies on both functional bands are at a lower frequency than the resonance frequencies of the actual radiators. Accordingly, both the lower and upper frequency band is widened. The shape of the parasite element does not weaken the adaptation of the antenna in either functional band.

(30) **Foreign Application Priority Data**

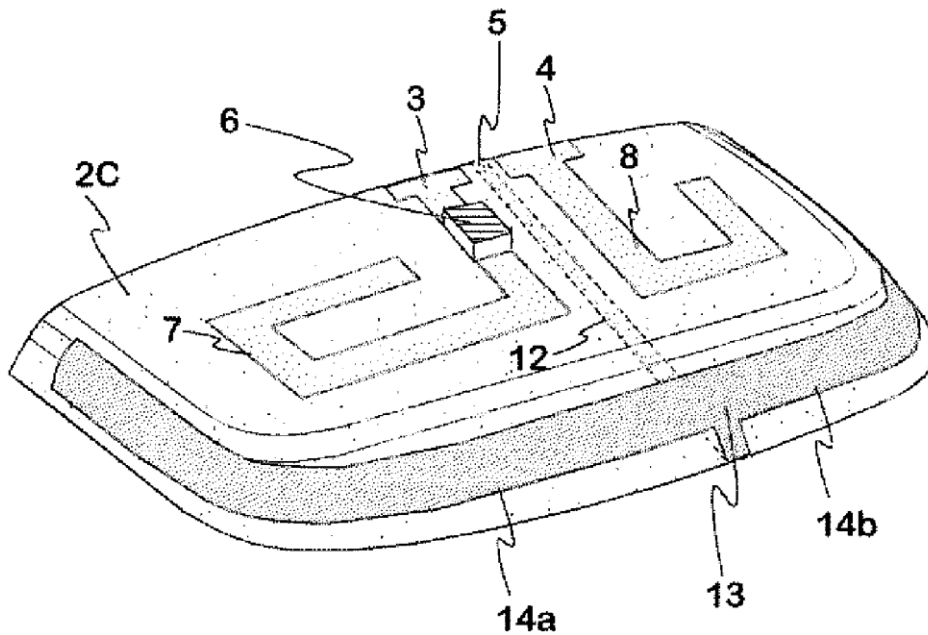
Jan. 25, 2011 (FI) 20115072

Publication Classification

(51) **Int. Cl.**

H01Q 9/04

(2006.01)





US 20130241781A1

(19) **United States**

(12) **Patent Application Publication**
Breiter

(10) **Pub. No.: US 2013/0241781 A1**

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

(54) **ANTENNA APPARATUS AND METHODS**

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

(75) Inventor: **Richard Breiter**, Fredriksberg (DK)

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

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

USPC **343/702; 29/600**

(21) Appl. No.: **13/989,249**

(57) **ABSTRACT**

(22) PCT Filed: **Nov. 25, 2010**

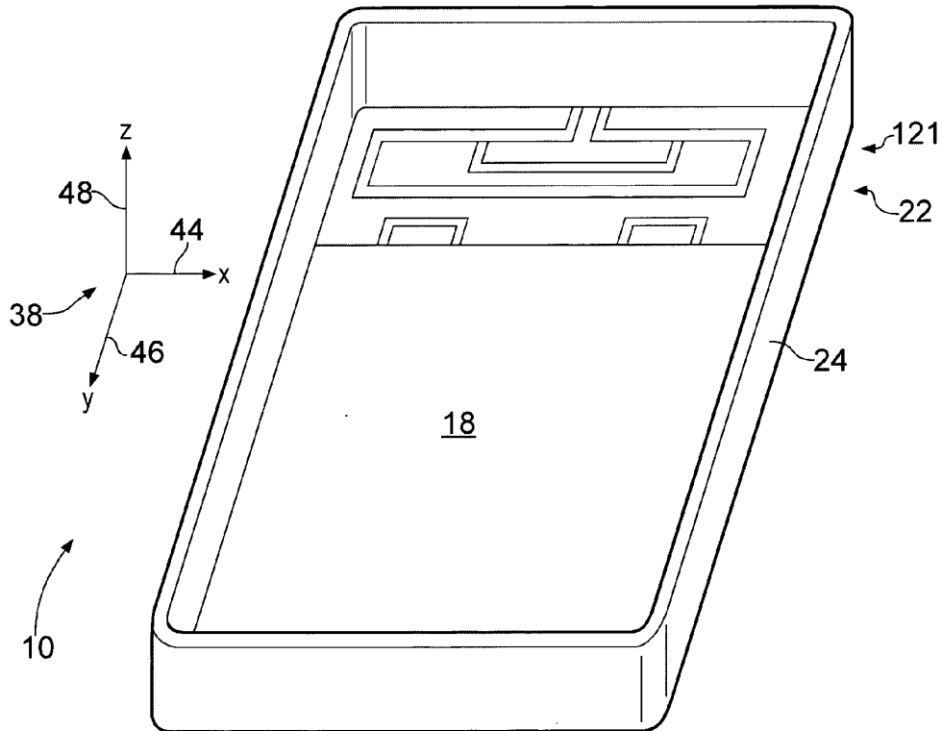
(86) PCT No.: **PCT/IB2010/055433**

§ 371 (c)(1),
(2), (4) Date: **May 23, 2013**

Publication Classification

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

An apparatus comprising: a cover portion defining an exterior surface of the apparatus and including a conductive cover part; a first conductive loop connected to the conductive cover part; and a first coupling member, connectable to radio circuitry and configured to electromagnetically couple with at least one of the first conductive loop and the conductive cover part, wherein at least the conductive cover part and the first conductive loop have a first electrical length and are configured to operate in a first frequency band.





US 20130241784A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0241784 A1**

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

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

(52) **U.S. CL.**
USPC 343/749

(75) Inventors: **Kin-Lu WONG**, Kaohsiung City (TW);
Yi-Ting HSIEH, Kaohsiung City (TW)

(57) **ABSTRACT**

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

(21) Appl. No.: **13/454,988**

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

(30) **Foreign Application Priority Data**

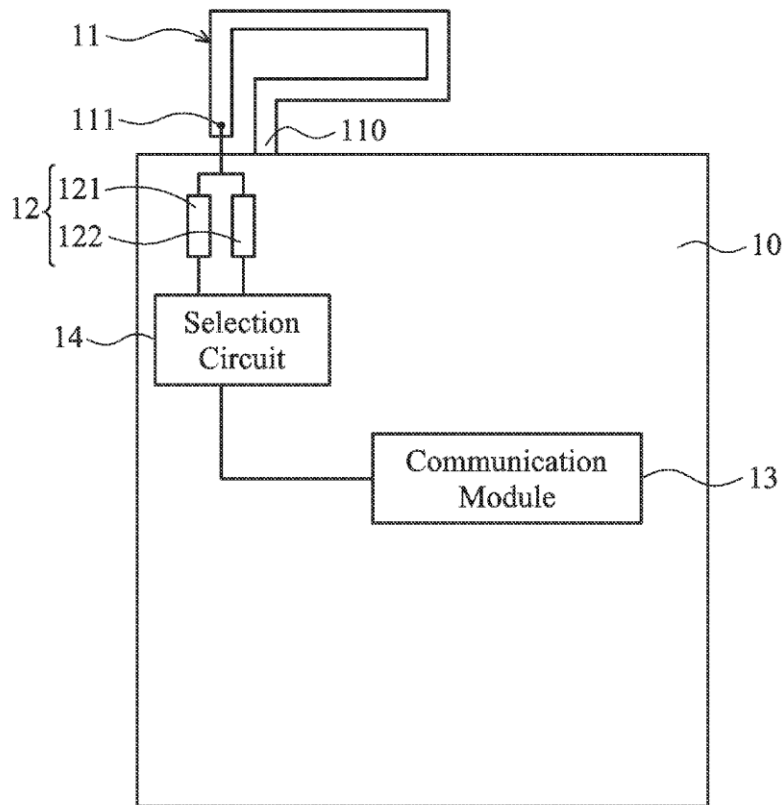
Mar. 14, 2012 (TW) 101108578

Publication Classification

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

A communication device includes a ground element, an antenna element, a circuit element group, and a communication module. The antenna element is a loop antenna. One end of the antenna element is a grounding end coupled to the ground element, and the other end of the antenna element is a feeding end close to the grounding end. The circuit element group includes at least two separate circuit element sub-groups. The communication module is coupled to the circuit element group. One of the circuit element sub-groups of the circuit element group is selectively coupled to the feeding end so as to make the antenna element operate in different communication bands.

100





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(19) **United States**

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

(10) **Pub. No.: US 2013/0241786 A1**

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

(54) **ANTENNA ASSEMBLY**

Publication Classification

(71) Applicant: **FIH (HONG KONG) LIMITED,**
Kowloon (HK)

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

(72) Inventors: **CHENG-HUNG KO,** Shindian (TW);
HAO-YING CHANG, Shindian (TW);
CHIH-YANG TSAI, Shindian (TW)

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

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

(57) **ABSTRACT**

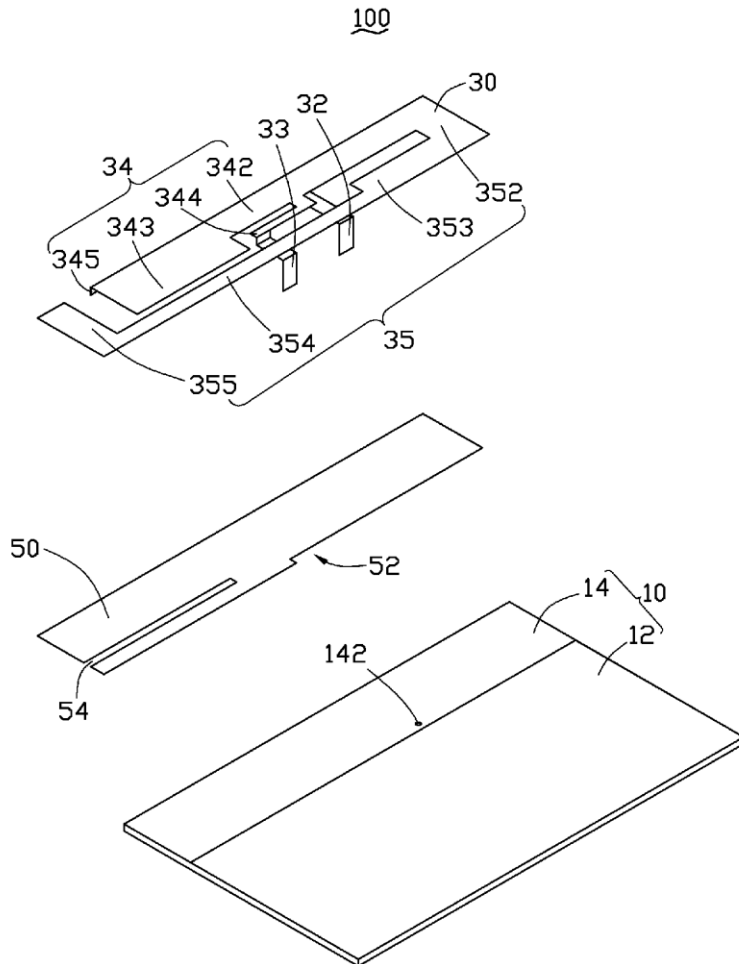
(21) Appl. No.: **13/730,869**

An antenna assembly includes a carrier, a metal sheet, and an antenna. The metal sheet is attached to the carrier and defining at least one notch. The antenna is connected to the metal sheet and includes a radio body for receiving and transmitting wireless signals. The radio body is positioned above the metal sheet. The length of current path in a peripheral wall of the at least one notch is in a predetermined proportion to the wavelength of the wireless signals, enabling the metal sheet to resonate with the radio body to increase the bandwidth of the antenna.

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

(30) **Foreign Application Priority Data**

Mar. 15, 2012 (TW) 101108905





US 20130241792A1

(19) **United States**

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

(10) **Pub. No.:** US 2013/0241792 A1

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

(54) **ANTENNA DEVICE, ELECTRONIC APPARATUS, AND WIRELESS COMMUNICATION METHOD**

Publication Classification

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

(52) **U.S. Cl.**
CPC *H01Q 1/50* (2013.01)
USPC 343/848

(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.: 13/785,963

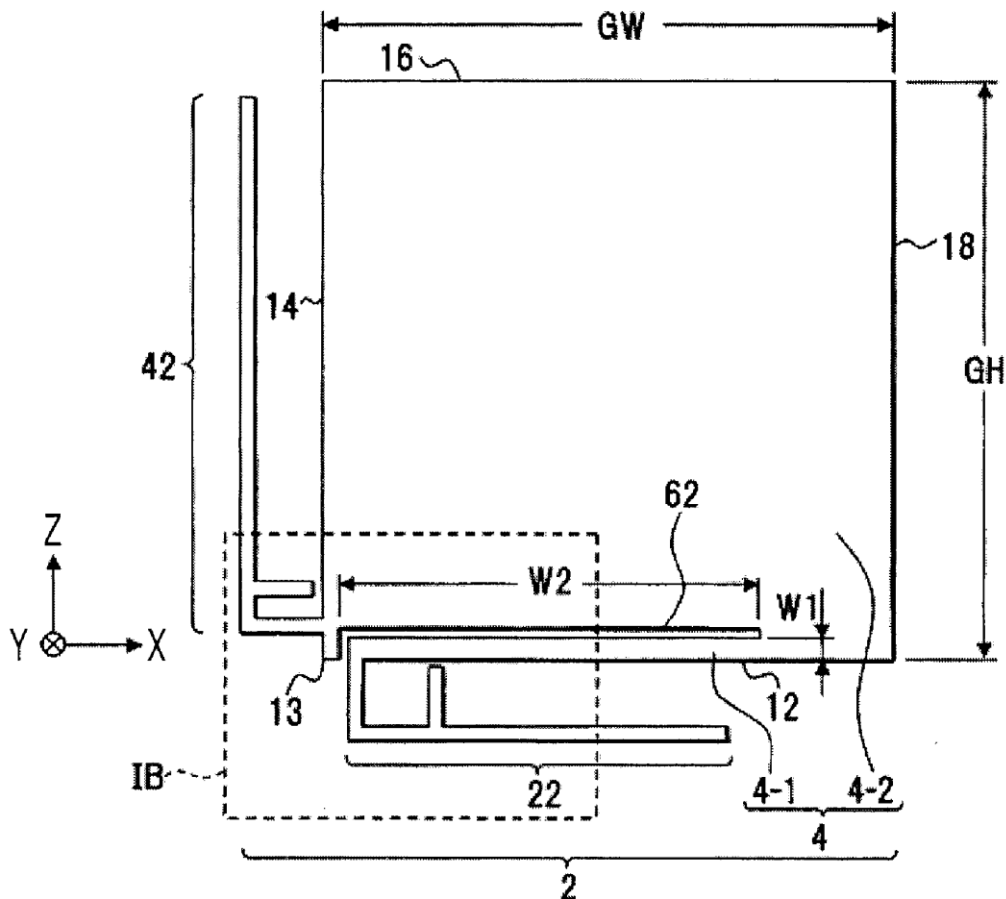
(22) Filed: Mar. 5, 2013

(30) **Foreign Application Priority Data**

Mar. 19, 2012 (JP) 2012-061689

(57) **ABSTRACT**

An antenna device, includes: a ground plate to which first and second antennas, each including a radiating element and a ground terminal, are connected, with one of the first and second antennas being powered, the ground plate including: a first slit extending from a portion where the ground terminal of one antenna of the first and second antennas is connected to the ground plate, in a direction along to the ground terminal, and a second slit extending from the tip of the first slit in a direction along to the radiating element.





US 20130241793A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0241793 A1**

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

(54) **MULTI-INPUT MULTI-OUTPUT ANTENNA SYSTEM**

Publication Classification

(75) Inventors: **Hao Ai**, Shenzhen (CN); **Hui Jiang**, Shenzhen (CN); **Lu Zhang**, Shenzhen (CN)

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

(52) **U.S. Cl.**
CPC . **H01Q 1/523** (2013.01); **H01Q 1/50** (2013.01)
USPC **343/853**; 343/893

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

(57) **ABSTRACT**

The present invention discloses a multi-input multi-output antenna system comprising a first radiation unit, a second radiation unit, a radiation floor, a dielectric plate and a parasitic element. The first radiation unit, the second radiation unit and the parasitic element are printed on an upper surface of the dielectric plate, and the radiation floor is printed on a lower surface of the dielectric plate. The first radiation unit and the second radiation unit are planar monopole antennas, and the parasitic element is positioned between the first radiation unit and the second radiation unit. The system in accordance with the present invention can implement miniaturization of the antennas, and ensure two ports of an antenna have high isolation while maintaining good radiation performance.

(21) Appl. No.: **13/641,759**

(22) PCT Filed: **Apr. 29, 2011**

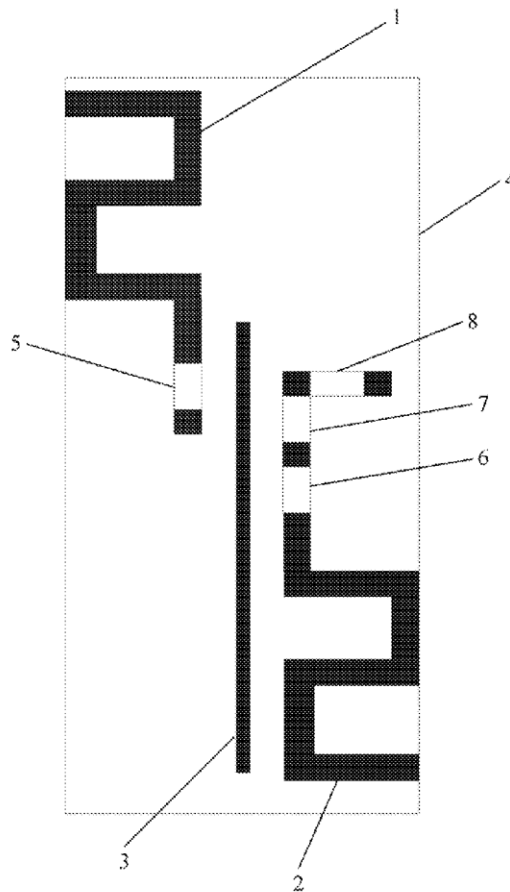
(86) PCT No.: **PCT/CN2011/073565**

§ 371 (c)(1),

(2), (4) Date: **Oct. 17, 2012**

(30) **Foreign Application Priority Data**

Dec. 1, 2010 (CN) 201010569432.6





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(19) **United States**

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

(10) **Pub. No.: US 2013/0241795 A1**

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

(54) **ANTENNA APPARATUS FOR MOBILE TERMINAL**

Publication Classification

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Gyeonggi-do (KR)

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

(72) Inventors: **Sang-Bong SUNG**, Gyeonggi-do (KR);
Hyeon-Uk KANG, Seoul (KR);
Kyoung-Mok KIM, Gyeonggi-do (KR);
Seung-Hwan KIM, Seoul (KR); **Jae-Ho LEE**, Gyeonggi-do (KR)

(52) **U.S. Cl.**
CPC **H01Q 1/50** (2013.01)
USPC **343/861; 343/876**

(57) **ABSTRACT**

A mobile terminal with an antenna apparatus is provided. The mobile terminal in one embodiment includes an antenna radiator disposed at a first end of the mobile terminal; at least one antenna modifying element disposed at a second, opposing end of the mobile terminal; and a coupling unit for fastening the first and second ends and electrically connecting the at least one antenna modifying element with the antenna device when the first and second ends are fastened. In another embodiment, a deformation detector detects at least one deformation of the mobile terminal, an antenna matching unit is electrically connectable to the first antenna radiator; and a controller is coupled to the deformation detector, for controlling an electrical connection between the antenna matching unit and the first antenna radiator when the at least one deformation is detected. The antenna matching unit may include a second antenna radiator.

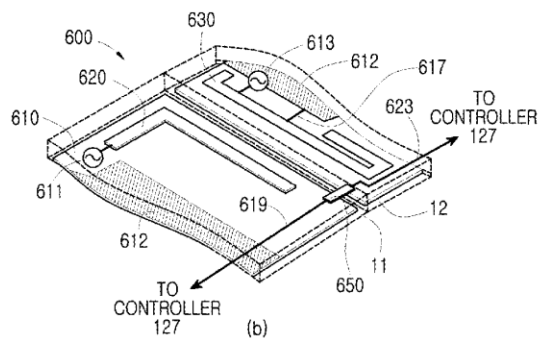
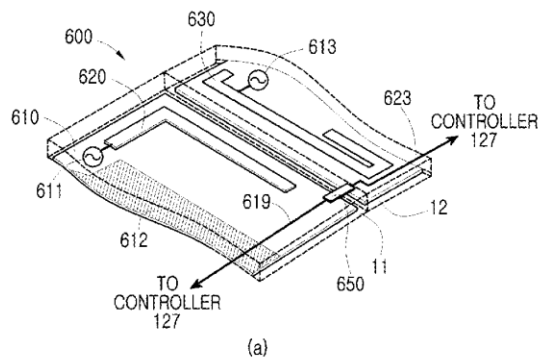
(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**, Gyeonggi-do (KR)

(21) Appl. No.: **13/786,705**

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

(30) **Foreign Application Priority Data**

Mar. 19, 2012 (KR) 10-2012-0027701





US 20130241796A1

(19) **United States**

(12) **Patent Application Publication**
NAGUMO

(10) **Pub. No.: US 2013/0241796 A1**

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

(54) **ANTENNA DEVICE**

Publication Classification

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

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

(72) Inventor: **Shoji NAGUMO**, Kyoto (JP)

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

(73) Assignee: **MURATA MANUFACTURING CO., LTD.**, Kyoto (JP)

(57) **ABSTRACT**

(21) Appl. No.: **13/886,007**

(22) Filed: **May 2, 2013**

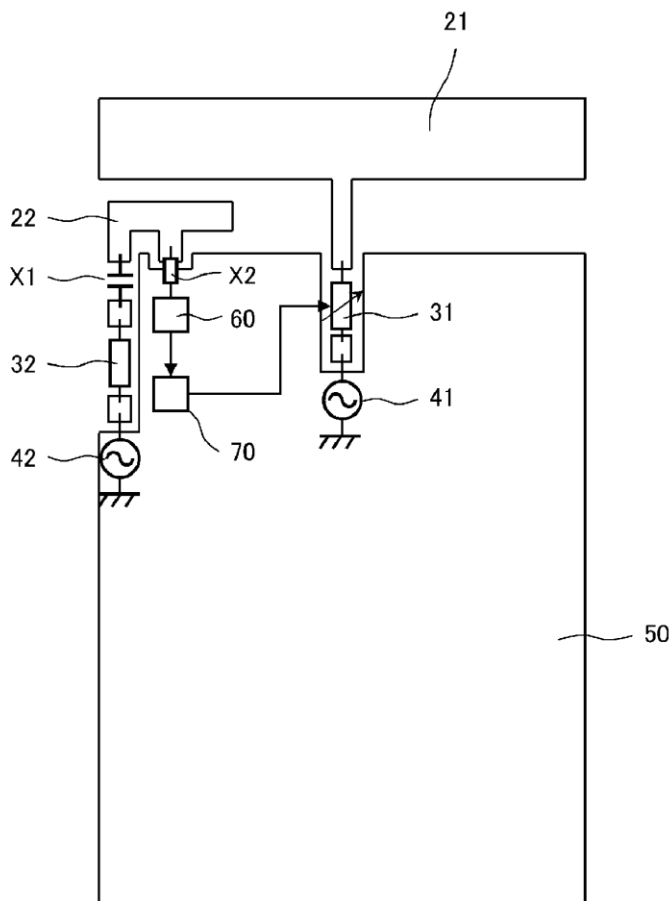
Related U.S. Application Data

(63) Continuation of application No. PCT/JP2011/069684, filed on Aug. 31, 2011.

Foreign Application Priority Data

Nov. 18, 2010 (JP) 2010-257911
Nov. 18, 2010 (JP) 2010-257912

An antenna device can detect the surrounding environment and appropriately corrected and maintain stable antenna characteristics. The antenna device includes at least first and second antenna element electrodes, an antenna matching circuit provided along a wireless communication signal path for the first antenna element electrode, a capacitance detection circuit connected to the second antenna element electrode and operable to detect stray capacitance of the antenna element electrode using a sensing signal. A matching control circuit controls the antenna matching circuit in accordance with an output signal of the capacitance detection circuit.





US 20130241797A1

(19) **United States**

(12) **Patent Application Publication**
Kuo

(10) **Pub. No.: US 2013/0241797 A1**

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

(54) **SWITCHING MULTI-MODE ANTENNA**

(76) Inventor: **Jerry W. Kuo**, San Jose, CA (US)

(21) Appl. No.: **13/421,870**

(22) Filed: **Mar. 16, 2012**

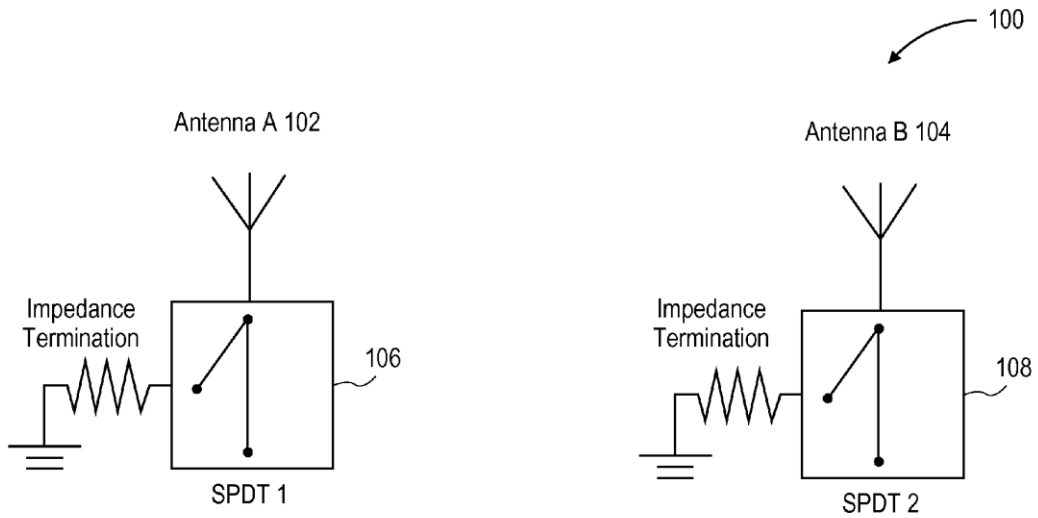
Publication Classification

(51) **Int. Cl.**
H01Q 3/24 (2006.01)

(52) **U.S. Cl.**
USPC **343/876**

(57) **ABSTRACT**

Methods and apparatus of a switching multi-mode antenna of a user device are described. A switching multi-mode antenna is coupled to receive an RF input from one of at least two radio frequency (RF) feeds via a switch. The switching multi-mode antenna includes multiple antenna structures to communicate information in multiple frequency bands. A first antenna structure is configured to transmit first information in one of the frequency bands and a second antenna structure is configured to receive second information in the same one of the frequency bands.





US 20130241798A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0241798 A1**
(43) **Pub. Date: Sep. 19, 2013**

(54) **BUILT-IN ANTENNA FOR ELECTRONIC DEVICE**

Publication Classification

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Gyeonggi-do (KR)

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

(72) Inventors: **Kyung-Jong LEE**, Gyeonggi-do (KR);
Seung-Hwan KIM, Seoul (KR);
Dong-Hwan KIM, Gyeonggi-do (KR);
Austin KIM, Gyeonggi-do (KR);
Young-Sung LEE, Gyeonggi-do (KR);
Jae-Ho LEE, Gyeonggi-do (KR);
Jae-Bong CHUN, Gyeonggi-do (KR)

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

(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**, Gyeonggi-do (KR)

(57) **ABSTRACT**

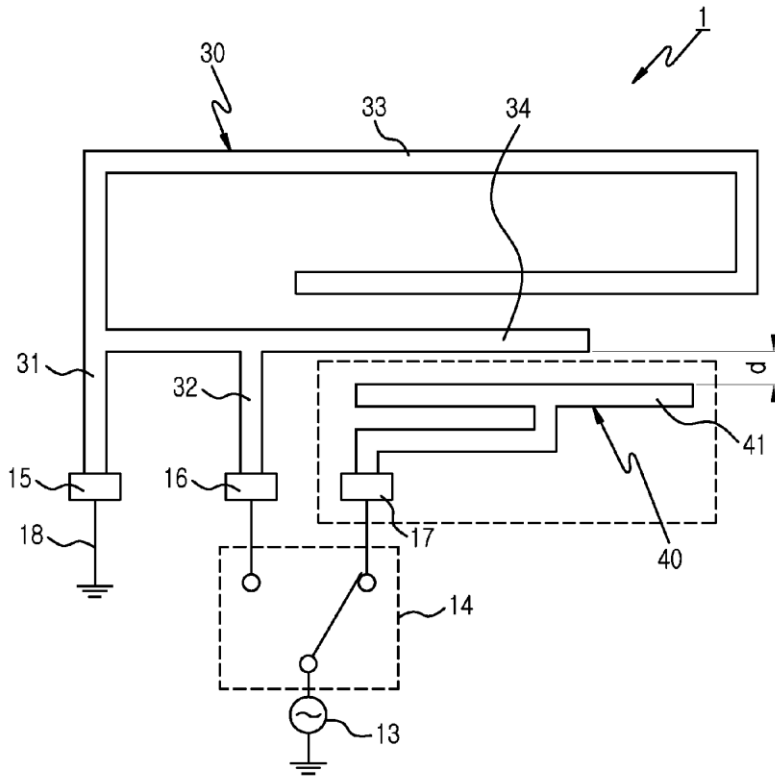
(21) Appl. No.: **13/761,289**

A built-in antenna for an electronic device is provided. The built-in antenna includes a substrate, a 1st antenna radiator with at least two radiating portions, a 2nd antenna radiator, and a switching means. The substrate has a conductive area and a non-conductive area. The 2nd antenna radiator is arranged within the non-conductive area of the substrate and fed by a Radio Frequency (RF) end of the substrate. The 2nd antenna radiator is configured to operate at a band different from at least one operating band of the 1st antenna radiator, and is fed by the RF end in a position adjacent the 1st antenna radiator. The switching means switches to selectively feed the 1st antenna radiator and the 2nd antenna radiator.

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

(30) **Foreign Application Priority Data**

Mar. 19, 2012 (KR) 10-2012-0027681





US 20130241800A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0241800 A1**

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

(54) **ELECTRONIC DEVICE WITH TUNABLE AND FIXED ANTENNAS**

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

USPC 343/893

(76) Inventors: **Robert W. Schlub**, Cupertino, CA (US);
Rodney A. Gomez Angulo, Sunnyvale, CA (US);
Qingxiang Li, Mountain View, CA (US);
Emily B. McMillin, Mountain View, CA (US);
Salih Yarga, Sunnyvale, CA (US);
Yi Jiang, Sunnyvale, CA (US)

(57) **ABSTRACT**

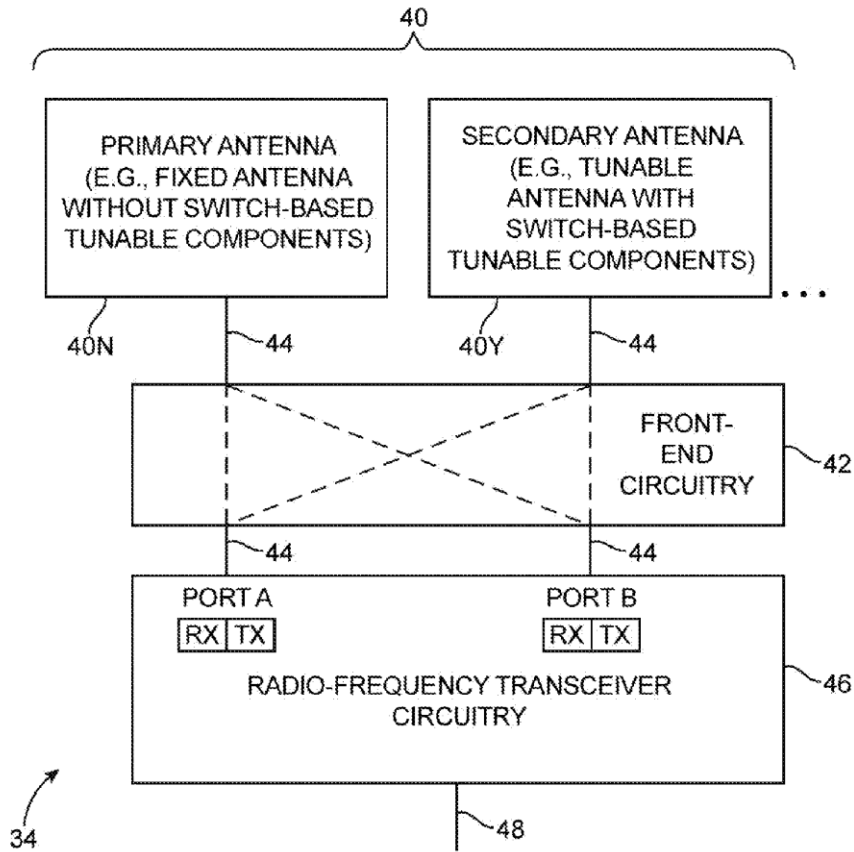
Electronic devices may be provided that contain wireless communications circuitry. The wireless communications circuitry may include radio-frequency transceiver circuitry and antennas. The antennas may include a non-tunable antenna and a tunable antenna. The non-tunable antenna may serve as the primary antenna in the electronic device and the tunable antenna may serve as a secondary antenna in the electronic device. The non-tunable antenna may be configured to operate in at least one communications band. The tunable antenna may contain adjustable circuitry. The adjustable circuitry may be used to tune the tunable antenna to cover the same communications band used by the non-tunable antenna. The tunable antenna may have a resonating element and an antenna ground. The adjustable circuit may be coupled between the resonating element and the antenna ground. The adjustable circuit may include electrical components such as inductors and capacitors and a radio-frequency switch for antenna tuning.

(21) Appl. No.: **13/420,278**

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

Publication Classification

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





US 20130244596A1

(19) **United States**

(12) **Patent Application Publication**
SOEKAWA

(10) **Pub. No.: US 2013/0244596 A1**

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

(54) **DATA COMMUNICATION TERMINAL APPARATUS**

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

(72) Inventor: **Kouji SOEKAWA**, Kawasaki (JP)

(21) Appl. No.: **13/714,536**

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

(30) **Foreign Application Priority Data**

Mar. 16, 2012 (JP) 2012-061263

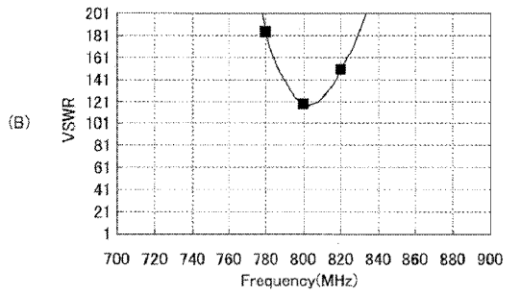
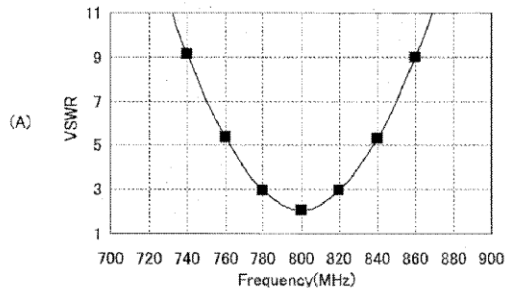
Publication Classification

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

(52) **U.S. Cl.**
CPC **H04B 1/40** (2013.01)
USPC **455/90.2**

(57) **ABSTRACT**

A data communication terminal apparatus is disclosed that includes a printed circuit board, a ground plane formed in the printed circuit board, a connector disposed on an end portion of the printed circuit board, and an antenna configured to have a feeding portion at one end and another end, the other end being connected to the ground plane via a capacitor between the feeding portion and the connector, the antenna forming a loop with the ground plane.





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(19) **United States**

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

(10) **Pub. No.: US 2013/0244739 A1**

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

(54) **ANTENNA ARRANGEMENT AND ANTENNA HOUSING**

Publication Classification

(71) Applicant: **NOKIA CORPORATION**, Espoo (FI)

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

(72) Inventors: **Aimo Arkko**, Ruutana (FI); **Jani Ollikainen**, Hilsinki (FI)

(52) **U.S. Cl.**
CPC **H04M 1/026** (2013.01)
USPC **455/575.7**

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

(21) Appl. No.: **13/871,565**

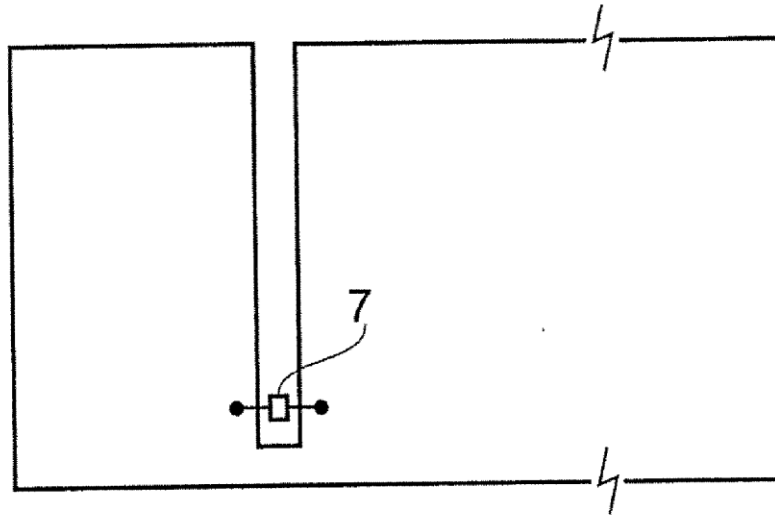
(57) **ABSTRACT**

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

Related U.S. Application Data

(63) Continuation of application No. 12/595,056, filed on Nov. 12, 2009, now Pat. No. 8,432,321.

An antenna arrangement including an antenna occupying at least a first plane; a conductive structure that is isolated from the antenna but is arranged to be parasitically fed by the antenna, the conductive structure having a slot and occupying at least a second plane different to but adjacent the first plane.





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(19) **United States**

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

(10) **Pub. No.: US 2013/0249738 A1**

(43) **Pub. Date: Sep. 26, 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: **Cheng Uei Precision Industry Co., LTD.**, New Taipei City (TW)

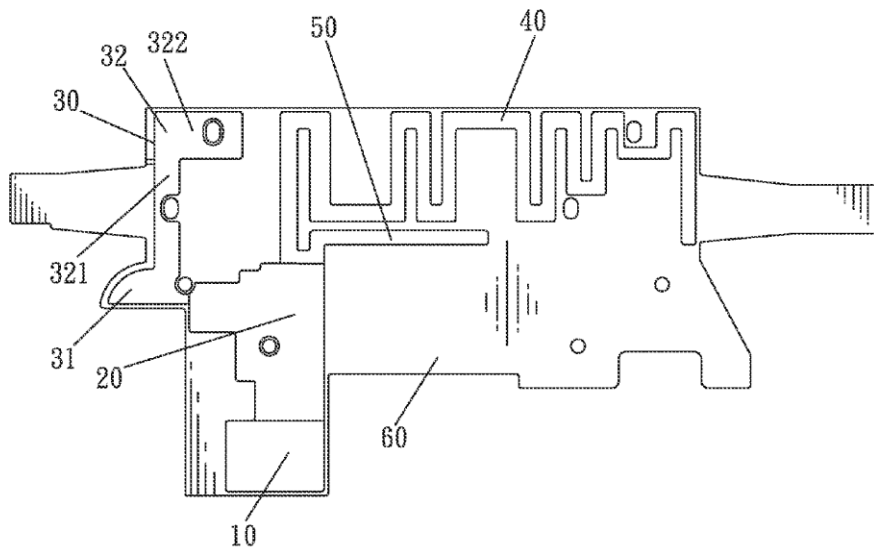
A multi-band antenna disposed on a circuit board includes a feeding portion located on a left side of the circuit board and adjacent to a front edge of the circuit board. A base slice is located on the left side of the circuit board and connected with a rear end of the feeding portion. A high frequency radiating portion is located on the left side of the circuit board and connected with a left end of the base slice. A low frequency radiating portion is connected with a rear end of the base slice and zigzag meanders opposite to the high frequency radiating portion. A mid-frequency radiating portion is connected with the rear end of the base slice and then straightly extends towards a right edge of the circuit board.

(21) Appl. No.: **13/429,372**

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

Publication Classification

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





US 20130249739A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0249739 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **APPARATUS FOR CONTROLLING
ELECTRIC FIELD DISTRIBUTION BY
UTILIZING SHORT TRACE STRUCTURES**

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

(76) Inventors: **Shih-Wei Hsieh**, Taipei City (TW);
Han-Chang Lin, Kaohsiung City (TW);
Cho-Yi Lin, New Taipei City (TW)

(57) **ABSTRACT**

An apparatus for controlling electric field distribution is provided, where the apparatus includes at least one portion of a portable electronic device, the portable electronic device includes a plurality of wireless communication functions respectively corresponding to different communication standards, and the plurality of wireless communication functions includes a mobile phone function and at least one other wireless communication function. The apparatus includes: a main antenna, connected to a first side of a PCB of the portable electronic device, for performing the mobile phone function; and a plurality of short trace structures, positioned at the first side of the PCB and connected to the PCB, wherein at least one of the plurality of short trace structures is selectively utilized as at least one short trace or utilized as at least one secondary antenna corresponding to the at least one other wireless communication function.

(21) Appl. No.: **13/555,208**

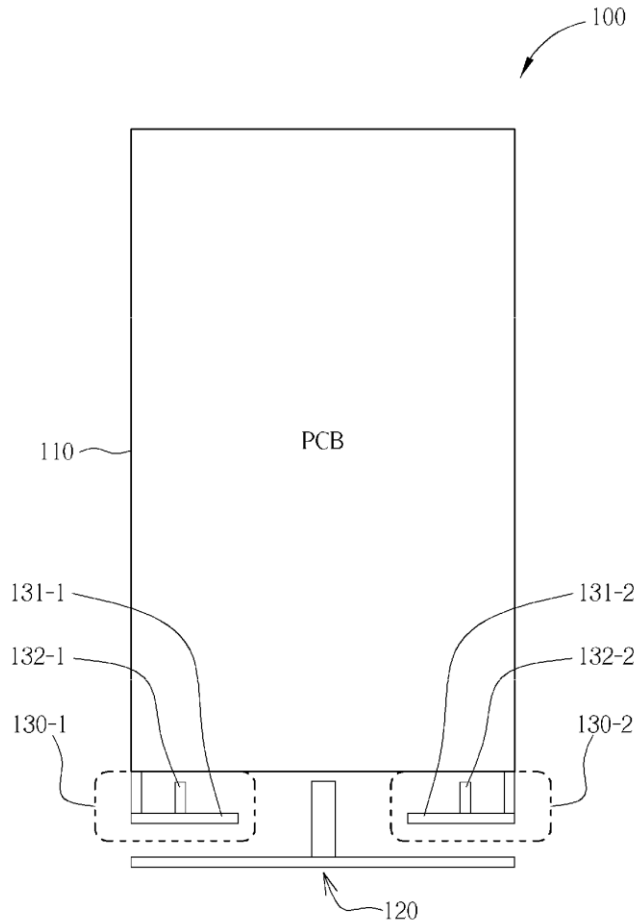
(22) Filed: **Jul. 23, 2012**

(30) **Foreign Application Priority Data**

Mar. 20, 2012 (TW) 101109458

Publication Classification

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





US 20130249741A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0249741 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **ANTENNA AND TERMINAL WITH ANENNA**

Publication Classification

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

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

(72) Inventors: **Hongyan Chen**, Beijing (CN); **Yafang Yu**, Beijing (CN); **Shuhui Sun**, Shenzhen (CN)

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

(73) Assignee: **Huawei Device Co., Ltd.**, Shenzhen (CN)

(57) **ABSTRACT**

(21) Appl. No.: **13/899,805**

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

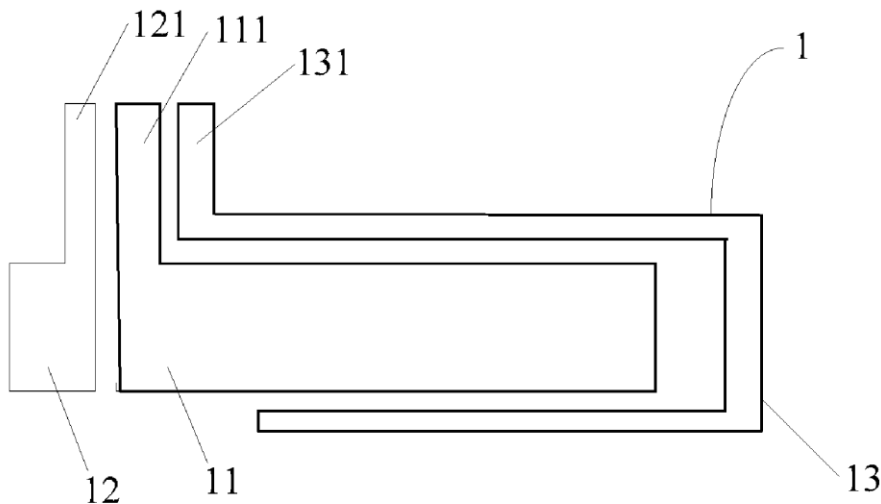
An antenna and a terminal with an antenna are disclosed. The antenna is a strip planar antenna, which includes an intermediate frequency branch, a high frequency branch and a low frequency branch, where the intermediate frequency branch, the high frequency branch and the low frequency branch are independent of one another, the high frequency branch and the low frequency branch encircle the intermediate frequency branch; a feed point connecting line is disposed on the intermediate frequency branch; a first ground point connecting line is disposed on the high frequency branch; a second ground point connecting line is disposed on the low frequency branch, and the feed point connecting line, the first ground point connecting line and the second ground point connecting line are located at the same side of the antenna.

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2011/081703, filed on Nov. 3, 2011.

Foreign Application Priority Data

(30) Nov. 22, 2010 (CN) 201010555656.1





US 20130249742A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0249742 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **ANTENNA DEVICE**

(57)

ABSTRACT

(75) Inventors: **Shinsuke Yukimoto**, Chichibu-gun (JP);
Ryo Sato, Chichibu-gun (JP)

(73) Assignee: **MITSUBISHI MATERIALS CORPORATION**, TOKYO (JP)

(21) Appl. No.: **13/989,734**

(22) PCT Filed: **Nov. 21, 2011**

(86) PCT No.: **PCT/JP2011/006467**

§ 371 (c)(1),

(2), (4) Date: **May 24, 2013**

(30) **Foreign Application Priority Data**

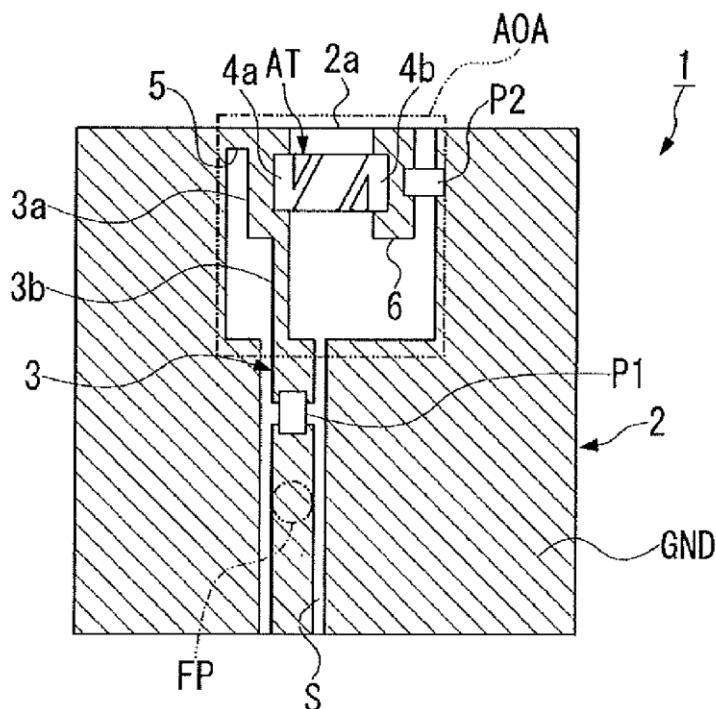
Nov. 30, 2010 (JP) 2010-267804

Publication Classification

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

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

Provided is an antenna device that is capable of ensuring sufficient antenna performance by maximally utilizing a limited antenna occupied area. The antenna device is provided with a substrate main body (2); a ground plane (GND) that is formed on the substrate main body; an antenna-occupied area (AOA) that is provided in contact with one side (2a) of the substrate main body; a slit section (S) that is bored in the ground plane so as to extend from this area in the direction opposite to the one side (2a) of the substrate main body; a power feeding pattern (3) that is formed so as to extend into the slit section, provided with a power feeding point at the base end side, and connected with a first passive element (P1) halfway while the tip end side extends into the antenna-occupied area toward the one side of the substrate main body; an antenna element (AT) of a dielectric antenna that is connected to the tip end of the power feeding pattern and positioned along the one side of the substrate main body; a second passive element (P2) that is connected between the antenna element (AT) and the adjoining ground plane; and a ground connection pattern (5) for connecting the tip end of the power feeding pattern with the ground plane.





US 20130249753A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0249753 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **SMALL ANTENNA APPARATUS OPERABLE IN MULTIPLE BANDS INCLUDING LOW-BAND FREQUENCY AND HIGH-BAND FREQUENCY WITH ULTRA WIDE BANDWIDTH**

(52) **U.S. Cl.**
CPC *H01Q 5/0024* (2013.01)
USPC **343/749**

(76) Inventors: **Kenichi Asanuma**, Kyoto (JP); **Atsushi Yamamoto**, Kyoto (JP); **Tsutomu Sakata**, Osaka (JP)

(57) **ABSTRACT**

(21) Appl. No.: **13/989,460**

A radiator includes a looped radiation conductor, a capacitor, an inductor, and a feed point on a radiation conductor. In a portion where the radiation conductor and a ground conductor are close to each other, a distance between the radiation conductor and the ground conductor gradually increases as a distance from the feed point along the looped radiation conductor increases. When the radiator is excited at a low-band resonance frequency, a current flows along a first path extending along an inner perimeter of the looped radiation conductor and including the inductor and the capacitor. When the radiator is excited at a high-band resonance frequency, a second current flows through a second path including a section extending along an outer perimeter of the looped radiation conductor, and the section including the capacitor but not including the inductor, and the section extending between the feed point and the inductor.

(22) PCT Filed: **Aug. 31, 2012**

(86) PCT No.: **PCT/JP2012/005538**

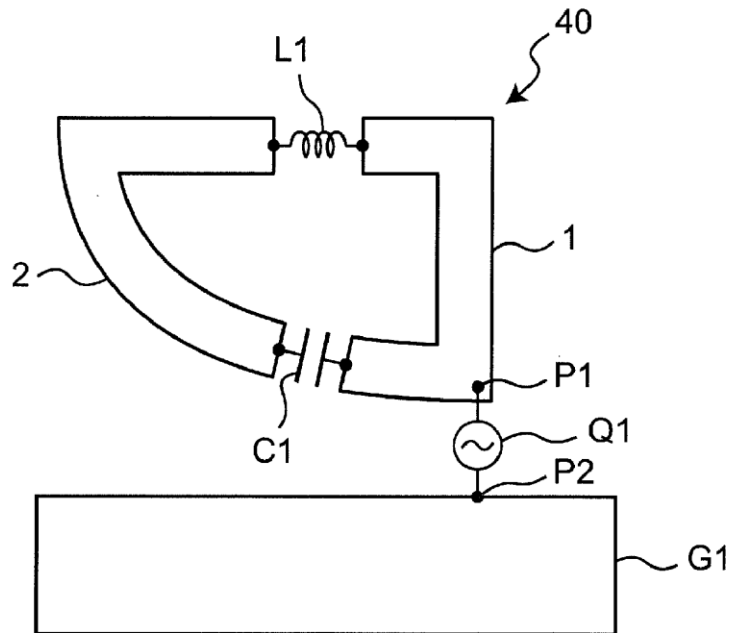
§ 371 (c)(1),
(2), (4) Date: **May 24, 2013**

(30) **Foreign Application Priority Data**

Oct. 27, 2011 (JP) 2011-235902

Publication Classification

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





US 20130249763A1

(19) **United States**

(12) **Patent Application Publication**
HSU

(10) **Pub. No.: US 2013/0249763 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **COMMUNICATION ANTENNA FOR THIN-FILM MOBILE DEVICE**

(52) **U.S. Cl.**
USPC **343/842; 29/600**

(76) Inventor: **SEN-KUNG HSU**, New Taipei City (TW)

(57) **ABSTRACT**

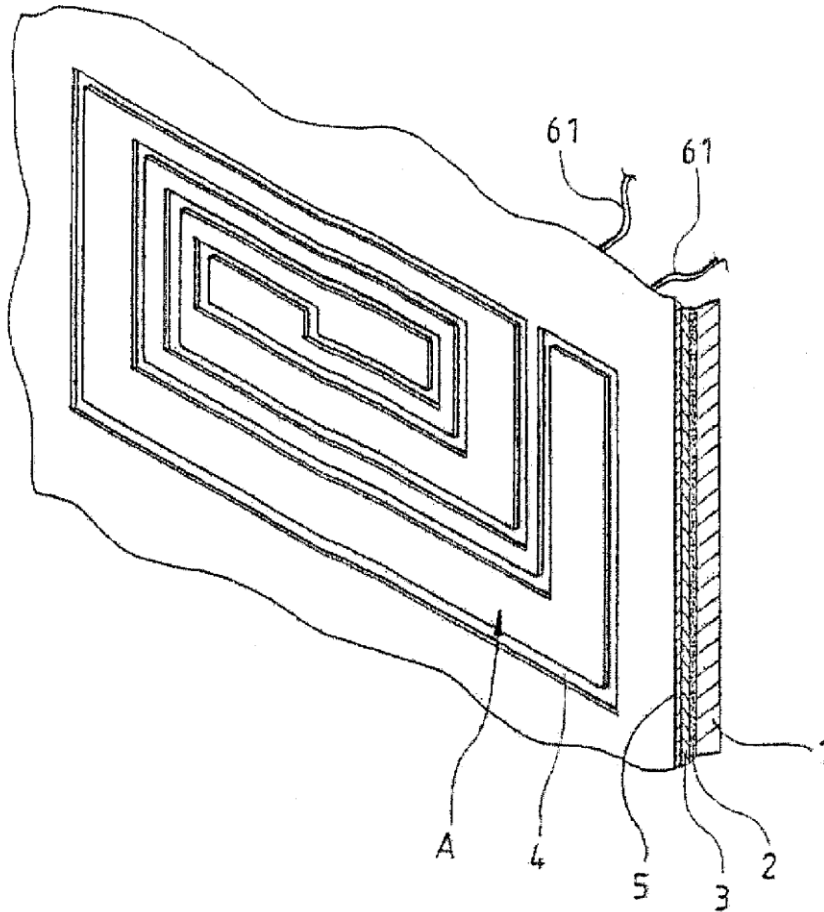
A communication antenna for a thin-film mobile device particularly relates to an antenna arranged on a cover of the mobile device and having an enhanced effect on transmission or reception of signals. The communication antenna connected to a transceiver circuit of the mobile device includes a plastic substrate, a metal layer joining an interface layer coated on the plastic substrate, wherein the metal layer is engraved with a separating loop that may have various shapes and areas such that the separating loop encloses an antenna that may have various shapes and areas, and an insulating protective layer coated on the engraved metal layer so as to cover the metal layer and the separating loop. Thereby, the mobile device has an enhanced effect on transmission or reception of signals and provides prevention of electromagnetic interference (EMI).

(21) Appl. No.: **13/429,445**

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

Publication Classification

(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01P 11/00 (2006.01)





US 20130249764A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0249764 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **COMPACT PLANAR INVERTED F-ANTENNA FOR MULTIBAND COMMUNICATION**

(52) **U.S. CL.**

USPC 343/845; 343/700 MS

(75) Inventors: **Rony E. Amaya**, Kanata (CA); **Yazi Cao**, Ottawa (CA)

(57)

ABSTRACT

(73) Assignee: **Her Majesty the Queen in Right of Canada, as represented by the Minister of Industry**, Ottawa (CA)

A multi-band antenna for sending/receiving wireless communication signals in a plurality of frequency bands. The multi-band antenna has a feed element for sending/receiving signals associated with the wireless communication signals. A stepped-impedance structure is connected to the feed element. The stepped-impedance structure has a plurality of concatenated stepped-impedance elements with each stepped-impedance element having a predetermined impedance and a predetermined electrical length associated with a resonance mode for sending/receiving wireless communication signals in a respective frequency band of the plurality of frequency bands.

(21) Appl. No.: **13/428,675**

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

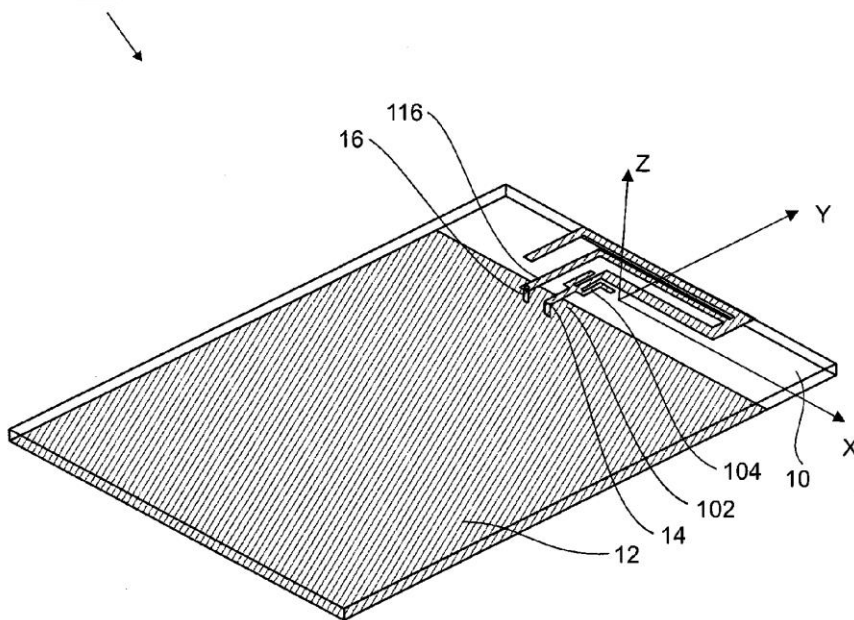
Publication Classification

(51) **Int. Cl.**

H01Q 9/04 (2006.01)

H01Q 1/48 (2006.01)

100





US 20130249765A1

(19) **United States**

(12) **Patent Application Publication**
Su

(10) **Pub. No.: US 2013/0249765 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **WIDEBAND ANTENNA AND RELATED RADIO-FREQUENCY DEVICE**

Publication Classification

(76) Inventor: **Chi-Kang Su, Hsinchu (TW)**

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

(52) **U.S. Cl.**
USPC **343/850**

(21) Appl. No.: **13/585,841**

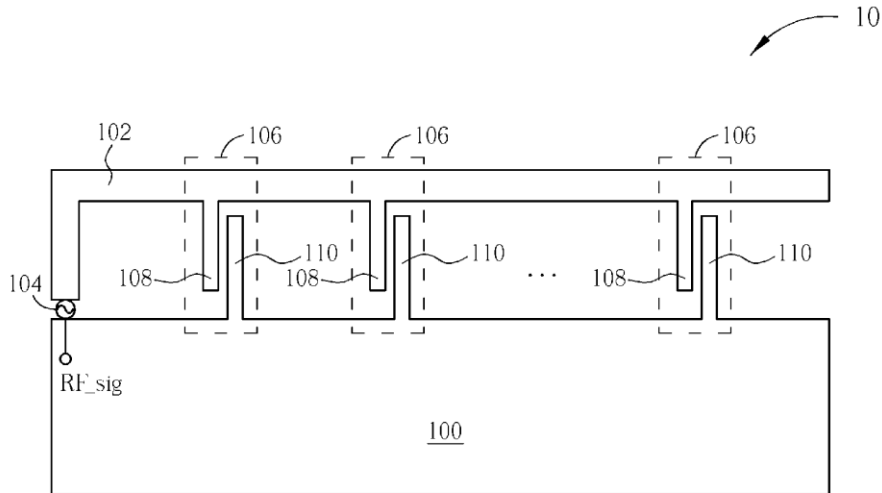
(57) **ABSTRACT**

(22) Filed: **Aug. 15, 2012**

A wideband antenna is disclosed. The wideband antenna includes a ground element electrically connected to a ground, a feed element for feeding in a Radio-Frequency signal, a radiation element electrically connected to the feed element for radiating the Radio-Frequency signal, and at least one meta-material structure electrically connected between the radiation element and the ground element.

(30) **Foreign Application Priority Data**

Mar. 22, 2012 (TW) 101109847





US 20130249767A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0249767 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **FREQUENCY STABILIZATION CIRCUIT,
ANTENNA DEVICE, AND COMMUNICATION
TERMINAL APPARATUS**

Publication Classification

(71) Applicant: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)

(51) **Int. Cl.**
H03H 7/38 (2006.01)
H01Q 21/00 (2006.01)

(72) Inventors: **Kenichi ISHIZUKA**, Nagaokakyo-shi
(JP); **Noboru KATO**, Nagaokakyo-shi
(JP)

(52) **U.S. Cl.**
CPC **H03H 7/38** (2013.01); **H01Q 21/0006**
(2013.01)
USPC **343/852**; 333/124

(73) Assignee: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)

(57) **ABSTRACT**

(21) Appl. No.: **13/904,124**

A frequency stabilization circuit includes a primary side circuit connected to a feeder circuit, and a secondary side circuit electromagnetically coupled to the primary side circuit. The primary side circuit is a series circuit including a first coiled conductor and a second coiled conductor, and the secondary side circuit is a series circuit including a third coiled conductor and a fourth coiled conductor. An antenna element is connected through a high pass filter to a first antenna connection portion set as a connection point of the first coiled conductor and the second coiled conductor. Additionally, the antenna element is connected through a low pass filter to a second antenna connection portion set as a connection point between the second coiled conductor and the fourth coiled conductor.

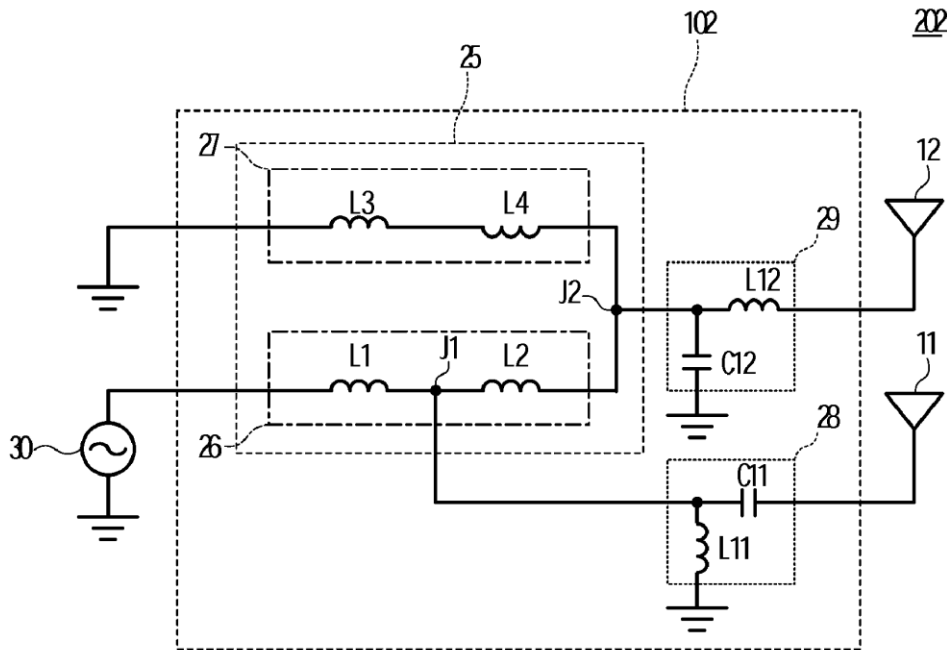
(22) Filed: **May 29, 2013**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2012/050767,
filed on Jan. 17, 2012.

Foreign Application Priority Data

(30) Jan. 20, 2011 (JP) 2011-010120





US 20130249768A1

(19) **United States**

(12) **Patent Application Publication**
Anguera Pros et al.

(10) **Pub. No.: US 2013/0249768 A1**

(43) **Pub. Date: Sep. 26, 2013**

(54) **MULTI-BAND MONOPOLE ANTENNAS FOR MOBILE COMMUNICATIONS DEVICES**

Publication Classification

(71) Applicant: **Fractus, S.A.**, Sant Cugat del Valles (ES)

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

(72) Inventors: **Jaume Anguera Pros**, Vinaros (ES);
Carles Puente Baliarda, Sant Cugat del Valles (ES)

(52) **U.S. Cl.**
CPC **H01Q 5/0027** (2013.01)
USPC **343/872**

(21) Appl. No.: **13/874,914**

(57) **ABSTRACT**

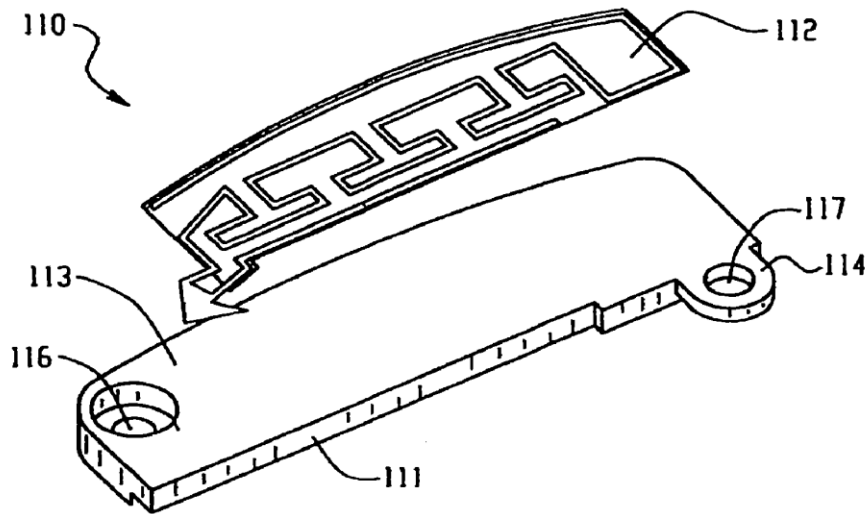
(22) Filed: **May 1, 2013**

Antennas for use in mobile communication devices are disclosed. The antennas disclosed can include a substrate with a base, a top, a front side and a back side; a first conductor can be located on the first side of the antenna substrate; and a second conductor can be located on the second side of the antenna substrate. The conductors can have single or multiple branches. If a conductor is a single branch it can, for example, be a spiral conductor or a conducting plate. If a conductor has multiple branches, each branch can be set up to receive a different frequency band. A conductor with multiple branches can have a linear branch and a space-filling or grid dimension branch. A conducting plate can act as a parasitic reflector plane to tune or partially tune the resonant frequency of another conductor. The first and second conductors can be electrically connected.

Related U.S. Application Data

(63) Continuation of application No. 12/228,487, filed on Aug. 13, 2008, now Pat. No. 8,456,365, which is a continuation of application No. 10/584,442, filed on Jul. 18, 2006, now Pat. No. 7,423,592, filed as application No. PCT/EP2005/000880 on Jan. 28, 2005.

(60) Provisional application No. 60/540,450, filed on Jan. 30, 2004.





US 20130257659A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257659 A1**

(43) **Pub. Date: Oct. 3, 2013**

(54) **ANTENNA HAVING FLEXIBLE FEED STRUCTURE WITH COMPONENTS**

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

(76) Inventors: **Dean F. Darnell**, San Jose, CA (US);
William J. Noellert, Sunnyvale, CA (US);
Mattia Pascolini, Campbell, CA (US)

(57) **ABSTRACT**

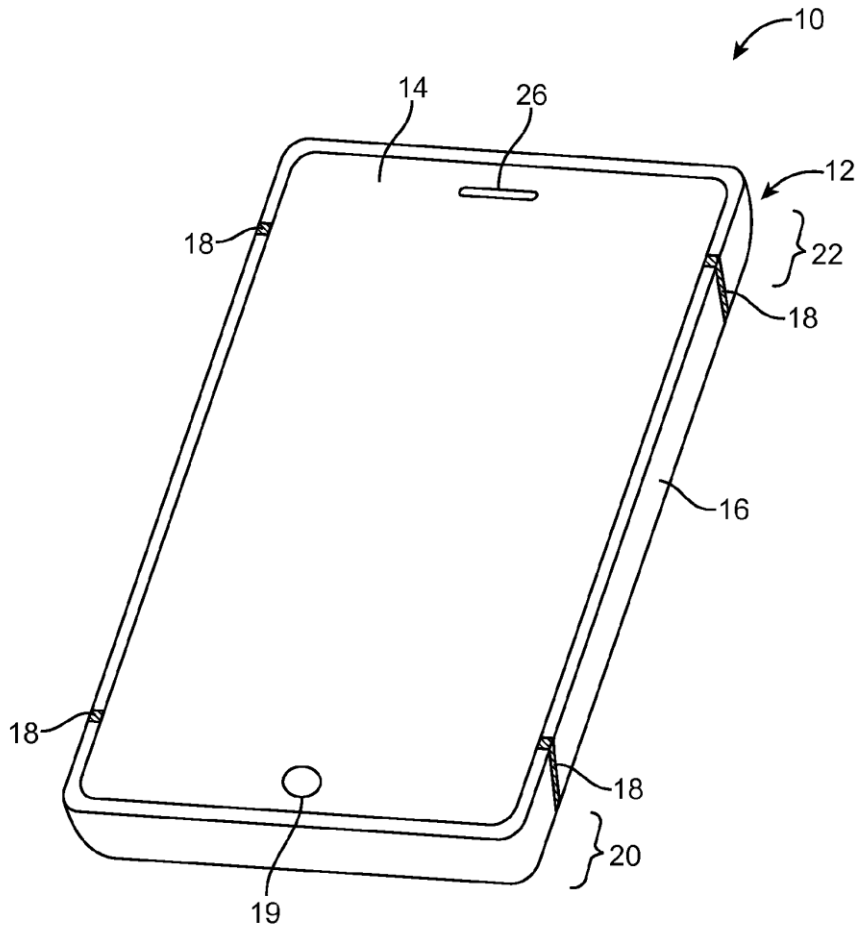
Electronic devices may include antenna structures. The antenna structures may form an antenna having first and second feeds at different locations. Transceiver circuitry for transmitting and receiving radio-frequency antenna signals may be mounted on one end of a printed circuit board. Transmission line structures may be used to convey signals between an opposing end of the printed circuit board and the transceiver circuitry. The printed circuit board may be coupled to an antenna feed structure formed from a flexible printed circuit using solder connections. The flexible printed circuit may have a bend and may be screwed to conductive electronic device housing structures using one or more screws at one or more respective antenna feed terminals. Electrical components such as an amplifier circuit and filter circuitry may be mounted on the flexible printed circuit.

(21) Appl. No.: 13/435,351

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

Publication Classification

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





US 20130257660A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257660 A1**

(43) **Pub. Date: Oct. 3, 2013**

(54) **COMMUNICATION DEVICE WITH CONDUCTIVE HOUSING AND ANTENNA ELEMENT THEREIN**

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

(75) Inventors: **Kin-Lu WONG**, Kaohsiung City (TW);
Li-Yu CHEN, Kaohsiung City (TW)

(57) **ABSTRACT**

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

A communication device with an upper cover and a lower cover including a conductive housing and an antenna element is provided. The conductive housing includes a first conductive surface and a second conductive surface. The first conductive surface is disposed on a surface of the upper cover. The second conductive surface is disposed on a surface of the lower cover. The first conductive surface and the second conductive surface are electrically coupled to each other, and a first edge of the first conductive surface is adjacent to a second edge of the second conductive surface. The antenna element is substantially disposed between the first edge and the second edge, and is excited to form a first band and a second band. The antenna element includes a ground element, a first radiating element, and a second radiating element.

(21) Appl. No.: **13/535,229**

(22) Filed: **Jun. 27, 2012**

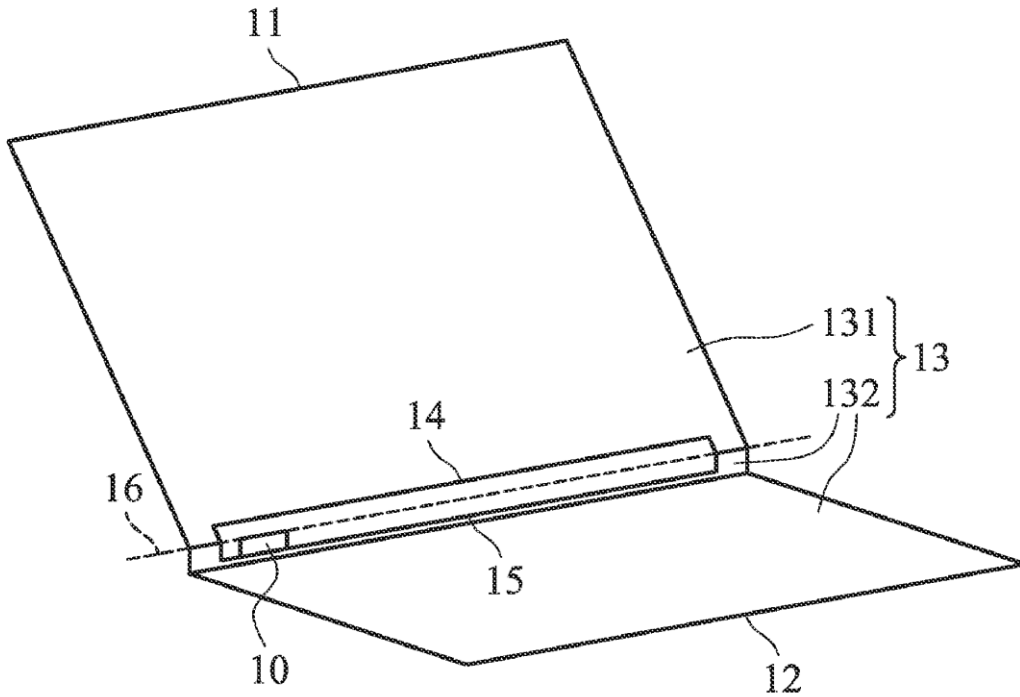
(30) **Foreign Application Priority Data**

Apr. 2, 2012 (TW) 101111636

Publication Classification

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

100





US 20130257661A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257661 A1**

(43) **Pub. Date: Oct. 3, 2013**

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

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

(71) Applicants: **Tomokazu Yuasa**, Akishima-shi (JP);
Hiroyuki Hotta, Ome-shi (JP)

(57) **ABSTRACT**

(72) Inventors: **Tomokazu Yuasa**, Akishima-shi (JP);
Hiroyuki Hotta, Ome-shi (JP)

According to one embodiment, an antenna apparatus includes an antenna element and a parasitic element. The antenna element includes an element main body whose first end portion is connected to a feed point and second end portion as the other end portion is open, with the element main body being configured to be selectable between a first state in which the element main body is retracted into a housing of the electronic device and a second state in which the element main body extends from the housing. The parasitic element is disposed such that when the antenna element is in the first state, the first end portion is connected to the element main body of the antenna element and the second end portion is connected to a ground portion.

(21) Appl. No.: **13/719,653**

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

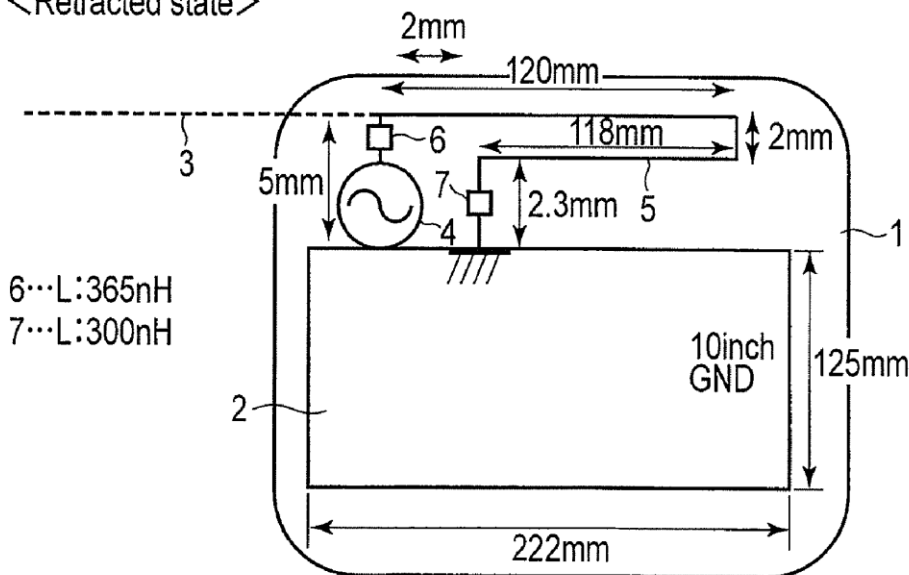
(30) **Foreign Application Priority Data**

Mar. 30, 2012 (JP) 2012-079795

Publication Classification

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

<Retracted state>





US 20130257665A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257665 A1**

(43) **Pub. Date: Oct. 3, 2013**

(54) **ANTENNA STRUCTURE**

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

USPC 343/742; 343/741

(75) Inventors: **CHING-WEI CHANG**, NEW TAIPEI CITY (TW); **YEN-CHAO LI**, TAOYUAN COUNTY (TW); **JIAN-MIN TSAI**, NEW TAIPEI CITY (TW)

(57) **ABSTRACT**

An antenna structure, used for being fed with a signal, includes a grounding portion, a radiation portion, and a frequency adjusting portion. The radiation portion has a loop segment, a high frequency segment, and a low frequency segment. The loop segment has a feeding sub-segment adjacent to the grounding portion and used for being fed with the signal. The high and low frequency segments are extended from opposite ends of the loop segment away from each other. The frequency adjusting portion is connected to the loop segment and the grounding portion. A high frequency dual-path is formed from a feeding point of the feeding sub-segment and extends along the loop segment in two different directions to the high frequency segment. A low frequency dual-path is formed from the feeding point and extends along the loop segment in two different directions to the low frequency segment.

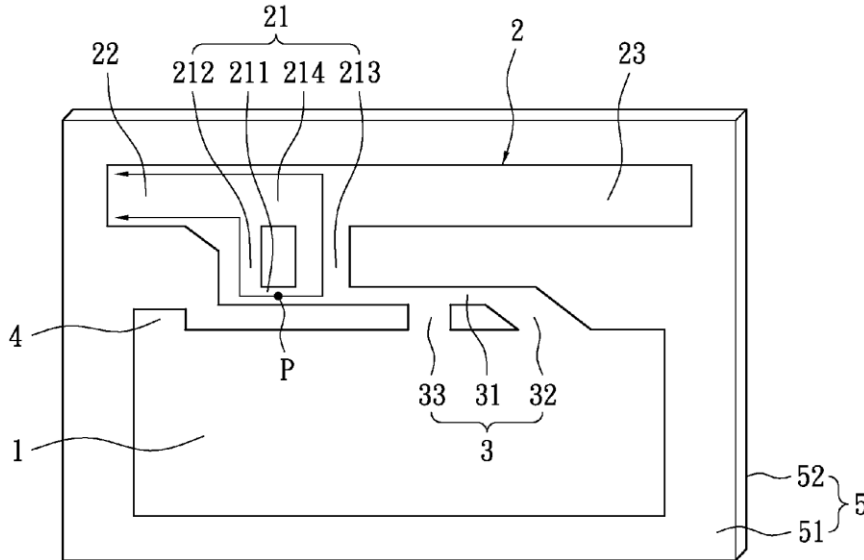
(73) Assignee: **AUDEN TECHNO CORP.**, TAOYUAN COUNTY (TW)

(21) Appl. No.: **13/433,426**

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

Publication Classification

(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 11/12 (2006.01)





US 20130257666A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257666 A1**

(43) **Pub. Date: Oct. 3, 2013**

(54) **ANTENNA WITH MULTIPLE COUPLED REGIONS**

which is a continuation of application No. 12/894,052, filed on Sep. 29, 2010, now Pat. No. 8,077,116, which is a continuation of application No. 11/841,207, filed on Aug. 20, 2007, now Pat. No. 7,830,320.

(71) Applicant: **ETHERTRONICS, INC.**, San Diego, CA (US)

Publication Classification

(72) Inventors: **Laurent Desclos**, San Diego, CA (US); **Chew Chwee Heng**, Singapore (SG); **Sebastian Rowson**, San Diego, CA (US); **Jeffrey Shamblin**, San Marcos, CA (US)

(51) **Int. Cl.**
H01Q 9/06 (2006.01)
H01Q 9/16 (2006.01)

(73) Assignee: **ETHERTRONICS, INC.**, San Diego, CA (US)

(52) **U.S. Cl.**
CPC ... **H01Q 9/06** (2013.01); **H01Q 9/16** (2013.01)
USPC **343/747**; **343/745**

(21) Appl. No.: **13/767,854**

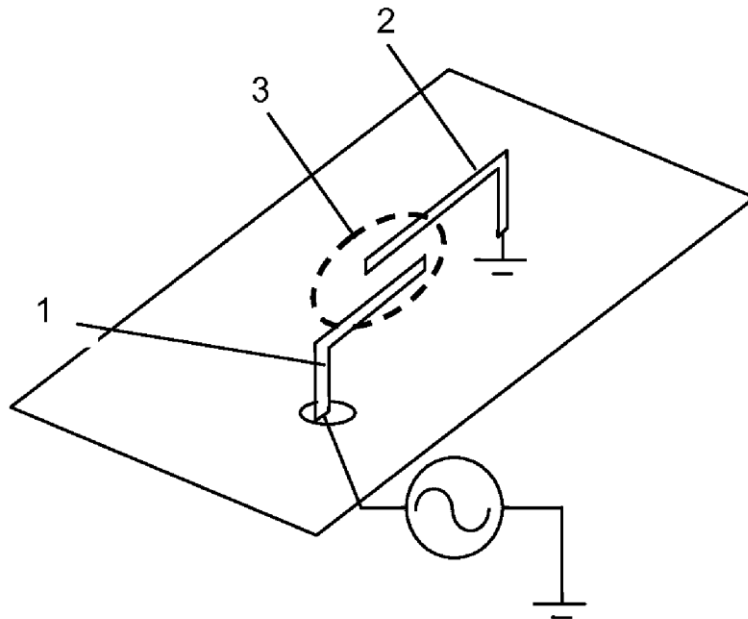
(57) **ABSTRACT**

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

An antenna having a driven element coupled to multiple additional elements to resonate at multiple frequencies. A magnetic dipole mode is generated by coupling a driven element to a second element, and additional resonances are generated by coupling additional elements to either or both of the driven or second element. One or multiple active components can be coupled to one or more of the coupled elements to provide dynamic tuning of the coupled or driven elements.

Related U.S. Application Data

(63) Continuation of application No. 12/536,419, filed on Aug. 5, 2009, now abandoned, Continuation-in-part of application No. 13/289,901, filed on Nov. 4, 2011,





US 20130257674A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257674 A1**

(43) **Pub. Date: Oct. 3, 2013**

(54) **MULTI-BAND MULTI-ANTENNA SYSTEM
AND COMMUNICATION DEVICE THEREOF**

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

(75) Inventors: **Wei-Yu Li**, Yilan County (TW); **Wei-Ji Chen**, Tainan City (TW); **Chun-Yih Wu**, Taipei City (TW)

(57) **ABSTRACT**

(73) Assignee: **INDUSTRIAL TECHNOLOGY
RESEARCH INSTITUTE**, Hsinchu (TW)

A multi-band multi-antenna system and a communication device thereof are provided. The multi-band multi-antenna system includes at least one ground, two antenna units, a coupling conductor line and a grounding conductor line. Both of the two antenna units have at least one conductor portion, a low-pass filtering portion and an extending conductor portion. Each antenna unit generates at least one higher and lower operating bands. The low-pass filtering portion is electrically coupled between the conductor portion and the extending conductor portion, and effectively decreases dependent relationship between the higher and lower operating bands. The coupling conductor line is disposed nearby the two antenna units and has a first coupling portion and a second coupling portion. The grounding conductor line is disposed between the two antenna units and connected to the ground.

(21) Appl. No.: **13/528,853**

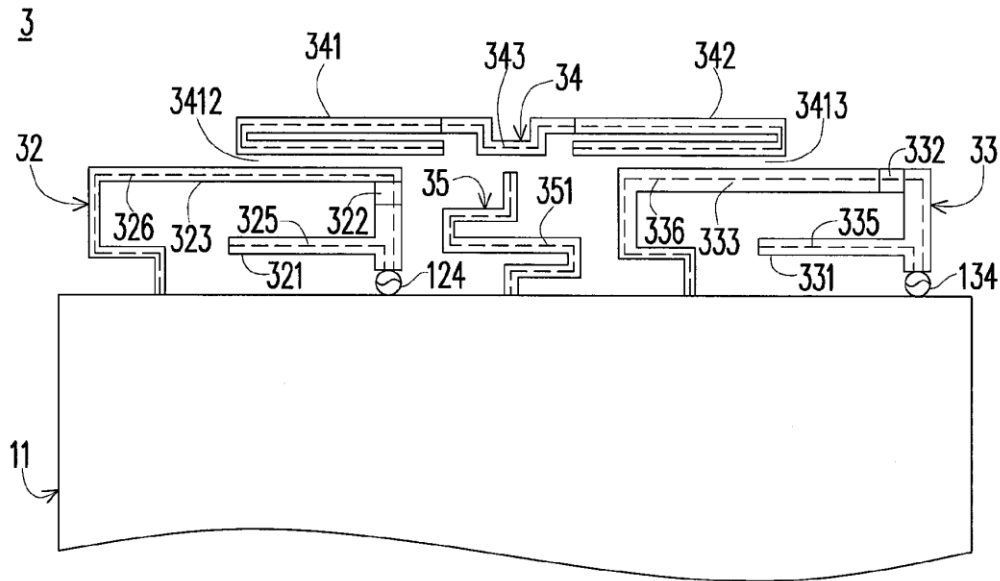
(22) Filed: **Jun. 21, 2012**

(30) **Foreign Application Priority Data**

Apr. 3, 2012 (TW) 101111861

Publication Classification

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





US 20130257676A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257676 A1**

(43) **Pub. Date: Oct. 3, 2013**

(54) **RADIO FREQUENCY ANTENNA CIRCUIT**

Publication Classification

(71) Applicant: **NXP B.V.**, Eindhoven (NL)

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

(72) Inventors: **Anthony Kerselaers**, Herselt (BE);
Liesbeth Gommé, Anderlecht (BE)

(52) **U.S. Cl.**
CPC **H01Q 1/50** (2013.01)
USPC **343/860; 343/850**

(73) Assignee: **NXP B.V.**, Eindhoven (NL)

(57) **ABSTRACT**

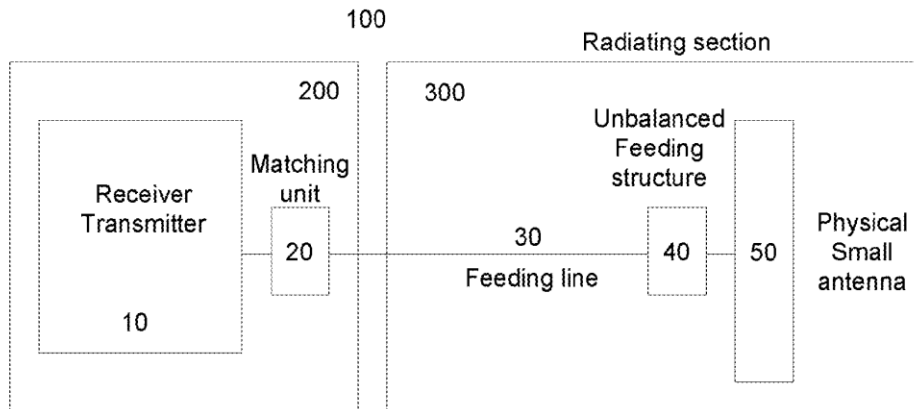
(21) Appl. No.: **13/758,257**

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

Presented is radio frequency antenna circuit for portable and/or compact electronic devices. Embodiments comprise an antenna connected to an unbalanced current feeding arrangement. The unbalanced feeding arrangement may generate common mode currents which increase the overall radiation resistance and efficiency of the antenna circuit.

(30) **Foreign Application Priority Data**

Mar. 30, 2012 (EP) 12162378.9





US 20130257679A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257679 A1**

(43) **Pub. Date: Oct. 3, 2013**

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

(52) **U.S. Cl.**
USPC **343/876**

(75) Inventors: **Kin-Lu WONG**, Kaohsiung (TW);
Shu-Chuan CHEN, Kaohsiung (TW)

(57) **ABSTRACT**

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

A communication device includes a ground element, an antenna element, and a reconfigurable circuit element group. The antenna element includes a first radiating portion and a second radiating portion. One end of the first radiating portion is a feeding end of the antenna element, and the other end is an open end. One end of the second radiating portion is coupled to the ground element, and the other end is an open end. The second radiating portion is longer than the first radiating portion. The second radiating portion surrounds the open end of the first radiating portion, and includes a first portion and a second portion. The reconfigurable circuit element group is coupled between the first portion and the second portion of the second radiating portion, and includes at least two branches. The reconfigurable circuit selectively opens and closes the branches such that the antenna element operates in different bands.

(21) Appl. No.: **13/469,803**

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

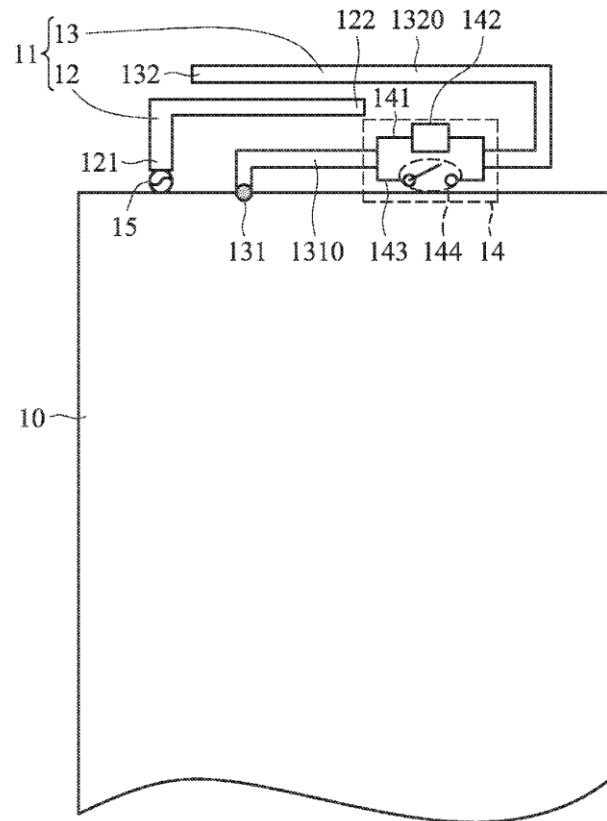
(30) **Foreign Application Priority Data**

Mar. 28, 2012 (TW) 101110729

Publication Classification

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

100





US 20130257681A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0257681 A1**

(43) **Pub. Date: Oct. 3, 2013**

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

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

CPC *H01Q 21/28* (2013.01)

USPC **343/893**

(71) Applicants: **Ippei Kashiwagi**, Fuchu-shi (JP);
Hiroyuki Hotta, Ome-shi (JP)

(57)

ABSTRACT

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

According to one embodiment, an antenna apparatus includes a first antenna unit disposed along a side of a ground pattern, a second antenna unit disposed along the side of the ground pattern so as to be juxtaposed with the first antenna unit, a first RF cable configured to connect the first antenna unit and the radio circuit unit, and a second RF cable configured to connect the second antenna unit and the radio circuit unit. The first RF cable and the second RF cable are routed from the first antenna unit and the second antenna unit in an arrangement direction of the first antenna unit and the second antenna unit so as to be parallel to each other, with the first RF cable being disposed so as to pass over the ground pattern.

(21) Appl. No.: **13/719,707**

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

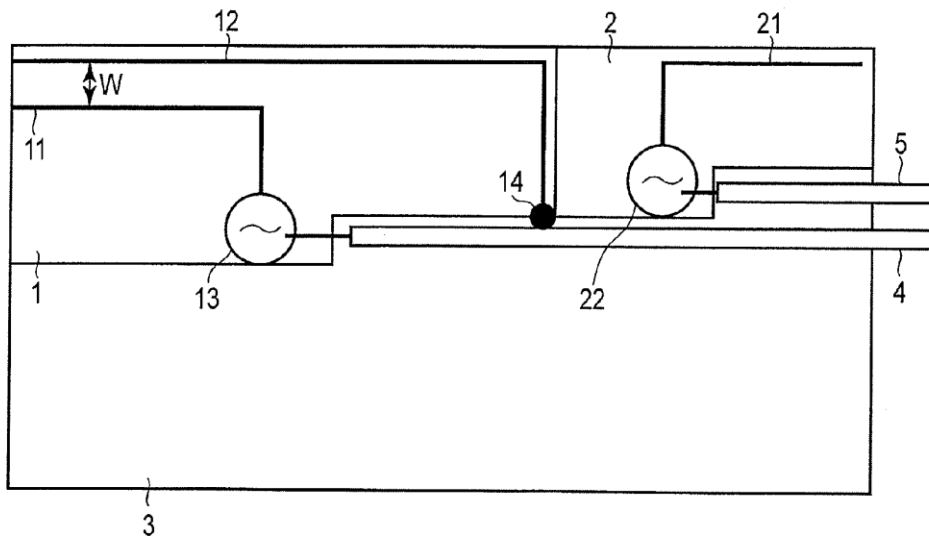
(30) **Foreign Application Priority Data**

Mar. 30, 2012 (JP) 2012-082411

Publication Classification

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

(2006.01)





US 20130265201A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0265201 A1**

(43) **Pub. Date: Oct. 10, 2013**

(54) **COMPACT BROADBAND ANTENNA**

(76) Inventors: **Houssam Kanj**, Waterloo (CA);
Huanhuan Gu, Kitchener (CA)

(21) Appl. No.: **13/442,418**

(22) Filed: **Apr. 9, 2012**

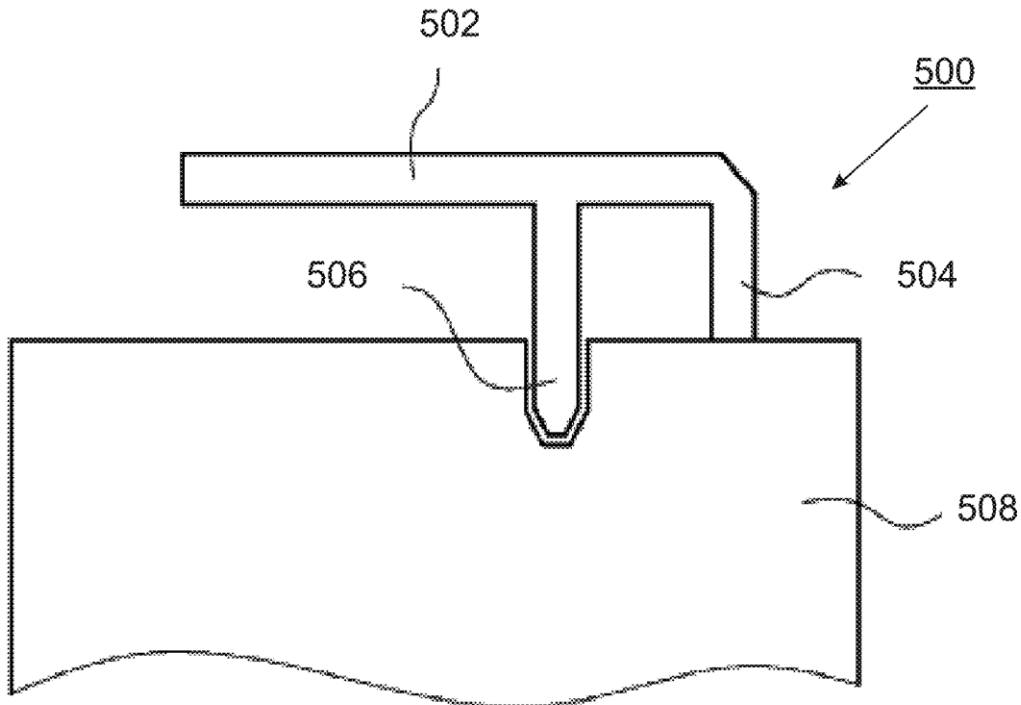
Publication Classification

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

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

(57) **ABSTRACT**

A compact broadband antenna is disclosed. In various embodiments, the broadband antenna comprises a folded inverted F radiator. The folded inverted F radiator comprises a first L-shaped element comprising an arm portion and a rectangular portion, a feed element coupled to a feed source and to the L-shaped element and a shorting element coupled to ground. In some embodiments, the antenna further comprises a second L-shaped arm providing an additional current path to enhance performance of the antenna. In other embodiments, the antenna further comprises a capacitive coupling patch comprising a rectangular portion that is substantially coplanar with said rectangular portion of the L-shaped element.





US 20130265205A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0265205 A1**

(43) **Pub. Date: Oct. 10, 2013**

(54) **FOLDED DIPOLE ANTENNA AND RF TAG USING THE FOLDED DIPOLE ANTENNA**

Publication Classification

(75) Inventors: **Yoji Okano**, Otake-shi (JP); **Tetsuya Kimura**, Otake-shi (JP); **Kazumi Yamamoto**, Otake-shi (JP); **Takanori Doi**, Otake-shi (JP); **Yoshiro Sato**, Otake-shi (JP)

(51) **Int. Cl.**
H01Q 9/26 (2006.01)
(52) **U.S. Cl.**
CPC **H01Q 9/26** (2013.01)
USPC **343/787**

(73) Assignee: **TODA KOGYO CORPORATION**, Otake-shi, Hiroshima-ken (JP)

(57) **ABSTRACT**

(21) Appl. No.: **13/884,417**

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

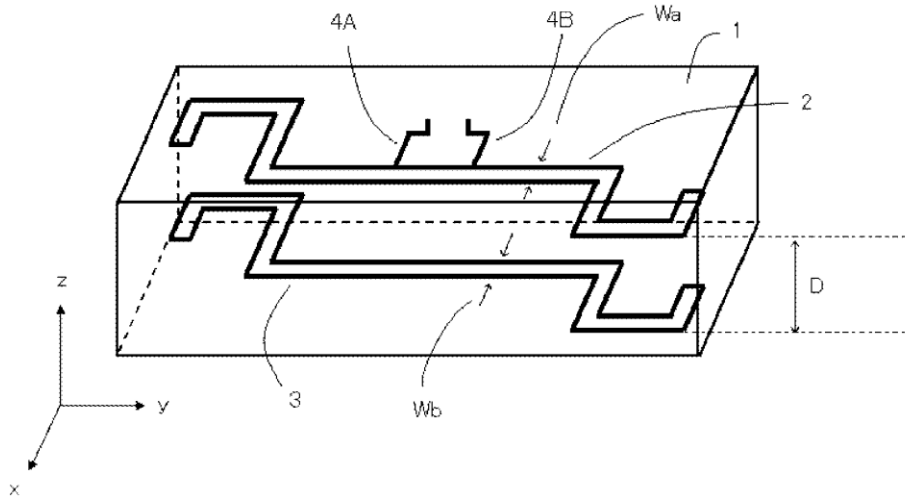
(86) PCT No.: **PCT/JP2011/075975**

§ 371 (c)(1),
(2), (4) Date: **Jun. 17, 2013**

The present invention relates to a folded dipole antenna comprising a magnetic material comprising a hexagonal Z-type ferrite and/or a hexagonal Y-type ferrite as a main component in which a radiation element and a reflection element each having a folded dipole structure are disposed, and an RF tag comprising the folded dipole antenna and an IC chip connected to the folded dipole antenna. The RF tag according to the present invention has a smaller size than that of the conventional RF tags and is not susceptible to adverse influence from ambient environments, and can be operated at an UHF band or surrounding frequency bands thereof.

(30) **Foreign Application Priority Data**

Nov. 12, 2010 (JP) 2010-253844





US 20130265207A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0265207 A1**

(43) **Pub. Date: Oct. 10, 2013**

(54) **ANTENNA-DEVICE SUBSTRATE AND ANTENNA DEVICE**

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

CPC *H01Q 1/50* (2013.01)

USPC **343/860; 343/850**

(75) Inventors: **Shinsuke Yukimoto**, Chichibu-Gun (JP);
Roy Saito, Chichibu--Gun (JP)

(57) **ABSTRACT**

(73) Assignee: **MITSUBISHI MATERIAL CORPORATION**, Tokyo (JP)

Provided are an antenna-device substrate which is capable of flexibly adjusting multiple resonance frequencies and can also be made small and thin and an antenna device provided with the same. The present invention is provided with a substrate main body (2), first to third elements (3 to 5), a ground plane (GND), and a ground connection pattern (6), wherein the first element is provided with a feed point (FP) at the base end and extends while having a power feeding-side passive element (P0), a first connecting portion (C1), and an antenna element (AT); the second element extends while being connected to the first element via a second connecting portion (C2); and the third element extends while being connected to the first element via a third connecting portion (C3). The first element extends while being spaced apart from the second and third elements and the ground plane such that a stray capacitance can be generated between the first element and each of the second and third elements and the ground plane; and at least one of the first to third elements is patterned from the surface to the rear surface of the substrate main body via a through-hole.

(21) Appl. No.: **13/993,175**

(22) PCT Filed: **Dec. 15, 2011**

(86) PCT No.: **PCT/JP2011/007020**

§ 371 (c)(1),

(2), (4) Date: **Jun. 11, 2013**

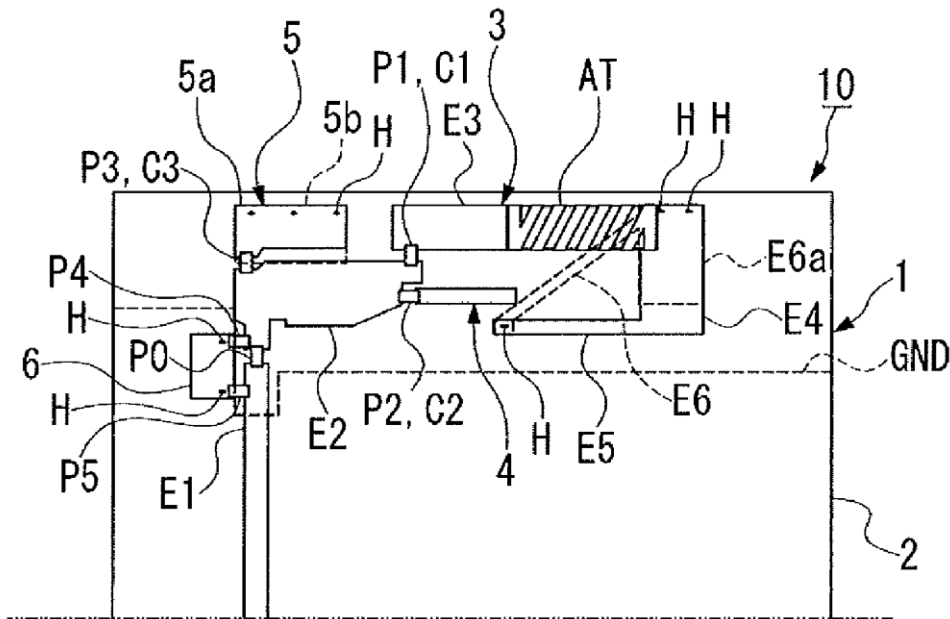
(30) **Foreign Application Priority Data**

Dec. 28, 2010 (JP) 2010-293924

Publication Classification

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

(2006.01)





US 20130265208A1

(19) **United States**

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

(10) **Pub. No.:** US 2013/0265208 A1

(43) **Pub. Date:** Oct. 10, 2013

(54) **ANTENNA UNIT**

(30) **Foreign Application Priority Data**

Oct. 8, 2010 (JP) 2010-228551

(75) Inventors: **Takuma Sawaya**, Aichi (JP);
Tokumitsu Hanita, Aichi (JP); **Seiji Go**,
Gunma (JP); **Atsushi Ubukata**, Gunma
(JP)

Publication Classification

(51) **Int. Cl.**
H01Q 1/42 (2006.01)

(52) **U.S. Cl.**
CPC **H01Q 1/42** (2013.01)
USPC **343/872**

(73) Assignee: **Yokowo Co., Ltd.**, Tokyo (JP)

(21) Appl. No.: **13/877,698**

(22) PCT Filed: **Aug. 31, 2011**

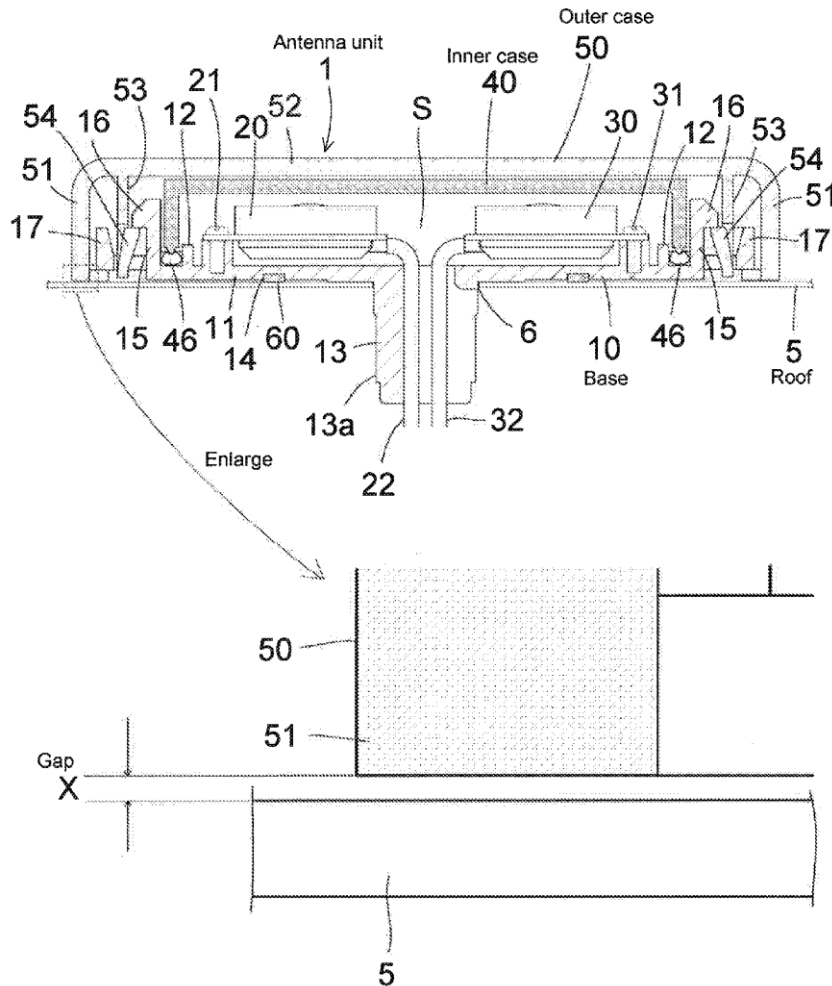
(86) PCT No.: **PCT/JP2011/069789**

§ 371 (c)(1),

(2), (4) Date: **Jun. 12, 2013**

(57) **ABSTRACT**

An antenna unit includes a base having a base-side fitting portion, antenna elements disposed on the base, an inner case fixed to the base and covering the antenna elements, and an outer case mounted on the base covering the inner case. The outer case 50 has an outer-case-side fitting portion fitted to the base-side fitting portion.





US 20130267170A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0267170 A1**

(43) **Pub. Date: Oct. 10, 2013**

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

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

(72) Inventors: **Kabsung CHONG**, Seoul (KR); **Jongoh KIM**, Seoul (KR); **Youngtae KIM**, Seoul (KR); **Mizi YI**, Seoul (KR); **Kiwon HAN**, Seoul (KR); **Euntaek JEOUNG**, Seoul (KR)

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

(21) Appl. No.: **13/685,208**

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

(30) **Foreign Application Priority Data**

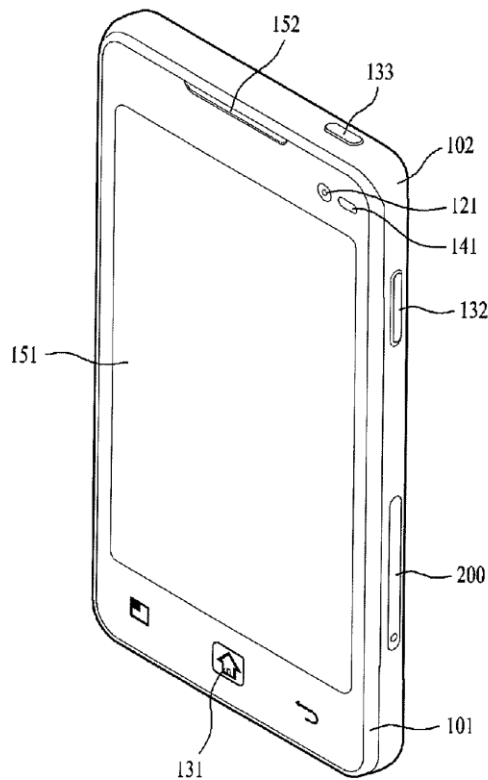
Apr. 5, 2012 (KR) 10-2012-0035626

Publication Classification

(51) **Int. Cl.**
H04B 1/38 (2006.01)
H01Q 1/38 (2006.01)
H04B 5/00 (2006.01)
(52) **U.S. Cl.**
CPC **H04B 1/3833** (2013.01); **H04B 5/0081** (2013.01); **H01Q 1/38** (2013.01)
USPC **455/41.1**; **455/575.7**; **455/573**; **343/787**

(57) **ABSTRACT**

An antenna and a mobile terminal having the antenna are discussed. According to an embodiment, the antenna can include a flexible board having a first region and a second region; a high frequency antenna pattern formed in the first region of the flexible board to transceive a wireless signal by detecting a magnetic flux; a low frequency antenna pattern formed in the second region of the flexible board to generate an induced current; and a magnetic sheet stacked on one surface of the flexible board to simultaneously cover both of the high frequency antenna pattern and the low frequency antenna pattern, the magnetic sheet having a high magnetic permeability for both a high frequency and a low frequency.





US 20130271329A1

(19) **United States**

(12) **Patent Application Publication**
Sato

(10) **Pub. No.: US 2013/0271329 A1**

(43) **Pub. Date: Oct. 17, 2013**

(54) **WIRELESS TERMINAL APPARATUS**

Publication Classification

(71) Applicant: **Koichi Sato**, Tachikawa-shi (JP)

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

(72) Inventor: **Koichi Sato**, Tachikawa-shi (JP)

(52) **U.S. Cl.**
CPC **H01Q 1/00** (2013.01)
USPC **343/720**

(21) Appl. No.: **13/719,684**

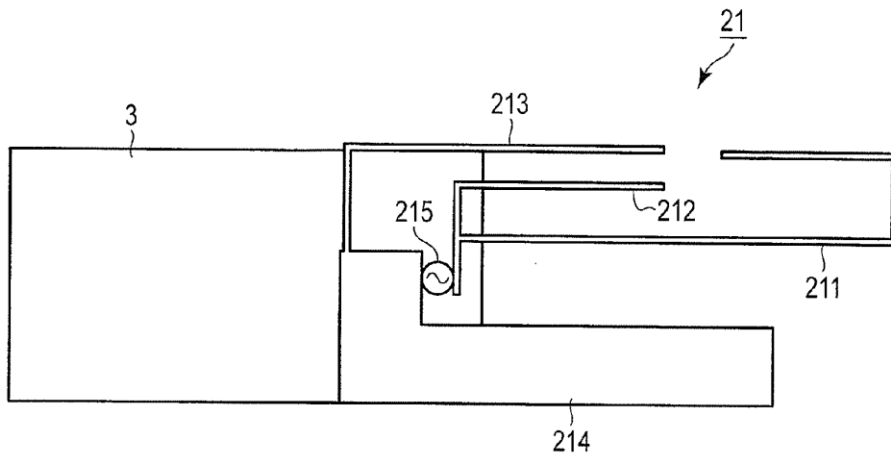
(22) Filed: **Dec. 19, 2012**

(57) **ABSTRACT**

(30) **Foreign Application Priority Data**

Apr. 13, 2012 (JP) 2012-091770

According to one embodiment, a wireless terminal apparatus includes an antenna unit and a sensor unit in a housing. The sensor unit is disposed so that at least part of the sensor unit overlaps the antenna unit.





US 20130271330A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0271330 A1**

(43) **Pub. Date: Oct. 17, 2013**

(54) **ANTENNA FOR WIRELESS DEVICE**

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

USPC 343/745

(75) Inventors: **Bruce Foster Bishop**, Aptos, CA (US);
Yong Kwon Park, Capitola, CA (US);
Junwon Kim, Capitola, CA (US)

(57) **ABSTRACT**

An antenna for a wireless device includes a low band left-handed (LBLH) mode element and a low band right-handed (LBRH) mode element both operable in a low frequency bandwidth and a high band left-handed (HBLH) mode element and a high band right-handed (HBRH) mode element both operable in a high frequency bandwidth. The LBLH mode element is capacitively coupled to a feed of the antenna and is inductively coupled to a ground of the antenna. The LBRH mode element is electrically coupled to the feed of the antenna. The HBLH mode element is capacitively coupled to the feed of the antenna and is inductively coupled to the ground of the antenna. The HBRH mode element is electrically coupled to the feed of the antenna. At least one tuning element is operatively coupled to at least one of the mode elements.

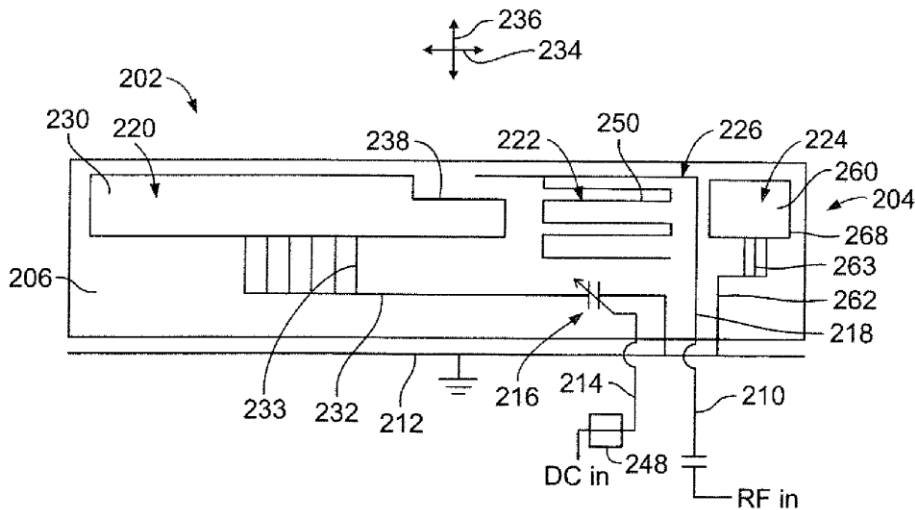
(73) Assignee: **Tyco Electronics Corporation**, Berwyn, PA (US)

(21) Appl. No.: **13/445,602**

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

Publication Classification

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





US 20130271333A1

(19) **United States**

(12) **Patent Application Publication**
Taura

(10) **Pub. No.: US 2013/0271333 A1**

(43) **Pub. Date: Oct. 17, 2013**

(54) **SLOT ANTENNA**

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

CPC *H01Q 13/106* (2013.01)

USPC **343/767**

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

(21) Appl. No.: **13/995,929**

(22) PCT Filed: **Oct. 27, 2011**

(57) **ABSTRACT**

(86) PCT No.: **PCT/JP2011/006008**

§ 371 (c)(1),

(2), (4) Date: **Jun. 19, 2013**

(30) **Foreign Application Priority Data**

Feb. 9, 2011 (JP) 2011-026066

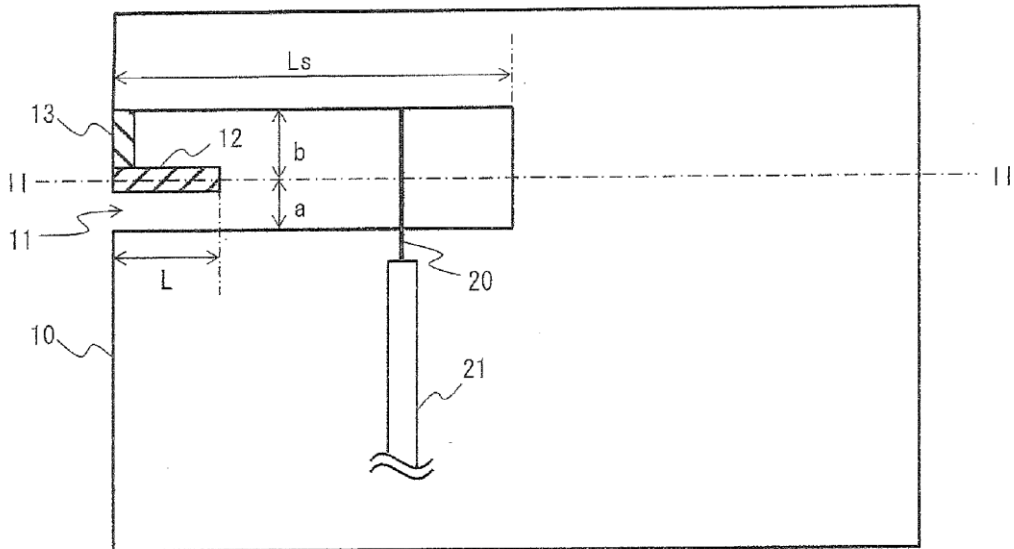
Publication Classification

(51) **Int. Cl.**

H01Q 13/10

(2006.01)

A slot antenna includes a dielectric substrate, a conductor surface provided on one of surfaces of the dielectric substrate, a slot formed by making a cut in the conductor surface, one end of the cut forming an opened end on an edge of the conductor surface, and a stub formed inside the slot, the stub being connected to one of opposing sides of the slot by using a connection part, in which the stub is formed in such a manner that a length of the connection part becomes longer than a distance between a side opposing to the side connected to the connection part and the stub.





US 20130271339A1

(19) **United States**

(12) **Patent Application Publication**
MIKATA

(10) **Pub. No.: US 2013/0271339 A1**

(43) **Pub. Date: Oct. 17, 2013**

(54) **MULTI-ANTENNA AND ELECTRONIC DEVICE**

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

CPC *H01Q 1/50* (2013.01)

USPC **343/850**

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

(57) **ABSTRACT**

(72) Inventor: **Jin MIKATA**, Tokyo (JP)

A passive element has an electrical length such that a resonance mode thereof is in a target frequency band, and first and second feed elements, each of which has an electrical length such that a resonance mode thereof is not in the target frequency band. The first feed element has a first coupling conductive part, and a first connecting conductive part, which has a continuous shape with the first coupling conductive part. The second feed element has a second coupling conductive part, and a second connecting conductive part, which has a continuous shape with the second coupling conductive part. The first coupling conductive part is disposed parallel and adjacent to the passive element. The second coupling conductive part is disposed parallel and adjacent to the passive element. The first connecting conductive part and the second connecting conductive part are disposed adjacent and parallel to each other.

(73) Assignee: **TAIYO YUDEN CO., LTD.**, Tokyo (JP)

(21) Appl. No.: **13/849,241**

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

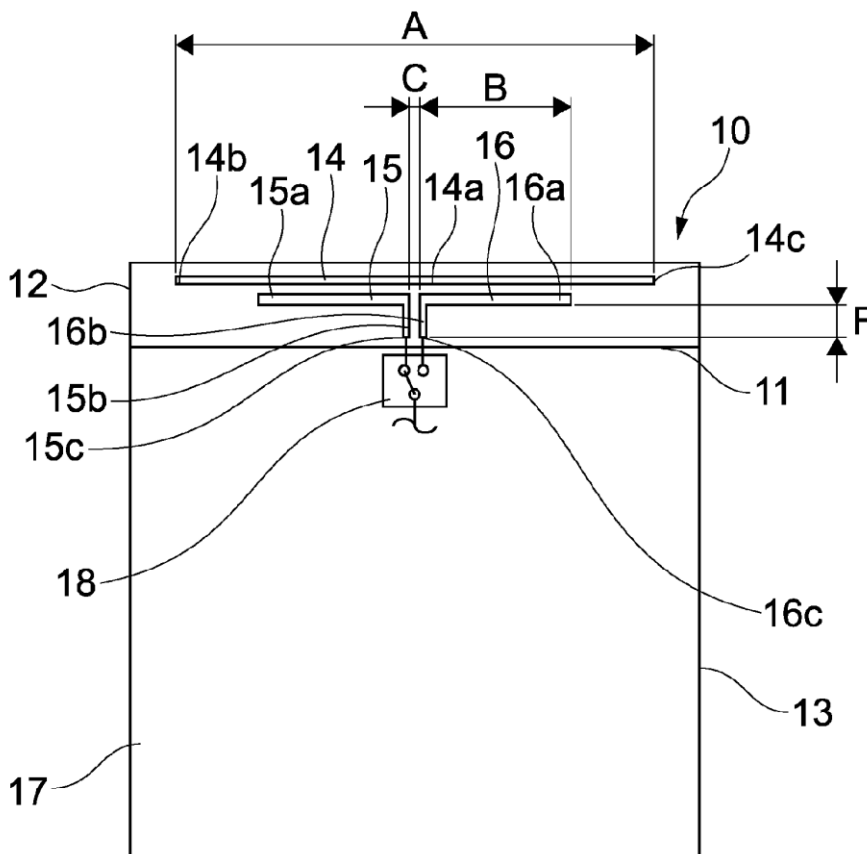
(30) **Foreign Application Priority Data**

Apr. 17, 2012 (JP) 2012-093974

Publication Classification

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

(2006.01)





US 20130271341A1

(19) **United States**

(12) **Patent Application Publication**
LIN

(10) **Pub. No.: US 2013/0271341 A1**

(43) **Pub. Date: Oct. 17, 2013**

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

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

CPC *H01Q 5/0093* (2013.01)

USPC **343/860**

(71) Applicant: **FIH (HONG KONG) LIMITED,**
Kowloon (HK)

(72) Inventor: **SHIH-CHIEH LIN,** Taoyuan (TW)

(57) **ABSTRACT**

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

(21) Appl. No.: **13/862,852**

(22) Filed: **Apr. 15, 2013**

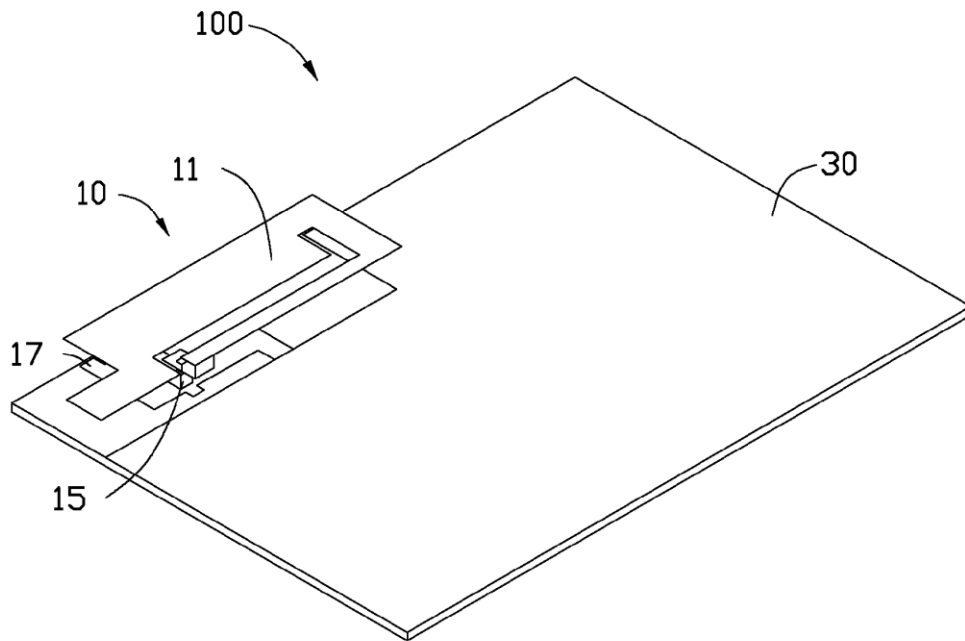
(30) **Foreign Application Priority Data**

Apr. 17, 2012 (TW) 101113683

Publication Classification

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

A multiband antenna, includes a main antenna, a coupling unit, and a matching unit. The main antenna includes a feed portion, a bent portion, a radiation portion, and an extending portion in a same plane. One end of the feed portion is connected to the coupling unit. The bent portion is perpendicularly connected to the other end of the feed portion. The radiation portion is parallel with the feed portion and perpendicularly connected to one end of the bent portion away from the feed portion. The extending portion is connected to one end of the radiation portion away from the bent portion, the coupling unit is parallel with the main antenna and connected to the matching unit, the matching unit feeds signals to and grounds the multiband antenna.





US 20130271345A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0271345 A1**

(43) **Pub. Date: Oct. 17, 2013**

(54) **MULTIPLE-INPUT MULTIPLE-OUTPUT ANTENNA DEVICE**

Publication Classification

(71) Applicant: **TAI-SAW TECHNOLOGY CO., LTD.**,
TAOYUAN COUNTY (TW)

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

(72) Inventors: **Tzu-Chun Tang**, TAOYUAN COUNTY
(TW); **Ken-Huang Lin**, TAOYUAN
COUNTY (TW)

(52) **U.S. Cl.**
CPC **H01Q 21/0075** (2013.01); **H01Q 21/0093**
(2013.01)
USPC **343/893; 29/600**

(73) Assignee: **TAI-SAW TECHNOLOGY CO., LTD.**,
TAOYUAN COUNTY (TW)

(57) **ABSTRACT**

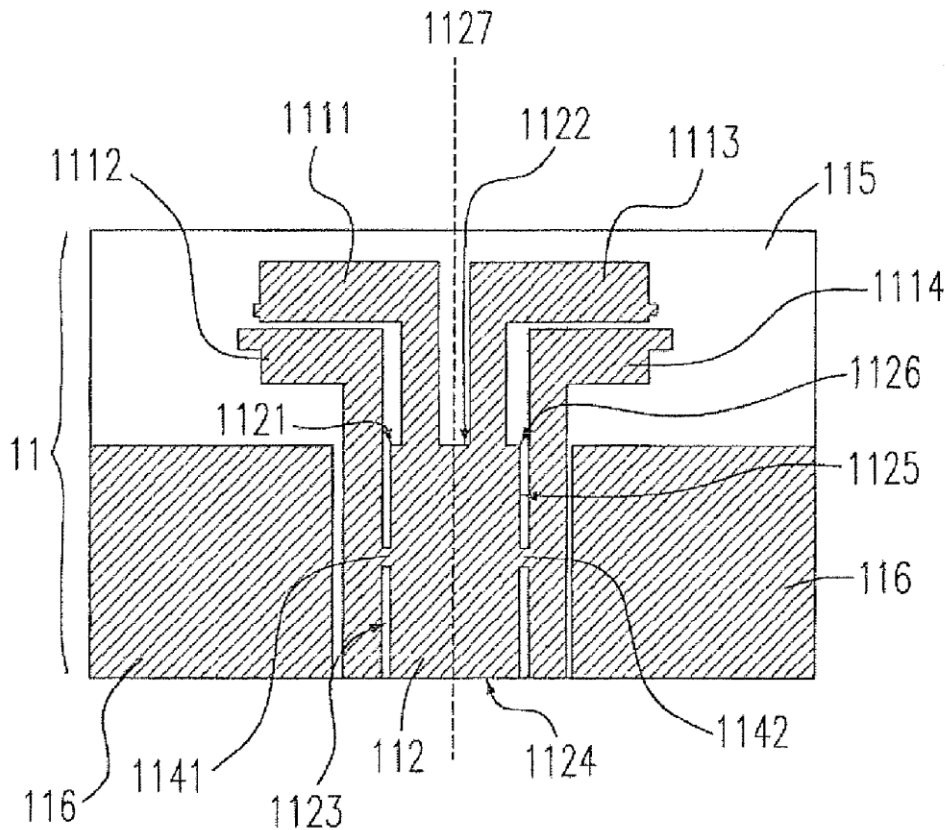
(21) Appl. No.: **13/863,900**

A coplanar waveguide fed multiple-input multiple-output (MIMO) antenna device is provided in the present invention. The coplanar waveguide fed multiple-input multiple-output (MIMO) antenna device includes a grounding metal piece; a grounding plane; a first radiation element connected to the grounding plane; and a second radiation element connected to the grounding plane through the grounding metal piece.

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

(30) **Foreign Application Priority Data**

Apr. 17, 2012 (TW) 101113674





US 20130273963A1

(19) **United States**

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

(10) **Pub. No.: US 2013/0273963 A1**

(43) **Pub. Date: Oct. 17, 2013**

(54) **ANTENNA SYSTEM WITH PARASITIC ELEMENT FOR HEARING AID COMPLIANT ELECTROMAGNETIC EMISSION**

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

CPC *H01Q 1/52* (2013.01)

USPC **455/550.1**; 343/700 MS

(71) Applicant: **Motorola Mobiltiy LLC**, Libertyville, IL (US)

(57) **ABSTRACT**

(72) Inventors: **Narendra Pulimi**, Round Lake, IL (US);
Hugh K. Smith, Palatine, IL (US);
Istvan J. Szini, Grayslake, IL (US)

A system for production of an electromagnetic (EM) field having EM emissions mitigated at one or more predetermined locations within a Hearing Aid Compliant (HAC) measurement plane is provided. The EM field mitigation system includes a ground plane, an antenna element, and a parasitic resonator element. The antenna element is coupled to the ground plane and resonates within at least one predetermined frequency band for transmitting and receiving the radio frequency (RF) signals modulated at one or more frequencies within the at least one predetermined first frequency band. The parasitic resonator element includes at least a half-wavelength resonator portion floating above the ground plane and a second half-wavelength resonator portion floating above the ground plane, crossing an effective electric field mid-line of the ground plane, and located a predetermined distance from the antenna element for mitigation of the EM emissions of the antenna element at the one or more predetermined locations within the HAC measurement plane.

(21) Appl. No.: **13/910,063**

(22) Filed: **Jun. 4, 2013**

Related U.S. Application Data

(62) Division of application No. 12/818,288, filed on Jun. 18, 2010, now Pat. No. 8,483,415.

Publication Classification

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

(2006.01)

602

