



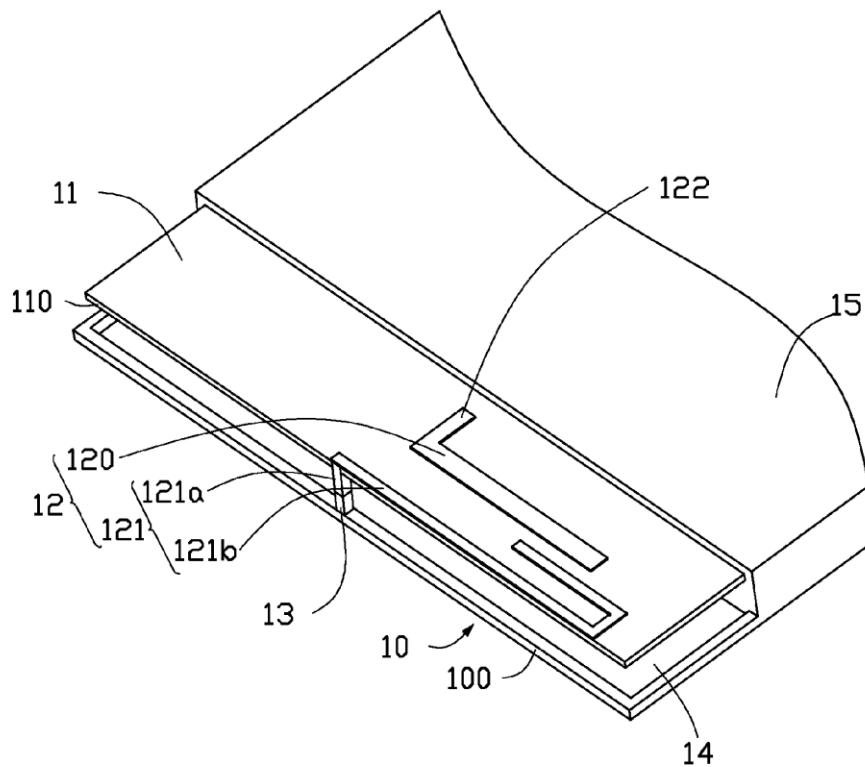
US 20140055304A1

(19) **United States**(12) **Patent Application Publication****LIN et al.**(10) **Pub. No.: US 2014/0055304 A1**(43) **Pub. Date: Feb. 27, 2014**(54) **ANTENNA APPARATUS INTEGRATING  
METAL SHELL**(71) Applicants: **YEN-HUI LIN**, New Taipei (TW);  
**CHIEN-CHANG LIU**, New Taipei  
(TW)(72) Inventors: **YEN-HUI LIN**, New Taipei (TW);  
**CHIEN-CHANG LIU**, New Taipei  
(TW)(21) Appl. No.: **13/689,784**(22) Filed: **Nov. 30, 2012**(30) **Foreign Application Priority Data**

Aug. 27, 2012 (TW) ..... 101131082

**Publication Classification**(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)(52) **U.S. Cl.**  
CPC ..... **H01Q 1/24** (2013.01)  
USPC ..... **343/702**(57) **ABSTRACT**

An antenna apparatus includes a metal shell, a circuit board parallel to the metal shell which forms a space between the circuit board and the shell, a tunable matching circuit mounted in the space with an terminal electrically connected to the shell, and an capacitive feed coupling antenna mounted on the circuit board. The capacitive feed coupling antenna includes a coupling ground strip mounted on the circuit board and a feed strip. The feed strip includes a first portion and a second portion mounted on the circuit board with a portion extending along an edge of the circuit board. The first portion is electrically interconnected between the other terminal of the tunable matching circuit and the second portion.





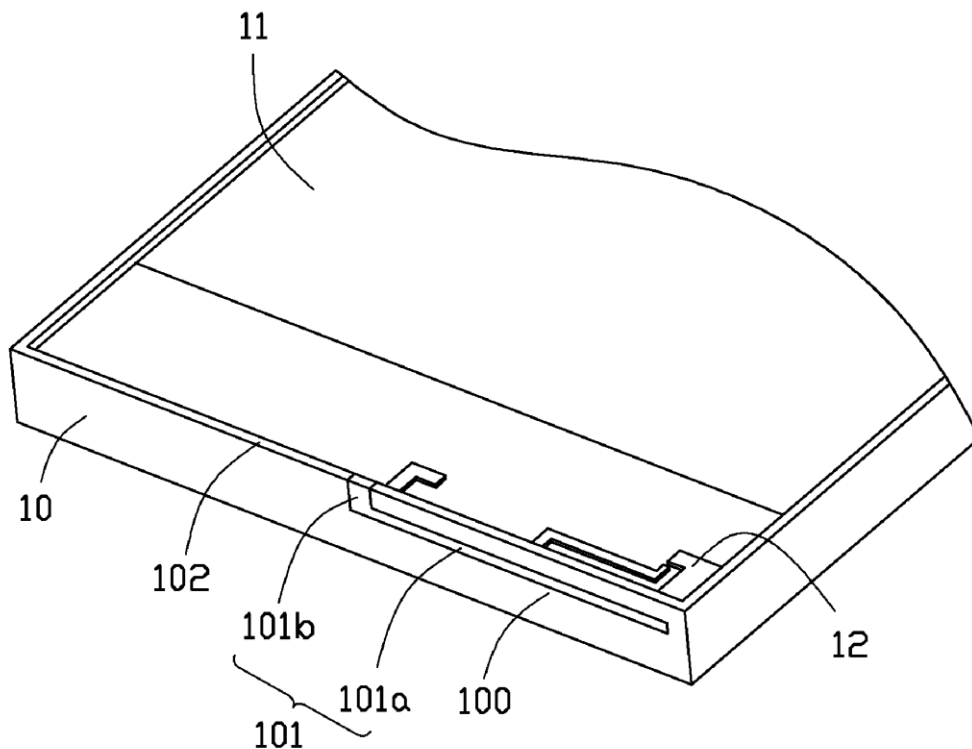
US 20140055305A1

(19) **United States**(12) **Patent Application Publication****LIN et al.**(10) **Pub. No.: US 2014/0055305 A1**(43) **Pub. Date: Feb. 27, 2014**(54) **ANTENNA APPARATUS INTEGRATING IN METAL SHELL****Publication Classification**(71) Applicants: **YEN-HUI LIN**, New Taipei (TW);  
**CHIEN-CHANG LIU**, New Taipei (TW)(51) **Int. Cl.**  
**H01Q 1/22** (2006.01)(72) Inventors: **YEN-HUI LIN**, New Taipei (TW);  
**CHIEN-CHANG LIU**, New Taipei (TW)(52) **U.S. Cl.**  
CPC ..... **H01Q 1/22** (2013.01)  
USPC ..... **343/702**(21) Appl. No.: **13/692,945**(22) Filed: **Dec. 3, 2012**(30) **Foreign Application Priority Data**

Aug. 27, 2012 (TW) ..... 101130967

(57) **ABSTRACT**

An antenna apparatus includes a metal shell having a slit portion defining a slit, a circuit board received in the shell, and an antenna line formed on the circuit board including bended strip-shaped metal electrically connected to the slit portion. The slit portion is grounded. The circuit board is substantially perpendicular to the metal sidewall. The antenna line is electrically connected to the slit portion.

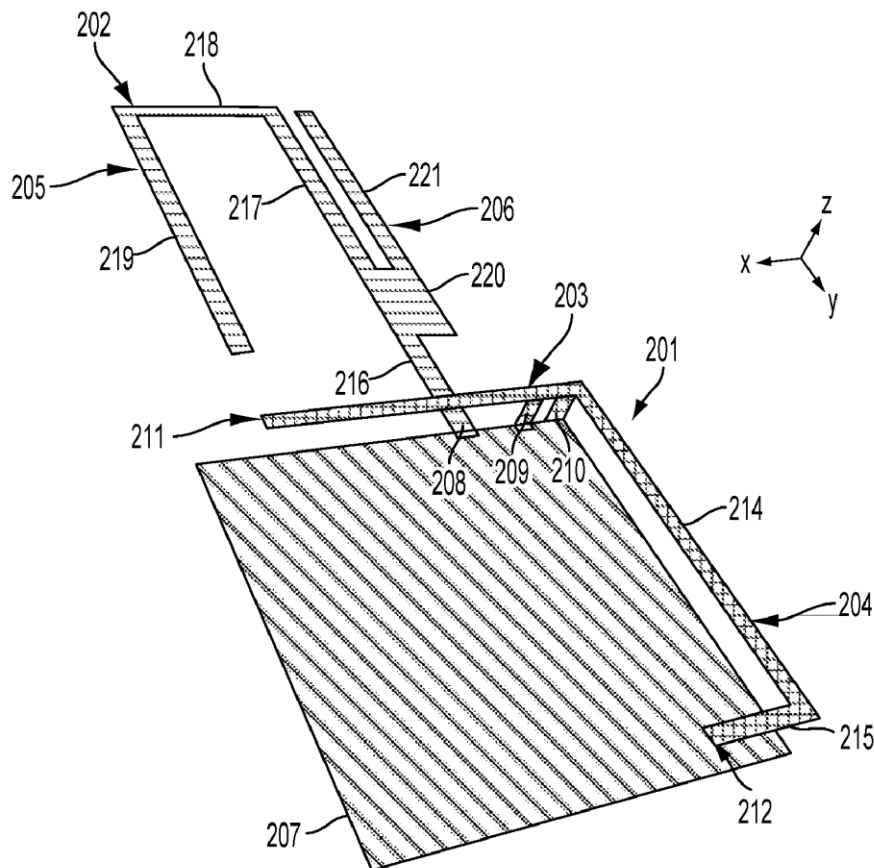




US 20140055309A1

(19) **United States**(12) **Patent Application Publication**  
**JENWATANAVET**(10) **Pub. No.: US 2014/0055309 A1**(43) **Pub. Date: Feb. 27, 2014**(54) **COMPACT ANTENNA SYSTEM**(76) Inventor: **Jatupum JENWATANAVET**, San  
Diego, CA (US)(21) Appl. No.: **13/594,571**(22) Filed: **Aug. 24, 2012****Publication Classification**(51) **Int. Cl.**  
**H01Q 21/00** (2006.01)  
**H01Q 1/24** (2006.01)  
**H01Q 5/01** (2006.01)  
**H01Q 1/38** (2006.01)(52) **U.S. Cl.**USPC ..... **343/718**; 343/700 MS; 343/893(57) **ABSTRACT**

The various embodiments include multiple antenna system designs for use in smaller sized mobile computing devices where spatial isolation of antennas may not be feasible. The various embodiments include at least an embodiment first antenna having a first arm and a second arm. The first arm and the second arm are positioned proximate to one another in an intersecting perpendicular configuration. The at least first arm and second arm may be formed a plane that is laterally offset from a plane containing a printed circuit board operating as a ground plane. The at least first arm and second arm may also be positioned in a corner of the printed circuit board. Additional embodiments include a second monopole antenna formed in the same plane as the printed circuit board and having a feed contact positioned proximate to a feed and ground contact of the first antenna.





US 20140055313A1

(19) **United States**(12) **Patent Application Publication****KOBAYASHI et al.**(10) **Pub. No.: US 2014/0055313 A1**(43) **Pub. Date: Feb. 27, 2014**(54) **MAGNETIC MATERIAL ANTENNA AND ANTENNA DEVICE**(71) Applicant: **MURATA MANUFACTURING CO., LTD.**, Kyoto (JP)(72) Inventors: **Eiichi KOBAYASHI**, Kyoto (JP);  
**Takuma SAWAYA**, Kyoto (JP);  
**Hiroyuki KUBO**, Kyoto (JP)(73) Assignee: **MURATA MANUFACTURING CO., LTD.**, Kyoto (JP)(21) Appl. No.: **14/071,378**(22) Filed: **Nov. 4, 2013****Related U.S. Application Data**

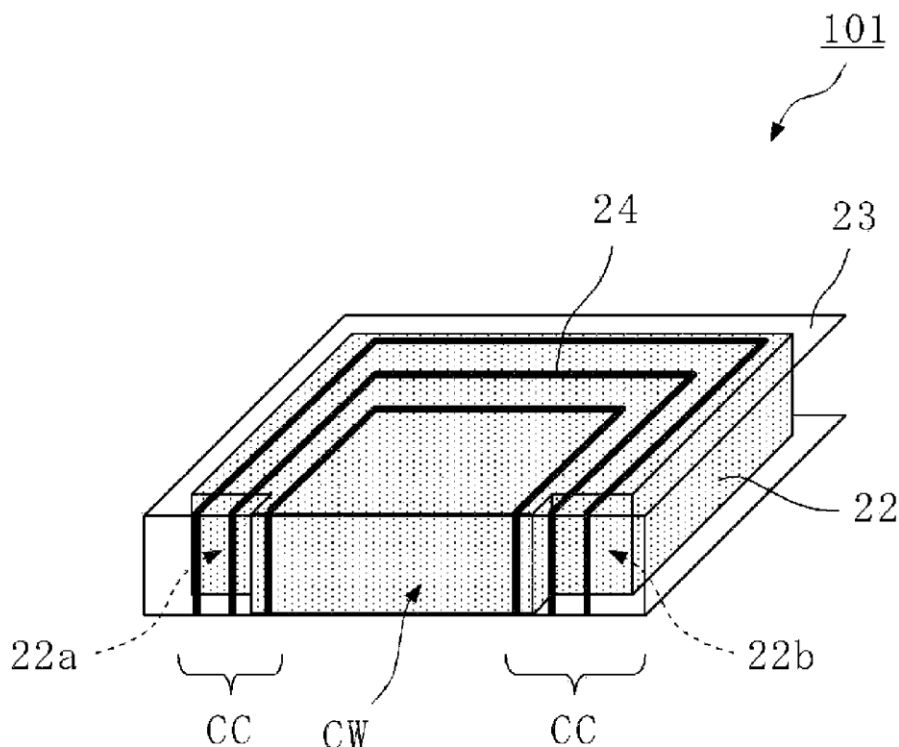
(63) Continuation of application No. 12/816,100, filed on Jun. 15, 2010, now Pat. No. 8,604,992, which is a continuation of application No. PCT/JP2008/068452, filed on Oct. 10, 2008.

(30) **Foreign Application Priority Data**

Dec. 18, 2007 (JP) ..... 2007-326604

**Publication Classification**(51) **Int. Cl.**  
**H01Q 7/06** (2006.01)(52) **U.S. Cl.**  
CPC ..... **H01Q 7/06** (2013.01)  
USPC ..... **343/788**(57) **ABSTRACT**

A spiral coil conductor defining its winding central section as a conductor opening section is formed on a flexible substrate. The flexible substrate has a U shaped bend along a line passing through the conductor opening section so as to envelop a magnetic material core. The magnetic material core is arranged in a state where its end face faces the bend of the flexible substrate, and the magnetic material core includes cut shapes provided at a portion of the end face. The portion at the end face faces coil conductor sections at the bend of the flexible substrate, and the cut shapes separate the portion apart from the coil conductor sections.







US 20140055315A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0055315 A1**

(43) **Pub. Date: Feb. 27, 2014**

(54) **WIRELESS TELEPHONE COUPLED  
ANTENNA**

(71) Applicants: **Henry Cooper**, Murrietta, CA (US);  
**Sheng Peng**, Lynnwood, WA (US)

(72) Inventors: **Henry Cooper**, Murrietta, CA (US);  
**Sheng Peng**, Lynnwood, WA (US)

(21) Appl. No.: **14/010,413**

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

**Related U.S. Application Data**

(60) Provisional application No. 61/693,110, filed on Aug.  
24, 2012.

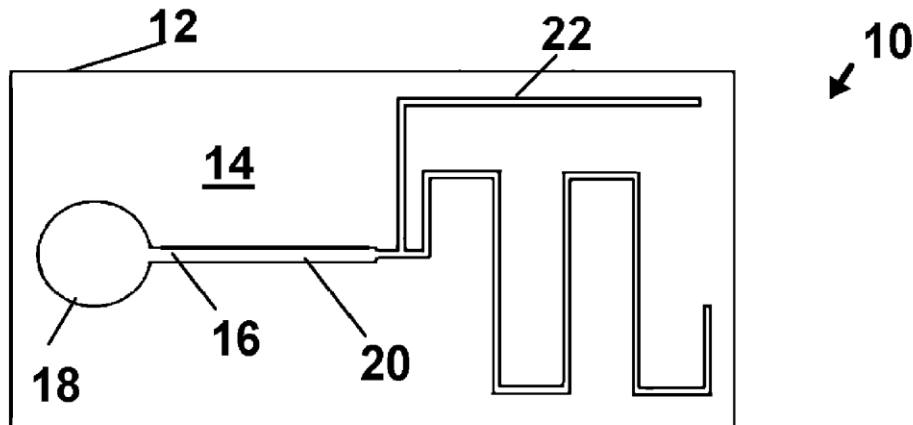
**Publication Classification**

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

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

(57) **ABSTRACT**

An auxiliary antenna for a RF communicating computing device such as a smartphone or pad computer or laptop computer, is provided for enhancement of the RF transmit and receive capabilities of the computing device. The antenna is engaged using mutual coupling of the antenna to an input point or feed line or antenna element of the computing device by registered placement on or adjacent an exterior surface of the computing device. The registered engagement can be provided by inclusion of the auxiliary antenna in a protective or decorative surrounding case, or use of an applicable antenna on a dialectic and a pattern configured to only engage the proper surface of the computing device.





US 20140055317A1

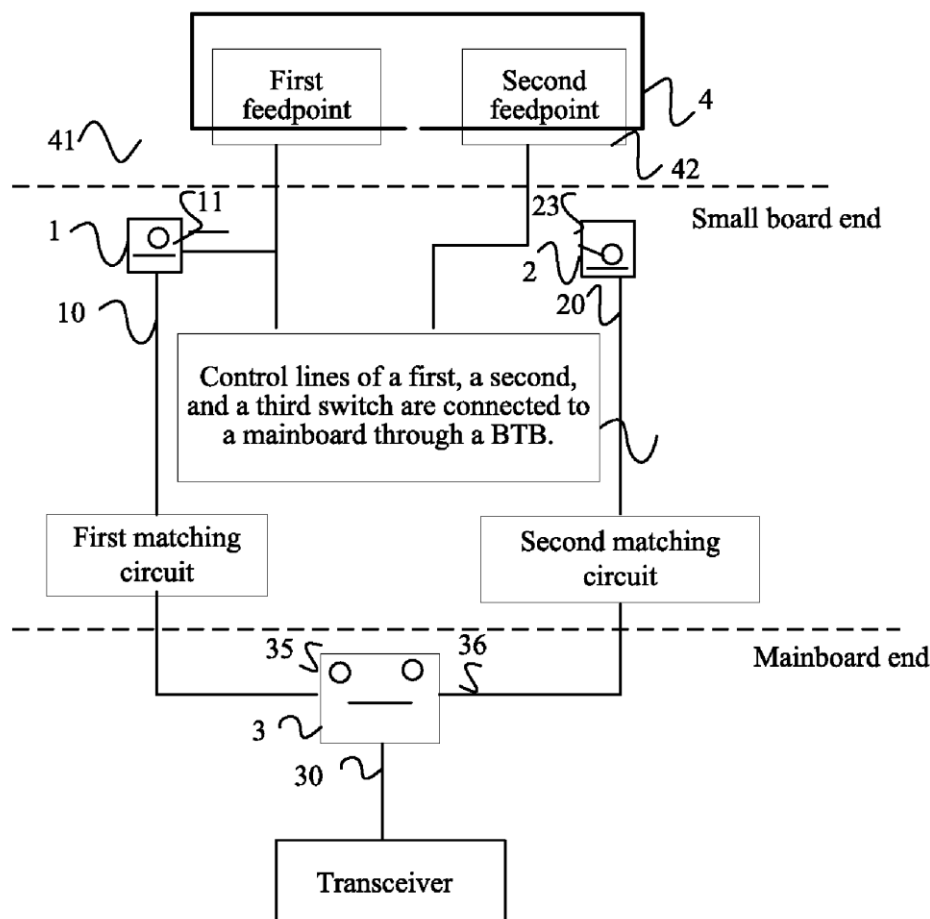
(19) **United States**(12) **Patent Application Publication**  
**Xue**(10) **Pub. No.: US 2014/0055317 A1**(43) **Pub. Date: Feb. 27, 2014**(54) **DUAL-FEEDPOINT ANTENNA SYSTEM AND  
METHOD FOR FEEDPOINT SWITCHOVER  
OF DUAL-FEEDPOINT ANTENNA SYSTEM**(52) **U.S. Cl.**CPC ..... **H01Q 3/24** (2013.01)USPC ..... **343/876**(71) Applicant: **Huawei Device Co., Ltd.**, Shenzhen  
(CN)(57) **ABSTRACT**(72) Inventor: **Liang Xue**, Shenzhen (CN)(21) Appl. No.: **13/970,049**(22) Filed: **Aug. 19, 2013**(30) **Foreign Application Priority Data**

Aug. 27, 2012 (CN) ..... 201210306815.3

**Publication Classification**(51) **Int. Cl.**  
**H01Q 3/24**

(2006.01)

A system includes a first feedpoint and a second feedpoint symmetrically disposed on the left and right sides of an antenna on a small board. A first switch, a second switch, and a third switch are disposed on a mainboard. The first switch, the second switch, and the third switch are controlled through a control instruction so that the system is in a first connection state and a second connection state. Signal strength corresponding to the first connection state and signal strength corresponding to the second connection state are detected, and if the signal strength corresponding to the first connection state is greater than the signal strength corresponding to the second connection state, each switch is controlled through an instruction so that the system is in the first connection state, in which the first feedpoint is working. Otherwise, the second feedpoint is working.





US 20140055318A1

(19) **United States**(12) **Patent Application Publication**  
LIU et al.(10) **Pub. No.: US 2014/0055318 A1**(43) **Pub. Date: Feb. 27, 2014**(54) **BROADBAND ANTENNA ELEMENT**(71) Applicants: **CHIEN-CHANG LIU**, New Taipei  
(TW); **YEN-HUI LIN**, New Taipei (TW)(72) Inventors: **CHIEN-CHANG LIU**, New Taipei  
(TW); **YEN-HUI LIN**, New Taipei (TW)(21) Appl. No.: **13/689,782**(22) Filed: **Nov. 30, 2012**(30) **Foreign Application Priority Data**

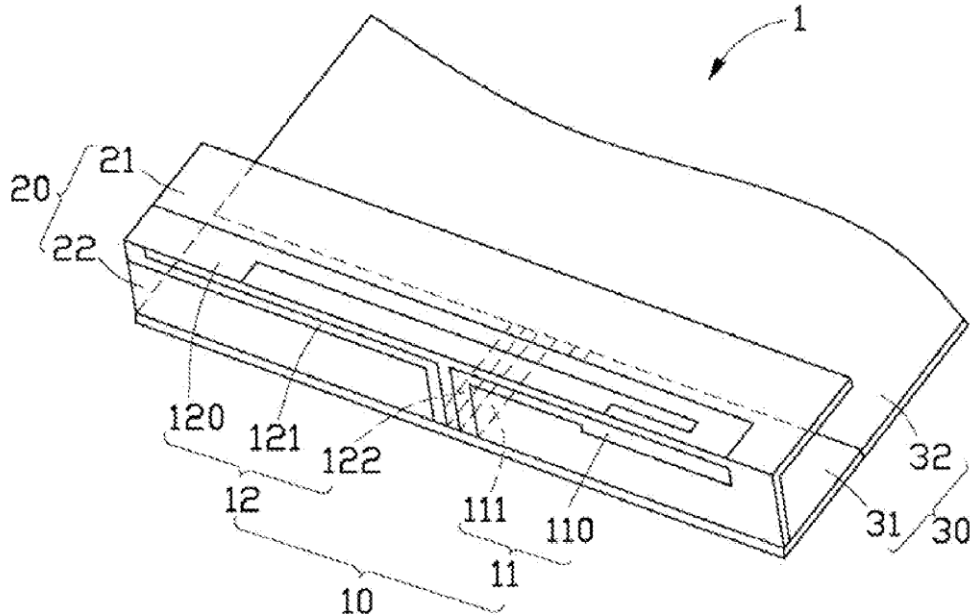
Aug. 27, 2012 (TW) ..... 101131081

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

(57)

**ABSTRACT**

A broadband antenna element includes a circuit board, an antenna carrier connected to the circuit board, and a broadband antenna. The broadband antenna includes a first antenna and a second antenna which are conductive bent strips of metal. The first antenna includes a first feed terminal and a second feed terminal. The second antenna includes a third feed terminal and a coupling ground terminal. The second feed terminal and the coupling ground terminal are mounted on the circuit board keeping a first predetermined distance away from each other. The first feed terminal is mounted on the antenna carrier/circuit board being connected to the second feed terminal, and the third feed terminal is mounted on the antenna carrier being connected to the coupling ground terminal.





US 20140055319A1

(19) **United States**(12) **Patent Application Publication**  
**Cho et al.**(10) **Pub. No.: US 2014/0055319 A1**(43) **Pub. Date: Feb. 27, 2014**(54) **MIMO ANTENNA WITH NO PHASE CHANGE**(30) **Foreign Application Priority Data**

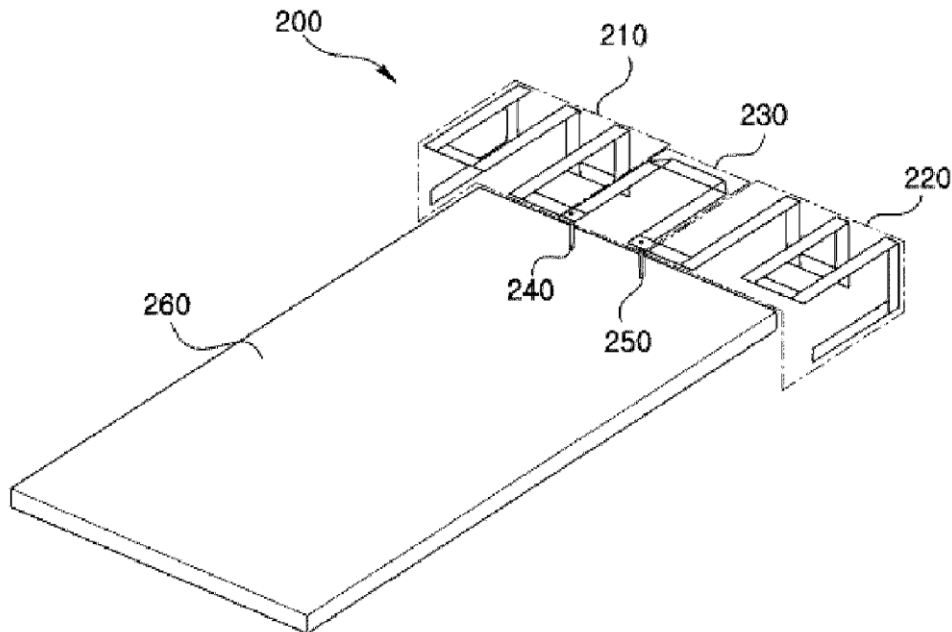
Jan. 4, 2011 (KR) ..... 10-2011-0000622

(75) Inventors: **Jeong Hoon Cho**, Seoul (KR); **Kyung Suk Kim**, Seoul (KR); **Ja Kwon Ku**, Seoul (KR); **Sung Tek Kahng**, Seoul (KR); **Geon Ho Jang**, Seoul (KR); **Seong Ryong Yoo**, Seoul (KR)**Publication Classification**(51) **Int. Cl.**  
**H01Q 5/00** (2006.01)(52) **U.S. Cl.**  
CPC ..... **H01Q 5/0093** (2013.01)  
USPC ..... **343/893**(73) Assignees: **INDUSTRY-ACADEMIC COOPERATION FOUNDATION INCHEON NATIONAL UNIVERSITY**, Incheon (KR); **LG INNOTEK CO., LTD.**, Seoul (KR)(57) **ABSTRACT**

A multi input multi output (MIMO) antenna with no phase change is provided. The MIMO antenna having no phase change constituting one antenna structure overall, wherein unit structures at both sides are symmetrical to each other in a meander form with respect to the center; the unit structures having the meander form are connected to a ground plate by using as a medium power feeding units **240** and **250** supplying an electric energy to the respective unit structures; and the unit structures are installed with a three-dimensional structure, being adjacent to the ground plate.

(21) Appl. No.: **13/978,359**(22) PCT Filed: **Oct. 10, 2011**(86) PCT No.: **PCT/KR2011/007493**

§ 371 (c)(1),

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



US 20140057578A1

(19) **United States**(12) **Patent Application Publication**  
**CHAN et al.**(10) **Pub. No.: US 2014/0057578 A1**(43) **Pub. Date: Feb. 27, 2014**(54) **MOBILE DEVICE AND ANTENNA  
STRUCTURE THEREIN**(52) **U.S. CL.**

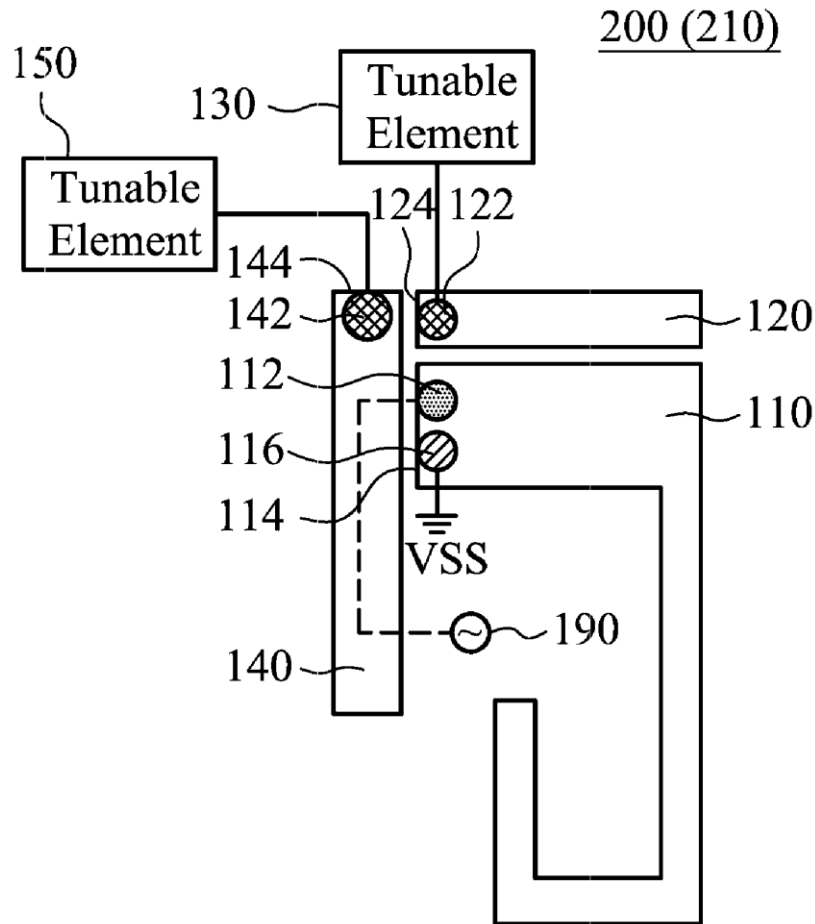
USPC ..... 455/77; 455/73

(75) Inventors: **Shih-Yi CHAN**, Taipei City (TW);  
**Tung-Liang WANG**, New Taipei City  
(TW)

(57)

**ABSTRACT**(73) Assignee: **Shih-Yi CHAN**, Taipei City (TW)(21) Appl. No.: **13/594,260**(22) Filed: **Aug. 24, 2012****Publication Classification**(51) **Int. Cl.****H04B 1/40** (2006.01)**H04B 1/38** (2006.01)

A mobile device including an antenna structure is provided. The antenna structure includes a main radiation element, a parasitical element, and a tunable element. The main radiation element has a feeding pin coupled to a signal source, wherein the feeding pin is substantially located at an end of the main radiation element. The parasitical element is close to the main radiation element, and has a parasitical pin which is substantially located at an end of the parasitical element. The tunable element includes a switch and a plurality of paths, wherein the switch selectively couples one of the paths to the parasitical pin in such a manner that the antenna structure operates in multiple bands.





US 20140062795A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0062795 A1**

(43) **Pub. Date: Mar. 6, 2014**

(54) **ANTENNA HAVING THREE OPERATING  
FREQUENCY BANDS AND METHOD FOR  
MANUFACTURING THE SAME**

(30) **Foreign Application Priority Data**

Sep. 4, 2012 (TW) ..... 101132221

**Publication Classification**

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

(52) **U.S. Cl.**  
CPC ..... **H01Q 9/04** (2013.01)  
USPC ..... **343/700 MS; 29/600**

(57) **ABSTRACT**

An antenna including a radiation portion is provided. The radiation portion includes a feed terminal and three conductor branch paths directly extending from the feed terminal. The three conductor branch paths are located on the same side of the feed terminal, and each has an initial direction, and any two of the three initial directions have an acute angle therebetween. A method for manufacturing an antenna having three operating frequency bands is also provided.

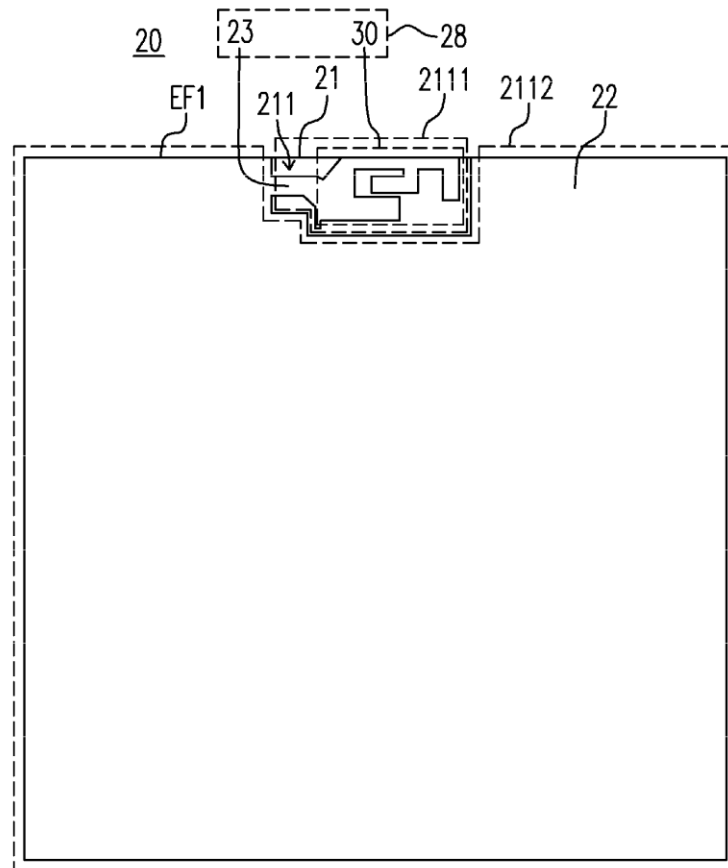
(71) Applicant: **Arcadyan Technology Corporation,**  
Hsinchu City (TW)

(72) Inventors: **Chih-Yung Huang,** Taichung City  
(TW); **Kuo-Chang Lo,** Miaoli County  
(TW); **Jen-Hsiang Fang,** Hsinchu City  
(TW)

(73) Assignee: **Arcadyan Technology Corporation,**  
Hsinchu City (TW)

(21) Appl. No.: **14/017,361**

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

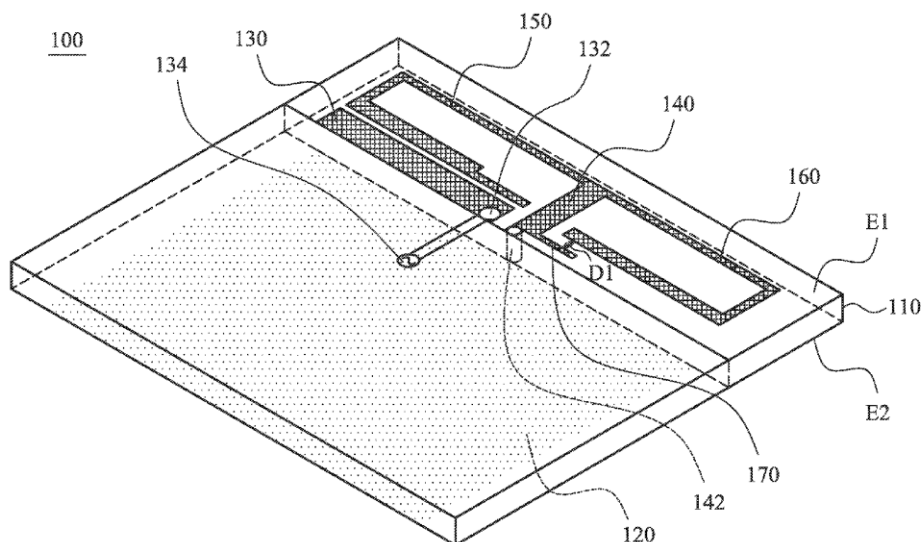




US 20140062796A1

(19) **United States**(12) **Patent Application Publication**  
**CHEN et al.**(10) **Pub. No.: US 2014/0062796 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **WIDEBAND ANTENNA**(71) Applicant: **MediaTek Inc.**, Hsin-Chu (TW)(72) Inventors: **Wei Yu CHEN**, New Taipei City (TW);  
**Shih-Wei HSIEH**, Taipei City (TW)(73) Assignee: **MediaTek Inc.**, Hsin-Chu (TW)(21) Appl. No.: **14/079,287**(22) Filed: **Nov. 13, 2013****Related U.S. Application Data**(63) Continuation-in-part of application No. 13/290,406,  
filed on Nov. 7, 2011, now Pat. No. 8,610,628.**Publication Classification**(51) **Int. Cl.**  
**H01Q 5/01** (2006.01)(52) **U.S. Cl.**CPC ..... **H01Q 5/01** (2013.01)USPC ..... **343/700 MS**(57) **ABSTRACT**

A wideband antenna includes a first substrate, a second substrate, a ground plane, an exciting element, a connection element, a first branch, a second branch, and a coupling branch. The ground plane is disposed on the first substrate. The exciting element is disposed on the second substrate and has a feed point coupled to a signal source. The connection element is disposed on the second substrate and coupled to the ground plane. The first branch is disposed on the second substrate and coupled to the connection element. The second branch is disposed on the second substrate and coupled to the connection element. The coupling element is disposed on the second substrate and coupled to the connection element. The distance between the coupling element and the second branch is smaller than 5 mm.





US 20140062797A1

(19) **United States**(12) **Patent Application Publication****Ke et al.**(10) **Pub. No.: US 2014/0062797 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **ELECTRONIC DEVICE****Publication Classification**

(71) Applicants: **Yun-Lung Ke**, Taipei City (TW);  
**Wen-Feng Tsai**, Taipei City (TW);  
**Cheng-Chi Chen**, Taipei City (TW);  
**Huang-Wei Chen**, Taipei City (TW)

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

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

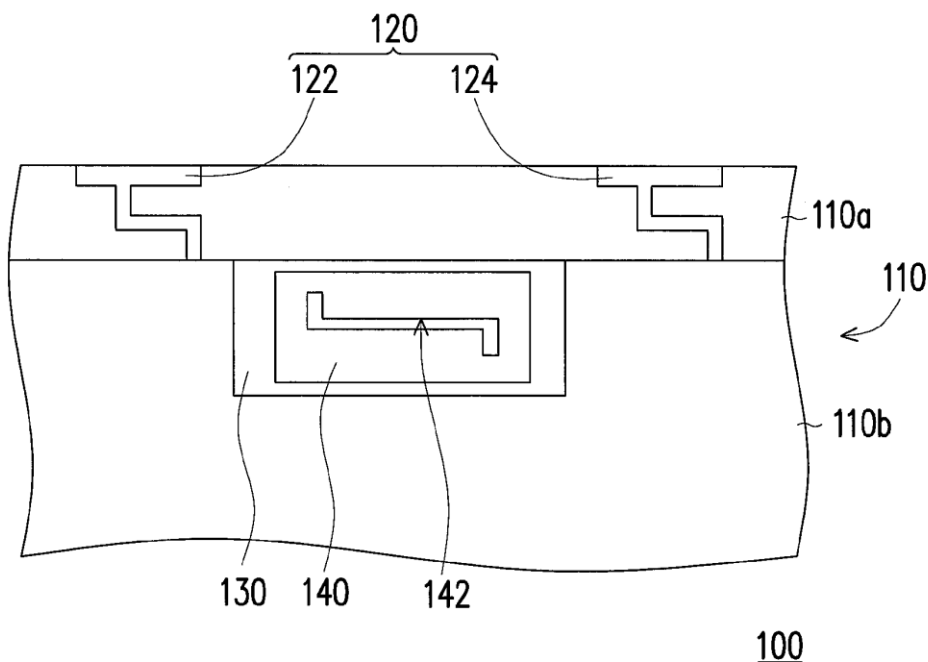
(72) Inventors: **Yun-Lung Ke**, Taipei City (TW);  
**Wen-Feng Tsai**, Taipei City (TW);  
**Cheng-Chi Chen**, Taipei City (TW);  
**Huang-Wei Chen**, Taipei City (TW)

(57) **ABSTRACT**

An electronic device including a shell, an antenna unit, an insulating layer and an isolating conductor is provided. The material of the shell includes conductive material. The antenna unit is disposed on the shell and includes a first antenna and a second antenna. The first antenna and the second antenna are grounded to the shell. The insulating layer is disposed on the shell and located between a ground plane of the first antenna and a ground plane of the second antenna. The isolating conductor is disposed on the insulating layer and has a slot.

(21) Appl. No.: **13/633,141**(22) Filed: **Oct. 2, 2012**(30) **Foreign Application Priority Data**

Aug. 28, 2012 (TW) ..... 101131227





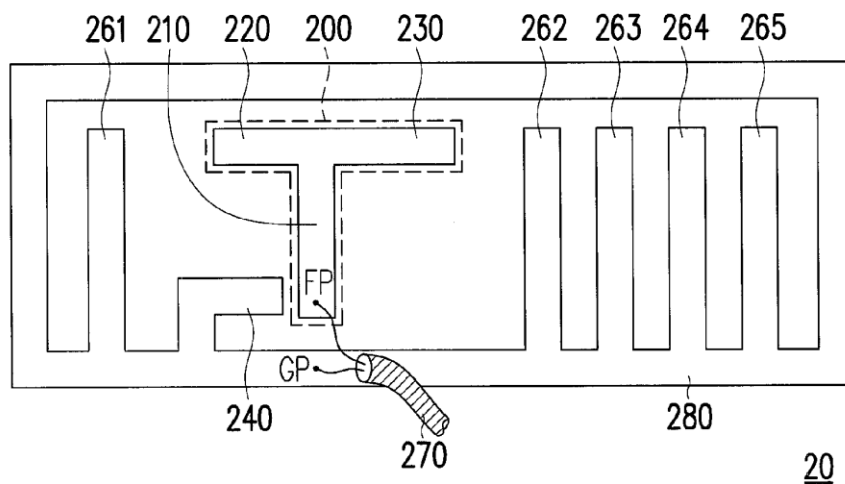


(12) **Patent Application Publication**  
**Lin**

(43) **Pub. Date:** **Mar. 6, 2014**

### Publication Classification

Aug. 28, 2012 (TW) ..... 101131225







US 20140062801A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0062801 A1**

(43) **Pub. Date: Mar. 6, 2014**

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

**Publication Classification**

(71) Applicant: **SONY MOBILE COMMUNICATIONS JAPAN, INC.**,  
Tokyo (JP)

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

(72) Inventors: **Chen Chin YONG**, Tokyo (JP);  
**Minh-Chau HUYNH**, Tokyo (JP)

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

(73) Assignee: **SONY MOBILE COMMUNICATIONS JAPAN, INC.**,  
Tokyo (JP)

(57) **ABSTRACT**

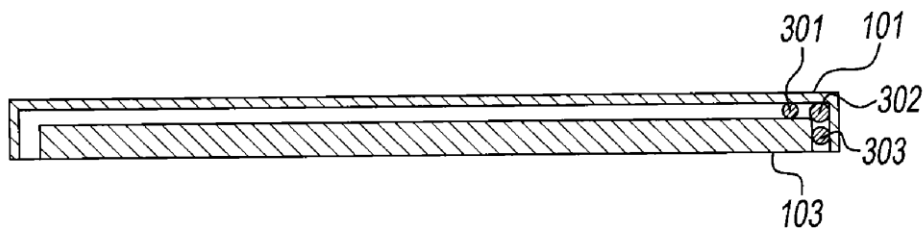
(21) Appl. No.: **13/962,539**

A multi-band frame antenna to be used for LTE, MIMO, and other frequency bands. The frame antenna includes two main parts: a metallic frame with no gaps or discontinuities, and a conductive block. The outer perimeter of the metallic frame surrounds the conductive block, and there is a gap between the metallic frame and the conductive block. The conductive block is connected to a system ground. One or more antenna feeds are routed across the gap, between the metallic frame and the conductive block. One or more electrically shorted connections may also be made across the gap, between the metallic frame and the conductive block.

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

**Related U.S. Application Data**

(60) Provisional application No. 61/695,198, filed on Aug. 30, 2012.





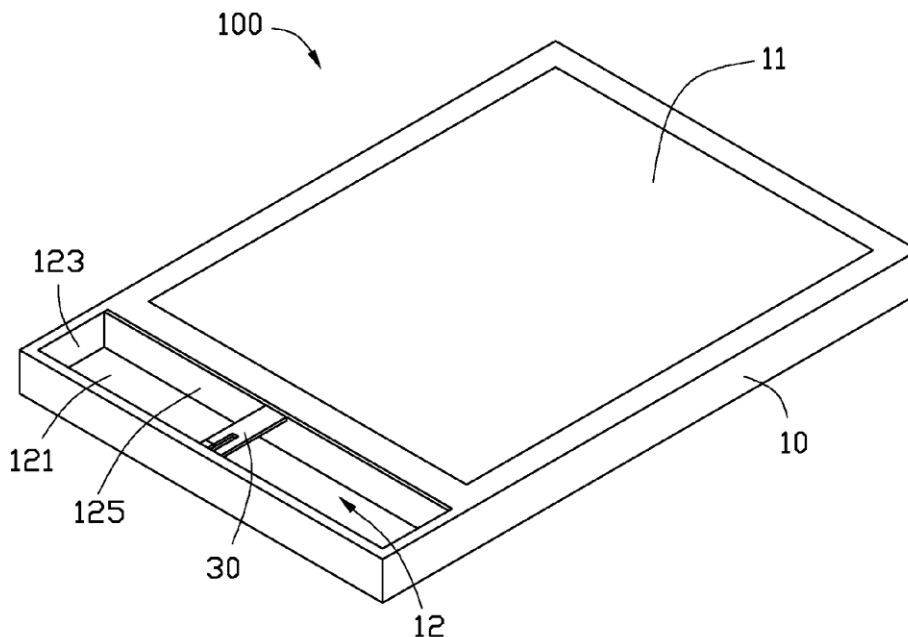
US 20140062803A1

(19) **United States**(12) **Patent Application Publication**  
**SU et al.**(10) **Pub. No.: US 2014/0062803 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **WIRELESS COMMUNICATION DEVICE**(71) Applicant: **Chiun Mai Communication Systems, Inc.**, New Taipei (TW)(72) Inventors: **WEI-CHENG SU**, New Taipei (TW);  
**YEN-HUI LIN**, New Taipei (TW)(73) Assignee: **Chiun Mai Communication Systems, Inc.**, New Taipei (TW)(21) Appl. No.: **14/011,921**(22) Filed: **Aug. 28, 2013**(30) **Foreign Application Priority Data**

Aug. 31, 2012 (TW) ..... 101131943

**Publication Classification**(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)(52) **U.S. Cl.**CPC ..... **H01Q 1/243** (2013.01)USPC ..... **343/702**(57) **ABSTRACT**

A wireless communication device includes a housing and an antenna. The housing is made of metal and defines a conductive chamber. The chamber includes a bottom wall, two opposite first side walls, and two opposite second side walls connecting to the first side walls, the first side walls and the second side walls surrounding around the bottom wall. The antenna comprises a radiating body, a feed end, and a ground end. The radiating body is suspended above the chamber and distanced from the conductive chamber in such a way that the antenna functions in a resonance mode with the conductive chamber, in operating at the required frequencies. The feed end and ground end extend from the radiating body and are connected to one of the second side walls.

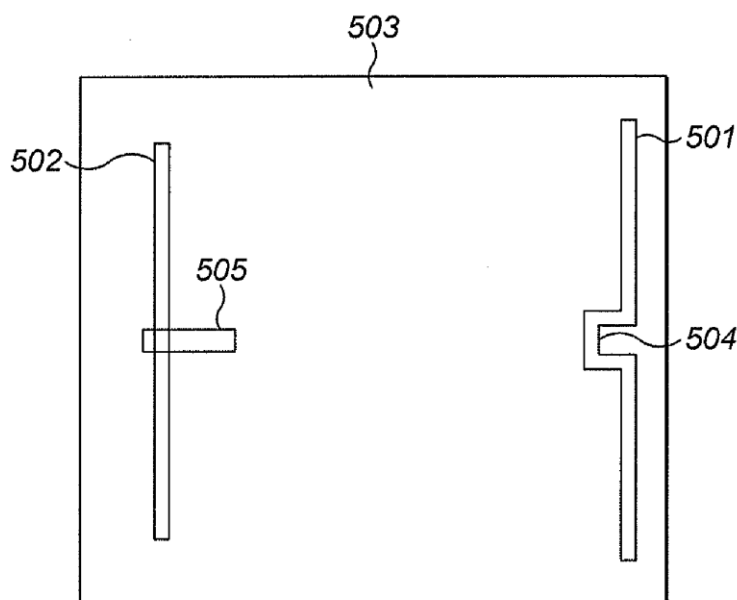




US 20140062812A1

(19) **United States**(12) **Patent Application Publication**  
**Smith et al.**(10) **Pub. No.: US 2014/0062812 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **MULTI-ANTENNA ISOLATION**(75) Inventors: **Leslie David Smith**, Wilburton Ely  
(GB); **Johan Lucas Gertenbach**,  
Blaustein (DE)(73) Assignee: **Cambridge Silicon Radio Limited**,  
Cambridge (GB)(21) Appl. No.: **13/599,346**(22) Filed: **Aug. 30, 2012****Publication Classification**(51) **Int. Cl.**  
**H01Q 1/00** (2006.01)  
**H01Q 1/50** (2006.01)(52) **U.S. Cl.**USPC ..... **343/730; 343/853**(57) **ABSTRACT**

An interconnection medium for connecting circuitry, including a ground plane; a first balanced antenna located in a first plane, the first plane being parallel to the ground plane; a second balanced antenna located in a second plane, the second plane being parallel to the first plane; wherein the first balanced antenna and the second balanced antenna are configured such that the magnetic field radiated by the first balanced antenna is orthogonal to the magnetic field radiated by the second balanced antenna, and the electrical field radiated by the first balanced antenna is orthogonal to the electric field radiated by the second balanced antenna.





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

(43) **Pub. Date:** **Mar. 6, 2014**

### Publication Classification

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

(52) **U.S. Cl.**  
CPC ..... *H01Q 1/50* (2013.01)  
USPC ..... **343/745**

(57) **ABSTRACT**

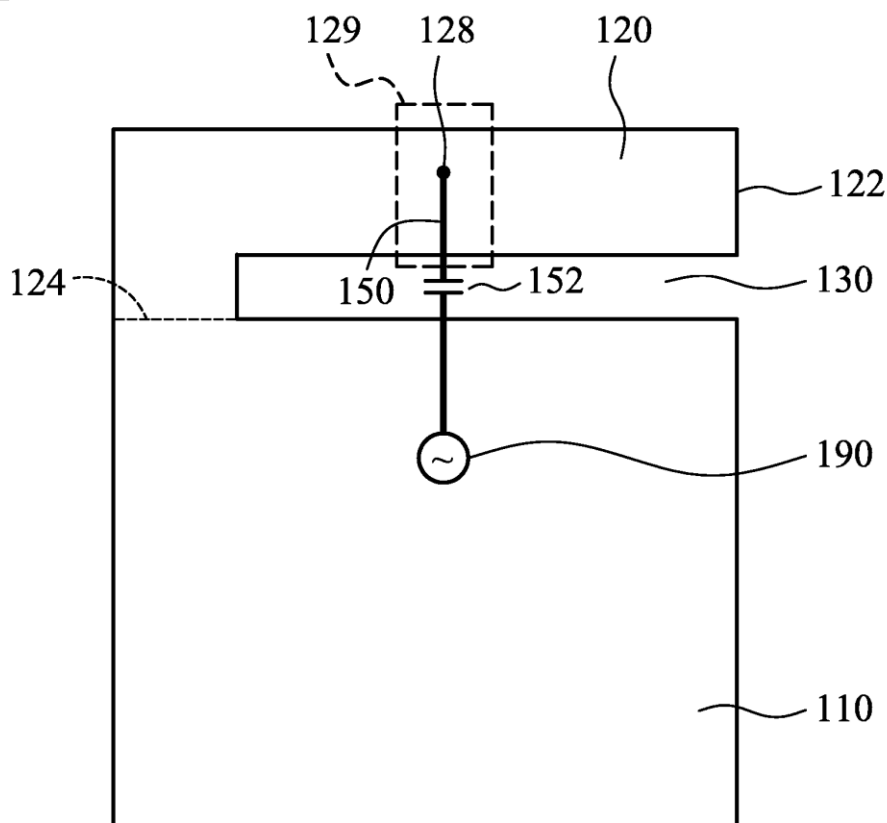
A mobile device includes an antenna structure, a signal source, a tunable circuit element, and a tuner. The antenna structure includes a radiation element. The tunable circuit element is coupled to the radiation element. The antenna structure and the tunable circuit element are disposed in a clearance region of the mobile device. The tuner has a variable impedance value, and is coupled between the tunable circuit element and the signal source. The tuner and the signal source are disposed in a circuit board region of the mobile device.

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

### Related U.S. Application Data

(63) Continuation-in-part of application No. 13/598,317, filed on Aug. 29, 2012.

100





US 20140062816A1

(19) **United States**

(12) **Patent Application Publication**  
**JO**

(10) **Pub. No.: US 2014/0062816 A1**

(43) **Pub. Date: Mar. 6, 2014**

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

**Publication Classification**

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

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

(72) Inventor: **Myungjae JO**, Gyeongsangbuk-do (KR)

(52) **U.S. Cl.**  
CPC ..... **H01Q 9/04** (2013.01)  
USPC ..... **343/745**

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

(57) **ABSTRACT**

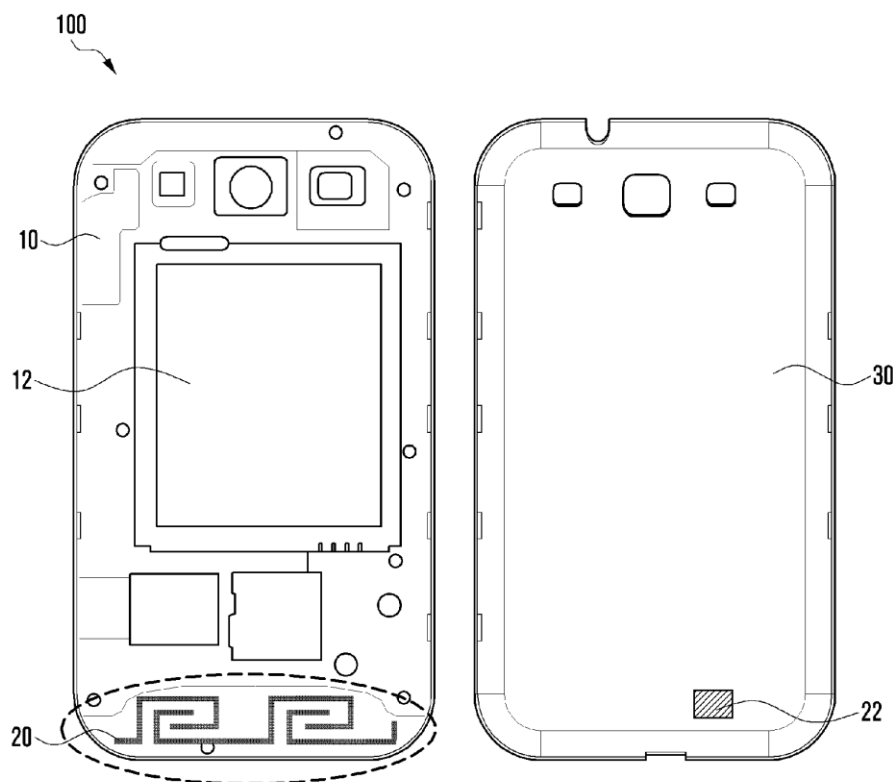
(21) Appl. No.: **14/012,197**

An antenna and a portable device having the same are provided. The antenna provided in a portable device includes: a radiator unit housed at one surface of the portable device; and a resonant frequency compensation unit housed at another surface of the portable device facing the one surface and adjusting a resonant frequency of the radiator unit changed by an environment change to a preset resonant frequency. Examples of the environment change include a device color change, and a battery size change.

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

(30) **Foreign Application Priority Data**

Aug. 29, 2012 (KR) ..... 10-2012-0094974

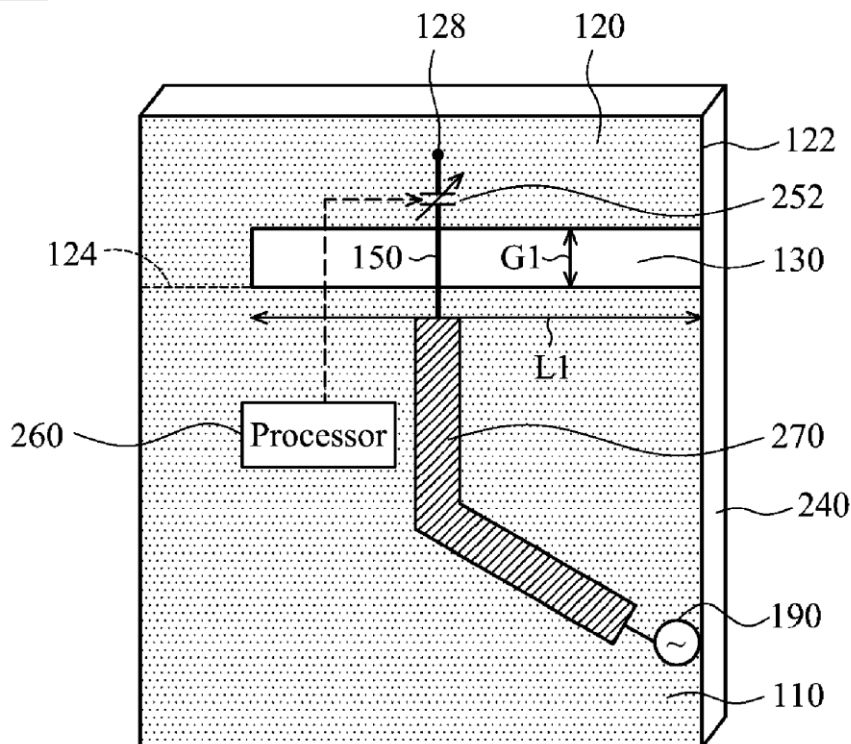




US 20140062818A1

(19) **United States**(12) **Patent Application Publication**  
TSAI et al.(10) **Pub. No.: US 2014/0062818 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **MOBILE DEVICE AND ANTENNA  
STRUCTURE****Publication Classification**(75) Inventors: **Tiao-Hsing TSAI**, Taoyuan County  
(TW); **Chien-Pin CHIU**, Taoyuan  
County (TW); **Hsiao-Wei WU**, Taoyuan  
County (TW); **Ying-Chih WANG**,  
Taoyuan County (TW)(51) **Int. Cl.**  
**H01Q 13/10** (2006.01)  
**H01Q 9/36** (2006.01)  
(52) **U.S. Cl.**  
USPC ..... **343/746; 343/767**(73) Assignee: **HTC CORPORATION**, Taoyuan City  
(TW)(21) Appl. No.: **13/598,317**(22) Filed: **Aug. 29, 2012**(57) **ABSTRACT**

A mobile device includes a ground plane, a grounding branch, and a feeding element. The grounding branch is coupled to the ground plane, wherein a slot is formed between the ground plane and the grounding branch. The feeding element extends across the slot. The feeding element is coupled between the grounding branch and a signal source. An antenna structure is formed by the feeding element and the grounding branch.

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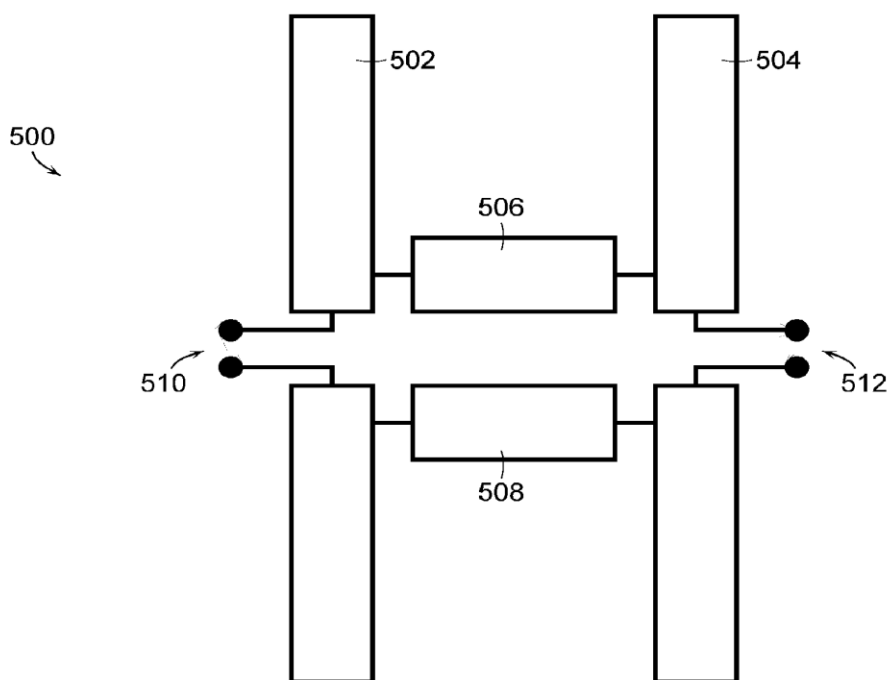
(19) **United States**(12) **Patent Application Publication**  
**Montgomery et al.**(10) **Pub. No.: US 2014/0062819 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **MULTIMODE ANTENNA STRUCTURE**(71) Applicants: **Mark T. Montgomery**, Melbourne, FL  
(US); **Frank Caimi**, Vero Beach, FL  
(US); **Mark W. Kishler**, Rockledge, FL  
(US)(72) Inventors: **Mark T. Montgomery**, Melbourne, FL  
(US); **Frank Caimi**, Vero Beach, FL  
(US); **Mark W. Kishler**, Rockledge, FL  
(US)(73) Assignee: **SKYCROSS, INC.**, Fremont, CA (US)(21) Appl. No.: **13/974,479**(22) Filed: **Aug. 23, 2013****Related U.S. Application Data**

(63) Continuation of application No. 13/454,738, filed on Apr. 24, 2012, now Pat. No. 8,547,289, which is a continuation of application No. 12/750,196, filed on Mar. 30, 2010, now Pat. No. 8,164,538, which is a continuation of application No. 12/099,320, filed on Apr. 8, 2008, now Pat. No. 7,688,273, which is a continuation-in-part of application No. 11/769,565, filed on Jun. 27, 2007, now Pat. No. 7,688,275.

(60) Provisional application No. 60/925,394, filed on Apr. 20, 2007, provisional application No. 60/916,655, filed on May 8, 2007.

**Publication Classification**(51) **Int. Cl.**  
**H01Q 5/02** (2006.01)(52) **U.S. Cl.**  
CPC ..... **H01Q 5/02** (2013.01)  
USPC ..... **343/747; 343/820; 343/770**(57) **ABSTRACT**

A multimode antenna structure is described for a communications device. The communications device includes circuitry for processing signals communicated to and from the antenna structure. The antenna structure is configured for optimal operation in a given frequency range. The antenna structure includes a plurality of antenna ports operatively coupled to the circuitry, and a plurality of antenna elements, each operatively coupled to a different one of the antenna ports. Each of the plurality of antenna elements is configured to have an electrical length selected to provide optimal operation within the given frequency range. By way of one or more connecting elements, electrical currents on one antenna element flow to a connected neighboring antenna element and generally bypass the antenna port coupled to the neighboring antenna element.





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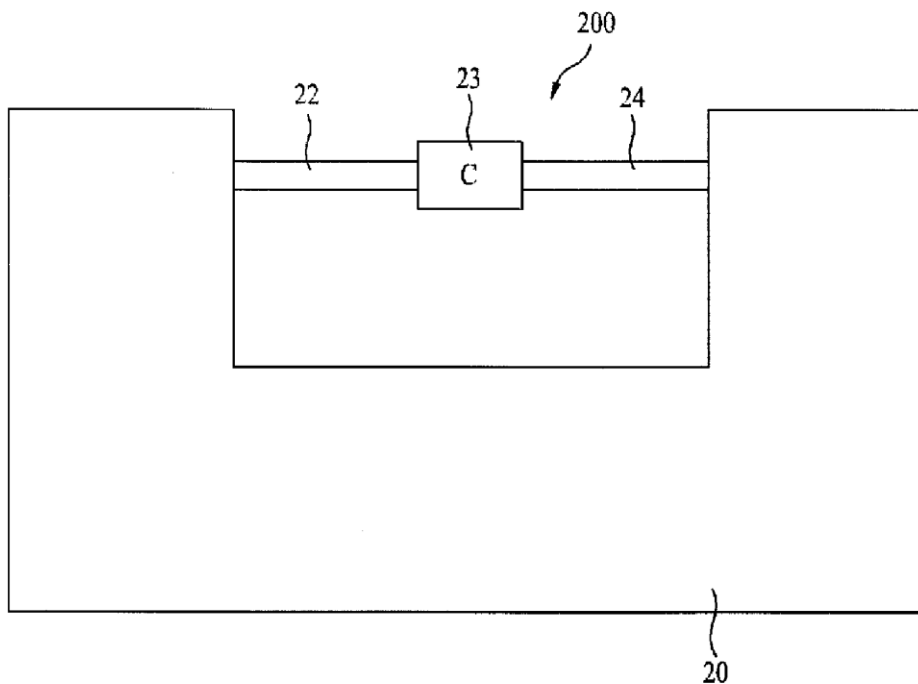
(19) **United States**(12) **Patent Application Publication**  
**JANG et al.**(10) **Pub. No.: US 2014/0062820 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **GROUND ANTENNA AND GROUND  
RADIATOR USING CAPACITOR**(30) **Foreign Application Priority Data**(71) Applicants: **Hyun Min JANG**, Jecheon-si (KR);  
**Hyeng Cheul CHOI**, Seoul (KR); **Dong  
Ryeol LEE**, Seoul (KR); **Yang LIU**,  
Seoul (KR); **Hyung Jin LEE**, Ansan-si  
(KR); **Jae Kyu YU**, Namyangju-si (KR)

Apr. 6, 2011 (KR) ..... 10-2011-0031913

Nov. 3, 2011 (KR) ..... 10-2011-0113754

**Publication Classification**(72) Inventors: **Hyun Min JANG**, Jecheon-si (KR);  
**Hyeng Cheul CHOI**, Seoul (KR); **Dong  
Ryeol LEE**, Seoul (KR); **Yang LIU**,  
Seoul (KR); **Hyung Jin LEE**, Ansan-si  
(KR); **Jae Kyu YU**, Namyangju-si (KR)(51) **Int. Cl.**  
**H01Q 1/48** (2006.01)(52) **U.S. Cl.**  
CPC ..... **H01Q 1/48** (2013.01)  
USPC ..... **343/749; 343/848**(73) Assignee: **RADINA CO., LTD**, Seoul (KR)(21) Appl. No.: **14/047,008**(22) Filed: **Oct. 6, 2013****Related U.S. Application Data**(63) Continuation of application No. PCT/KR2012/  
001027, filed on Feb. 10, 2012.(57) **ABSTRACT**

By providing a radiator configuration circuit and a feeding circuit each having a simple structure, a ground radiation antenna having a more simplified fabrication process as well as a remarkably reduced fabrication cost is provided herein. Additionally, a ground radiation antenna having an excellent radiation performance, even when one side of a mobile communication terminal is covered with a conductive substance, such as an LCD panel, is also provided herein.





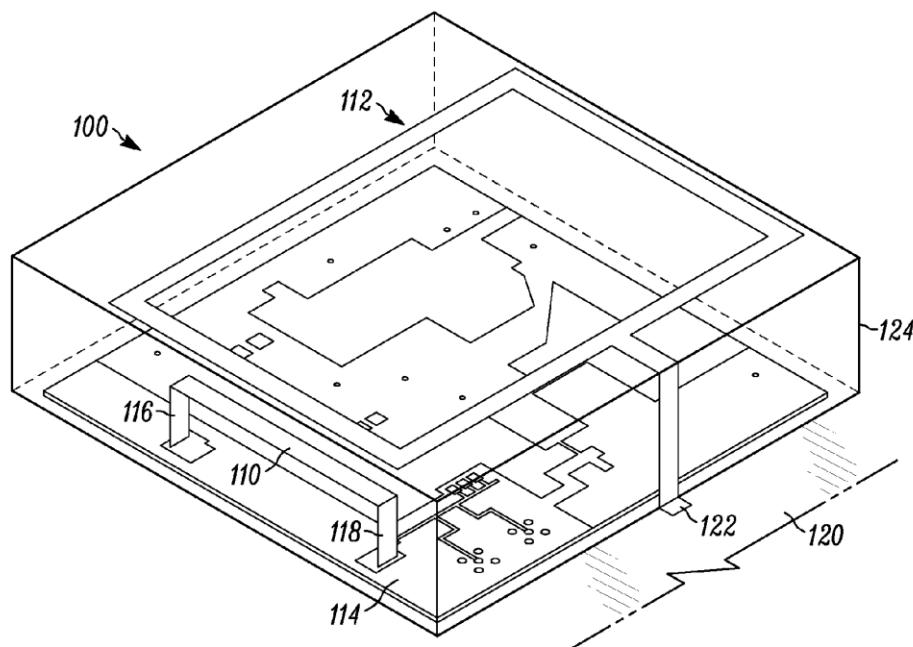
US 20140062828A1

(19) **United States**(12) **Patent Application Publication****Nosov et al.**(10) **Pub. No.: US 2014/0062828 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **RESONANT COMPOUND ANTENNA  
STRUCTURE****Publication Classification**(71) Applicant: **Continental Automotive Systems, Inc.**,  
Auburn Hills, MI (US)(51) **Int. Cl.**  
**H01Q 7/00** (2006.01)(72) Inventors: **Eugene Ivanovich Nosov**, Rochester  
Hills, MI (US); **David James Reimus**,  
Waterford, MI (US); **Delia Perez**,  
Rochester Hills, MI (US)(52) **U.S. Cl.**  
CPC ..... **H01Q 7/00** (2013.01)  
USPC ..... **343/866; 29/600**(21) Appl. No.: **14/020,652**(57) **ABSTRACT**(22) Filed: **Sep. 6, 2013**

A resonant structure, antenna system and method for improving the wireless performance of an interior antenna of a vehicular or mobile device is disclosed. The resonant structure comprises an inductive section configured to inductively couple to an interior antenna and a capacitive section configured to capacitively couple to a ground plane. The inductive section and the capacitive section are communicatively coupled to each other. The interior antenna is configured to be contained in a device package.

**Related U.S. Application Data**

(60) Provisional application No. 61/697,617, filed on Sep. 6, 2012.

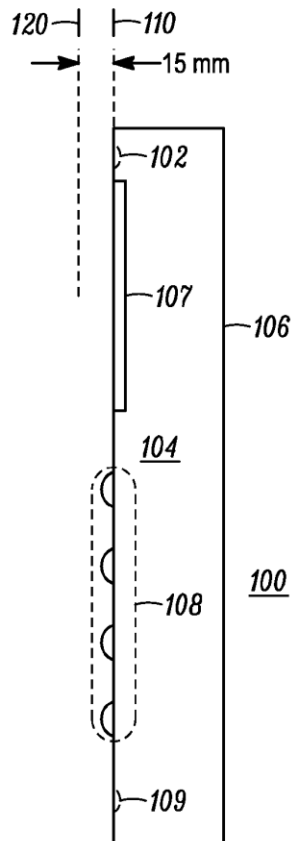




US 20140066126A1

(19) **United States**(12) **Patent Application Publication**  
**Asrani et al.**(10) **Pub. No.: US 2014/0066126 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **PORTABLE ELECTRONIC DEVICE HAVING  
AN ANTENNA SYSTEM WITH A  
NON-RESONATING STRUCTURE****Publication Classification**(51) **Int. Cl.**  
**H04B 7/26** (2006.01)  
(52) **U.S. Cl.**  
CPC ..... **H04B 7/26** (2013.01)  
USPC ..... **455/556.1**(71) Applicant: **Motorola Mobility LLC**, Libertyville,  
IL (US)(72) Inventors: **Vijay L. Asrani**, Round Lake, IL (US);  
**Adrian Napoles**, Lake Villa, IL (US);  
**Louis J. Vannatta**, Crystal Lake, IL  
(US)(73) Assignee: **Motorola Mobility LLC**, Libertyville,  
IL (US)(21) Appl. No.: **14/068,329**(22) Filed: **Oct. 31, 2013****Related U.S. Application Data**(62) Division of application No. 12/645,038, filed on Dec.  
22, 2009, now Pat. No. 8,604,980.(57) **ABSTRACT**

An antenna system for reception and transmission of radio frequency (RF) signals and a method for tuning the antenna system are provided. The antenna system includes a ground plane, a first element and a second element. The first element includes a driven unbalanced antenna element that resonates within at least one predetermined first frequency band to transmit and receive radio frequency (RF) signals modulated at one or more frequencies within the at least one predetermined first frequency band. The second element is non-resonating within the at least one predetermined first frequency band and is located within an antenna volume of the first element to create a partial loop response within the antenna volume of the first element by capacitively coupling to the first element when connected to the ground plane.





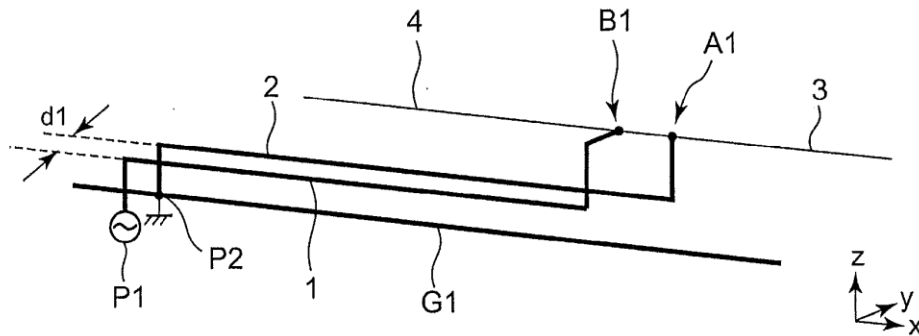
US 20140071000A1

(19) **United States**(12) **Patent Application Publication**  
**TANI et al.**(10) **Pub. No.: US 2014/0071000 A1**(43) **Pub. Date: Mar. 13, 2014**(54) **SMALL ANTENNA APPARATUS OPERABLE  
IN MULTIPLE FREQUENCY BANDS****Publication Classification**(71) Applicant: **PANASONIC CORPORATION**, Osaka  
(JP)(51) **Int. Cl.**  
**H01Q 5/00** (2006.01)(72) Inventors: **Kazuya TANI**, Osaka (JP); **Toshiharu  
ISHIMURA**, Osaka (JP); **Kenji  
NISHIKAWA**, Hyogo (JP); **Kazuya  
NAKANO**, Osaka (JP)(52) **U.S. Cl.**  
CPC ..... **H01Q 5/001** (2013.01)  
USPC ..... **343/700 MS**(73) Assignee: **PANASONIC CORPORATION**, Osaka  
(JP)(57) **ABSTRACT**

A first base radiation element has a first end connected to the feed point, and a second end. A second base radiation element has a first end connected to the ground point, and a second end. The first and second base radiation elements respectively include portions extending in a first direction and close to each other. The first base radiation element is branched into first and second branch radiation elements at a first branch point located at the second end of the first base radiation element, the first branch radiation element includes a portion extending in the first direction, and the second branch radiation element includes a portion extending in a second direction opposite to the first direction. The end of the second base radiation element is connected to a connecting point different from the first branch point of the first branch radiation element.

(21) Appl. No.: **13/787,158**(22) Filed: **Mar. 6, 2013**(30) **Foreign Application Priority Data**

Sep. 13, 2012 (JP) ..... 2012-201477







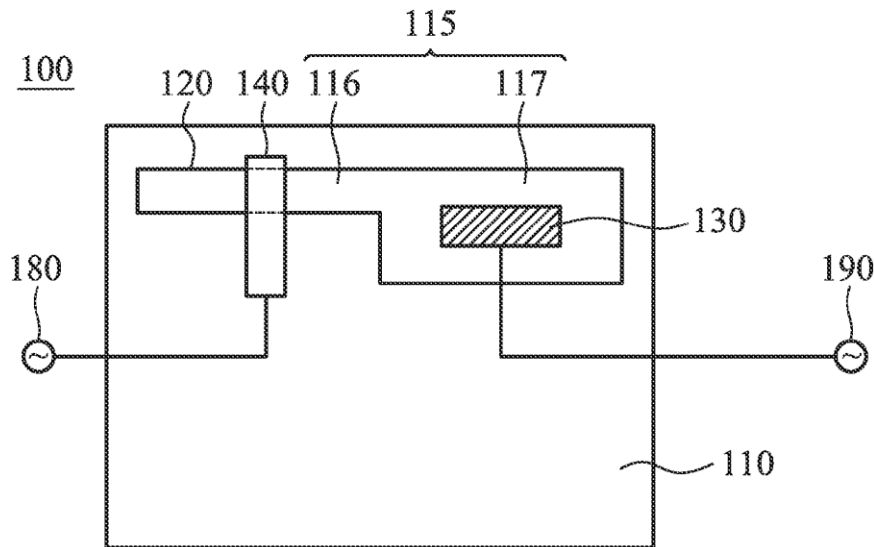
US 20140071005A1

(19) **United States**(12) **Patent Application Publication**  
**WANG**(10) **Pub. No.: US 2014/0071005 A1**(43) **Pub. Date: Mar. 13, 2014**(54) **MOBILE DEVICE AND ANTENNA**  
**STRUCTURE THEREIN****Publication Classification**(51) **Int. Cl.**  
**H01Q 21/28** (2006.01)  
**H01Q 13/10** (2006.01)  
**H01Q 21/30** (2006.01)(71) Applicant: **ACER INCORPORATED**, Taipei  
Hsien (TW)(72) Inventor: **Chuan-Chun WANG**, Taipei Hsien  
(TW)(52) **U.S. Cl.**  
CPC ..... **H01Q 21/28** (2013.01); **H01Q 21/30**  
(2013.01); **H01Q 13/106** (2013.01)  
USPC ..... **343/725**(73) Assignee: **ACER INCORPORATED**, Taipei  
Hsien (TW)(57) **ABSTRACT**

A mobile device includes a metal body element, a feeding element, and a second antenna. The metal body element is substantially a planar structure and has a slot, wherein a first antenna is formed by the slot of the metal body element. The feeding element extends across the slot of the metal body element, and is coupled to a first signal source. The second antenna is substantially located inside the slot of the metal body element, and is coupled to a second signal source. The slot is used as a portion of a resonant structure of the second antenna in order to reduce a total size of the first antenna and the second antenna.

(21) Appl. No.: **13/731,287**(22) Filed: **Dec. 31, 2012**(30) **Foreign Application Priority Data**

Sep. 7, 2012 (TW) ..... 101132656



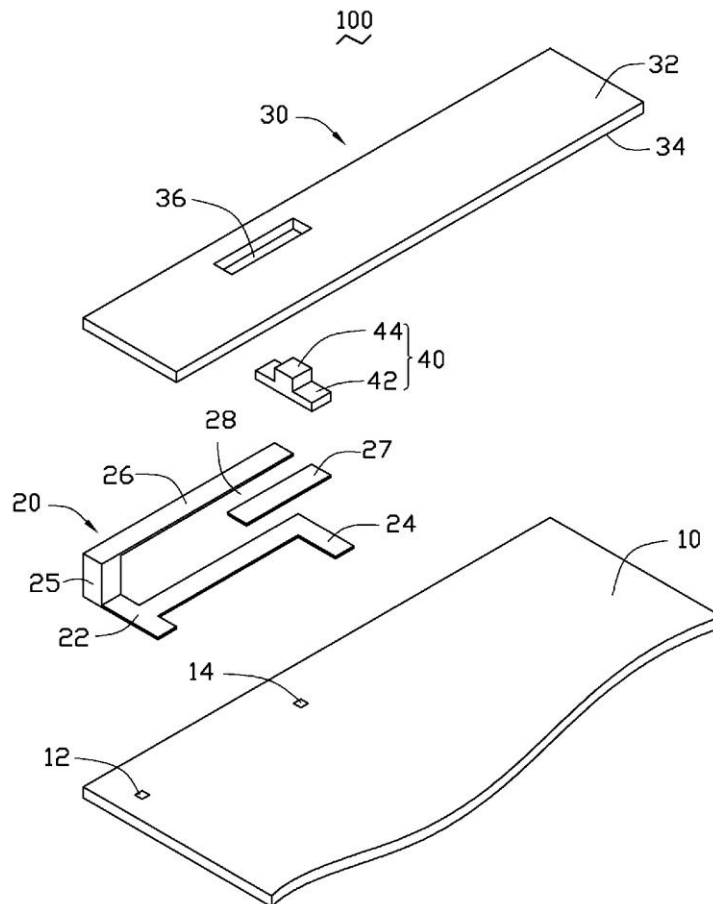


US 20140071007A1

(19) **United States**(12) **Patent Application Publication**  
**LIU**(10) **Pub. No.: US 2014/0071007 A1**(43) **Pub. Date: Mar. 13, 2014**(54) **WIRELESS COMMUNICATION DEVICE****Publication Classification**(71) Applicant: **FIH (Hong Kong) Limited**, Kowloon  
(HK)(51) **Int. Cl.**  
**H01Q 9/06** (2006.01)(72) Inventor: **CHI-SHENG LIU**, New Taipei (TW)(52) **U.S. Cl.**  
CPC ..... **H01Q 9/06** (2013.01)  
USPC ..... **343/745**(73) Assignee: **FIH (HONG KONG) LIMITED**,  
Kowloon (HK)(57) **ABSTRACT**(21) Appl. No.: **13/956,614**(22) Filed: **Aug. 1, 2013**(30) **Foreign Application Priority Data**

Sep. 10, 2012 (TW) ..... 101132904

A wireless communication device includes a cover, an antenna, and an adjusting member. The antenna includes a first radiator and a second radiator separate from the first radiator. The adjusting member is slidably mounted to the cover and is made of conductive materials. The adjusting member is positioned between and connecting the first radiator and the second radiator. The adjusting member is slid relative to the cover to change connection positions of the adjusting member relative to the first radiator and the second radiator.









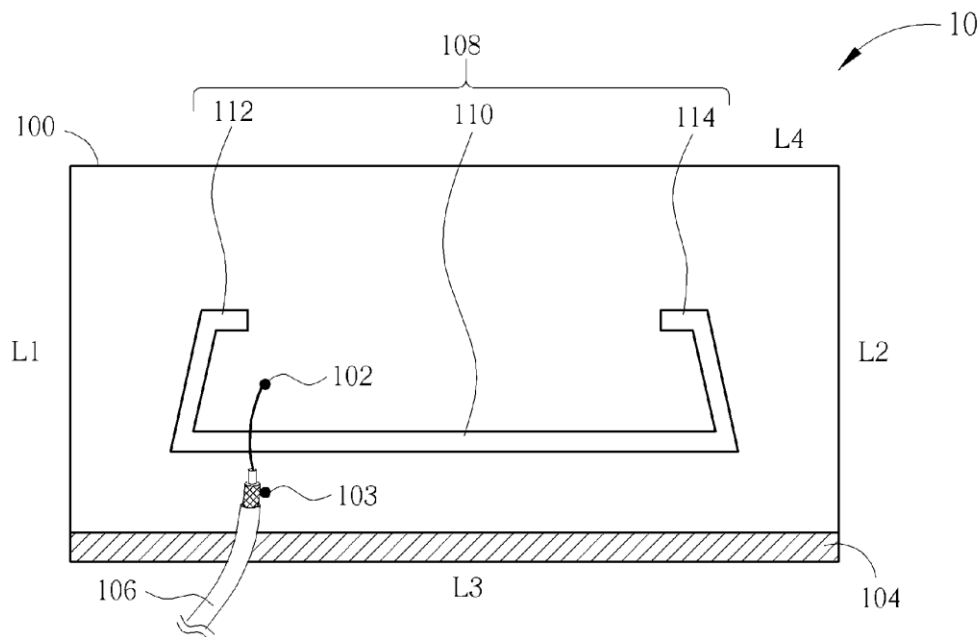
US 20140071009A1

(19) **United States**(12) **Patent Application Publication**  
**Cheng et al.**(10) **Pub. No.: US 2014/0071009 A1**(43) **Pub. Date: Mar. 13, 2014**(54) **DUAL-BAND ANTENNA**(71) Applicant: **WISTRON NEWEB CORPORATION**, Hsinchu (TW)(72) Inventors: **Kai-Yang Cheng**, Hsinchu (TW);  
**Ming-Feng Chang**, Hsinchu (TW);  
**Chih-Ming Wang**, Hsinchu (TW)(73) Assignee: **Wistron NeWeb Corporation**, Hsinchu (TW)(21) Appl. No.: **13/745,857**(22) Filed: **Jan. 20, 2013**(30) **Foreign Application Priority Data**

Sep. 7, 2012 (TW) ..... 101132787

**Publication Classification**(51) **Int. Cl.**  
**H01Q 13/10** (2006.01)(52) **U.S. Cl.**CPC ..... **H01Q 13/10** (2013.01)USPC ..... **343/770; 343/767**(57) **ABSTRACT**

A dual-band antenna utilized in a wireless communication device for receiving or transmitting wireless signals of a first frequency band and a second frequency band includes a rectangular metal plane formed with a slot structure substantially extending from a first side to a second side of the rectangular metal plane, a feeding terminal formed on the rectangular metal plane, and a grounding element, disposed on a third side or a fourth side of the rectangular metal plane, for electrically connecting the rectangular metal plane and a system ground of the wireless communication device, wherein the first side is substantially parallel to the second side, the third side is substantially parallel to the fourth side, and the first side is substantially perpendicular to the third side or the fourth side.





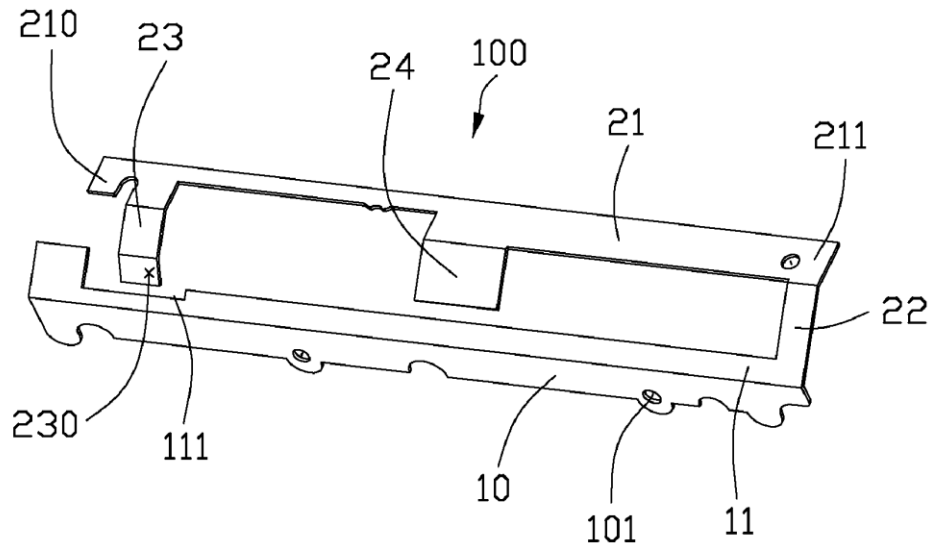
US 20140071014A1

(19) **United States**(12) **Patent Application Publication**  
**TAI**(10) **Pub. No.: US 2014/0071014 A1**(43) **Pub. Date: Mar. 13, 2014**(54) **MULTI-BAND ANTENNA**(52) **U.S. Cl.**(71) Applicant: **HON HAI PRECISION INDUSTRY**  
**CO., LTD.**, New Taipei (TW)CPC ..... **H01Q 5/0027** (2013.01); **H01Q 5/01**  
(2013.01)(72) Inventor: **LUNG-SHENG TAI**, New Taipei (TW)USPC ..... **343/848**; 343/700 MS(73) Assignee: **HON HAI PRECISION INDUSTRY**  
**CO., LTD.**, New Taipei (TW)(57) **ABSTRACT**(21) Appl. No.: **14/023,417**(22) Filed: **Sep. 10, 2013**(30) **Foreign Application Priority Data**

Sep. 10, 2012 (TW) ..... 101132903

**Publication Classification**(51) **Int. Cl.**  
**H01Q 5/00** (2006.01)  
**H01Q 5/01** (2006.01)

A multi-band antenna includes a longitudinal grounding element, a longitudinal arm extending along a longitudinal direction thereof, and a first lateral arm extending from the longitudinal arm and separating from the grounding plate. The longitudinal arm connects with the grounding plate through a connecting arm at an end thereof. The first lateral arm is disposed adjacent to the opposite end of the longitudinal arm to divide the longitudinal arm to two radiating portions. The first lateral arm defines a feeding point. This structure of the antenna benefits to radiating efficiency and isolation of adjacent antennas.





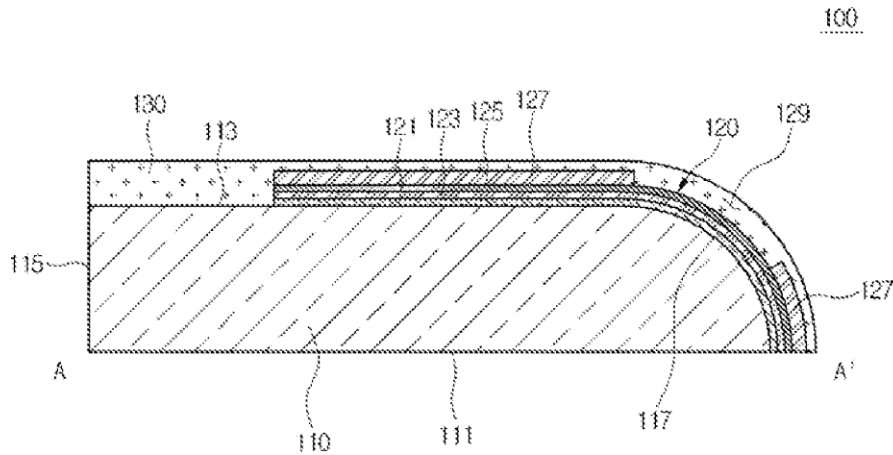
US 20140071019A1

(19) **United States**(12) **Patent Application Publication**  
**LIM**(10) **Pub. No.: US 2014/0071019 A1**(43) **Pub. Date: Mar. 13, 2014**(54) **ANTENNA APPARATUS AND METHOD OF  
MANUFACTURING THE SAME****Publication Classification**(71) Applicant: **LG INNOTEK CO., LTD.**, Seoul (KR)(51) **Int. Cl.**  
**H01Q 1/36** (2006.01)(72) Inventor: **Dong Uk LIM**, Seoul (KR)(52) **U.S. Cl.**  
CPC ..... **H01Q 1/36** (2013.01)  
USPC ..... **343/873**; 156/280; 156/250(73) Assignee: **LG INNOTEK CO., LTD.**, Seoul (KR)(57) **ABSTRACT**(21) Appl. No.: **14/024,905**

Disclosed are an antenna apparatus and a method of manufacturing the same. The antenna apparatus includes a base, a radiation device on the base, and a protective layer formed on the radiation device to expose a partial region of the radiation device. The outer appearance failure of the antenna apparatus can be prevented, and the electrical performance of the antenna apparatus can be ensured.

(22) Filed: **Sep. 12, 2013**(30) **Foreign Application Priority Data**

Sep. 13, 2012 (KR) ..... 10-2012-0101788





US 20140071022A1

United States

**(12) Patent Application Publication**  
NA**(10) Pub. No.: US 2014/0071022 A1**  
**(43) Pub. Date: Mar. 13, 2014****(54) MOBILE TERMINAL****(52) U.S. Cl.**  
CPC*H01Q 5/001* (2013.01)**(71) Applicant: LG ELECTRONICS INC., Seoul (KR)**

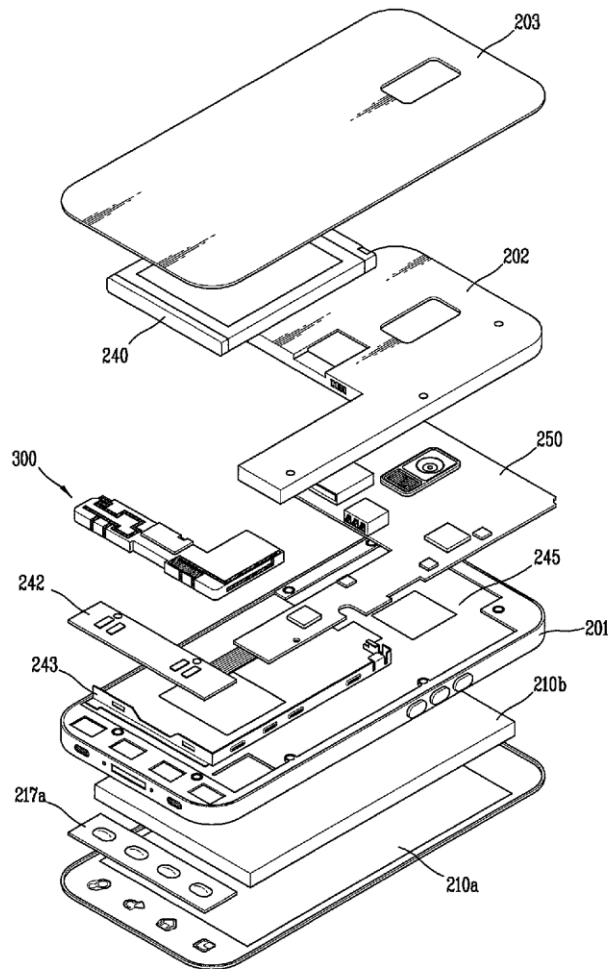
USPC 343/904

**(72) Inventor: Youngsoo NA, Seoul (KR)****(73) Assignee: LG ELECTRONICS INC., Seoul (KR)****(21) Appl. No.: 14/023,132****(22) Filed: Sep. 10, 2013****(30) Foreign Application Priority Data**

Sep. 11, 2012 (KR) ..... 10-2012-0100608

**Publication Classification****(51) Int. Cl.**  
*H01Q 5/00* (2006.01)**(57) ABSTRACT**

A mobile terminal including a terminal body; a display configured to display information; and an antenna device mounted in the terminal body. Further, the antenna device includes a first conductive member including a shape such that the antenna device resonates at a first frequency band; a second conductive member diverging from the first conductive member, and extending by a prescribed length; and a ground member spaced apart from the second conductive member, and capacitive-coupled to the second conductive member, such that a frequency resonance added by the second conductive member is generated near a center frequency of the first frequency band.





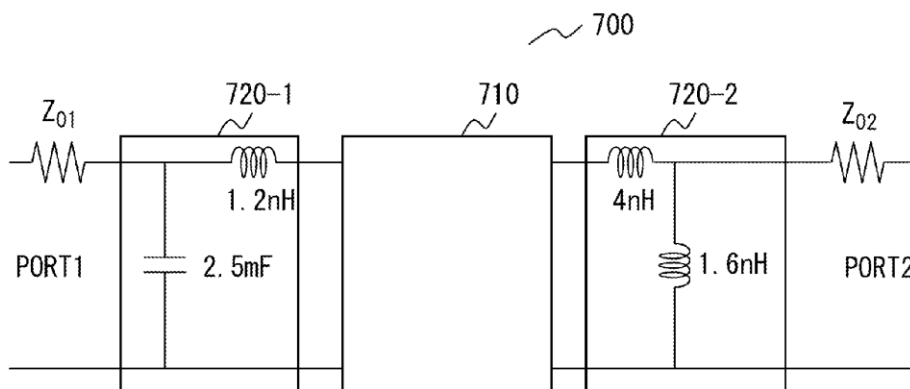
US 20140074440A1

(19) **United States**(12) **Patent Application Publication**  
**YAMAGAJO et al.**(10) **Pub. No.: US 2014/0074440 A1**(43) **Pub. Date: Mar. 13, 2014**(54) **ANTENNA DESIGN METHOD AND APPARATUS**(71) Applicant: **Fujitsu Limited**, Kawasaki-shi (JP)(72) Inventors: **Takashi YAMAGAJO**, Yokosuka (JP);  
**Tabito TONOOKA**, Kawasaki (JP); **Kai NOJIMA**, Yokohama (JP)(73) Assignee: **Fujitsu Limited**, Kawasaki-shi (JP)(21) Appl. No.: **14/016,891**(22) Filed: **Sep. 3, 2013**(30) **Foreign Application Priority Data**

Sep. 10, 2012 (JP) ..... 2012-198958

**Publication Classification**(51) **Int. Cl.**  
**G06F 17/50** (2006.01)(52) **U.S. Cl.**CPC ..... **G06F 17/50** (2013.01); **G06F 17/5045**  
(2013.01)USPC ..... **703/1**(57) **ABSTRACT**

An antenna design method executed by a computer includes creating an antenna model including an antenna which includes a plurality of antenna elements and matching circuits which are respectively connected to the plurality of antenna elements and which comprise a matching element including a parasitic reactance and a loss resistance; obtaining a characteristic of the antenna and a characteristic of the matching element; calculating a characteristic of the created antenna model using the obtained characteristic of the antenna and the characteristic of the matching element; judging whether or not the calculated characteristic of the antenna model satisfies a standard value; and displaying result of the judgment.





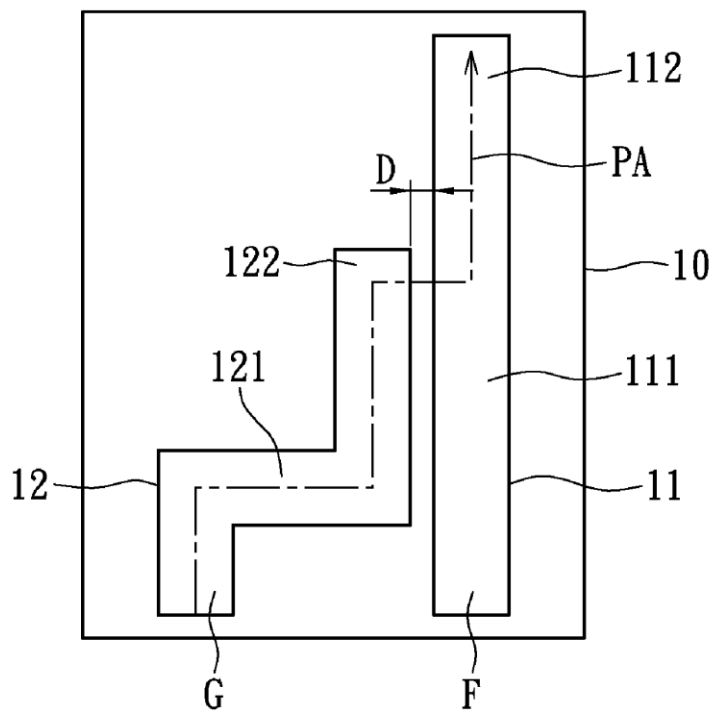
US 20140078000A1

(19) **United States**(12) **Patent Application Publication**  
**HUANG et al.**(10) **Pub. No.: US 2014/0078000 A1**(43) **Pub. Date: Mar. 20, 2014**(54) **MULTIBAND ANTENNA STRUCTURE**(52) **U.S. CL.**

USPC ..... 343/700 MS

(75) Inventors: **YU-TSUNG HUANG**, KAOHSIUNG  
CITY (TW); **JIAN-MIN TSAI**, NEW  
TAIPEI CITY (TW); **CHING-WEI**  
**CHANG**, NEW TAIPEI CITY (TW)(57) **ABSTRACT**

A multiband antenna structure comprises a substrate, a first radiating unit and a second radiating unit. The first radiating unit is disposed on the substrate, having a feed-in end, a first radiating path and a first terminal. The first radiating unit is operated at a first operating frequency. The second radiating unit is disposed on the substrate and has a grounding end, a second radiating path and a second terminal. The second radiating unit is operated at a second operating frequency. The first terminal of the first radiating unit is adjacent to the second radiating path or the second terminal of the second radiating unit is adjacent to the first radiating path for the first radiating unit or the second unit to excite a third operating frequency. The third operating frequency is lower than the lower frequency among the first operating frequency and the second operating frequency.

(73) Assignee: **AUDEN TECHNO CORP.**, TAOYUAN  
COUNTY (TW)(21) Appl. No.: **13/618,201**(22) Filed: **Sep. 14, 2012****Publication Classification**(51) **Int. Cl.**  
**H01Q 5/01** (2006.01)1



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

(43) **Pub. Date:** Mar. 20, 2014

### Publication Classification

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

(52) **U.S. Cl.**  
CPC ..... *H01Q 5/0024* (2013.01)  
USPC ..... 343/700 MS

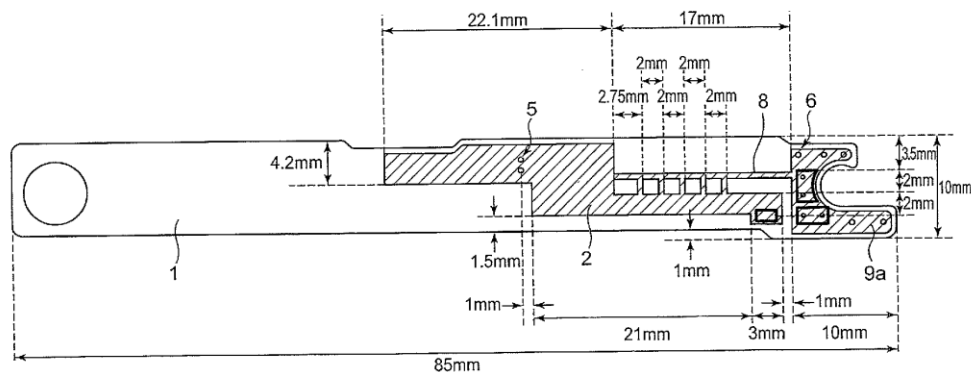
(57) **ABSTRACT**

An antenna apparatus is provided with a dielectric substrate, a feed point, a first radiation conductor, a second radiation conductor, and a through-hole conductor. The first radiation element is capacitively coupled to the second radiation element in a portion where the first and second radiation conductors overlaps with each other via the dielectric substrate. At least one of the first and second radiation elements has a meander portion formed in the portion where the first and second radiation elements are capacitively coupled to each other, and an LC resonator is formed of the meander portion, and the portion where the first and second radiation elements are capacitively coupled to each other.

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

(30) **Foreign Application Priority Data**

Sep. 14, 2012 (JP) ..... 2012-203066







US 20140078002A1

(19) **United States**(12) **Patent Application Publication**  
**HUNG**(10) **Pub. No.: US 2014/0078002 A1**(43) **Pub. Date: Mar. 20, 2014**(54) **ANTENNA**(71) Applicant: **ACCTON TECHNOLOGY**  
**CORPORATION, HSINCHU (TW)**(72) Inventor: **Ching-Fa HUNG, HSINCHU (TW)**(21) Appl. No.: **13/927,893**(22) Filed: **Jun. 26, 2013**(30) **Foreign Application Priority Data**

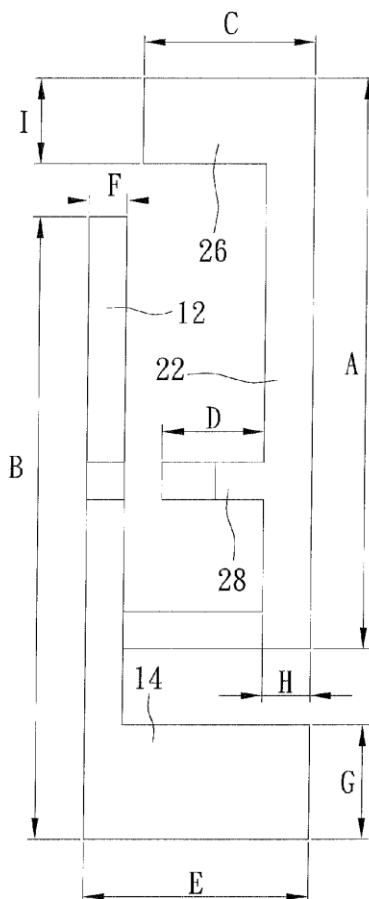
Sep. 19, 2012 (TW) ..... 101134323

**Publication Classification**(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)(52) **U.S. Cl.**CPC ..... **H01Q 9/0407** (2013.01)USPC ..... **343/700 MS**

(57)

**ABSTRACT**

An antenna includes an oscillating member and a grounding member arranged toward each other. The oscillating member includes a main body and a first extending section. The first extending section is projected from a first end of the main body toward the grounding member. The grounding member includes a main body, a second extending section, a third extending section, a fourth extending section and a grounding section. The second extending section is projected from a third end of the main body toward the oscillating member; the third extending section is projected from a fourth end of the main body toward the oscillating member; the fourth extending section is projected from the main body toward the oscillating member. The second extending section is the only one to electrically connect the oscillating member and the grounding member. The grounding section has a grounding point as a ground of the antenna.





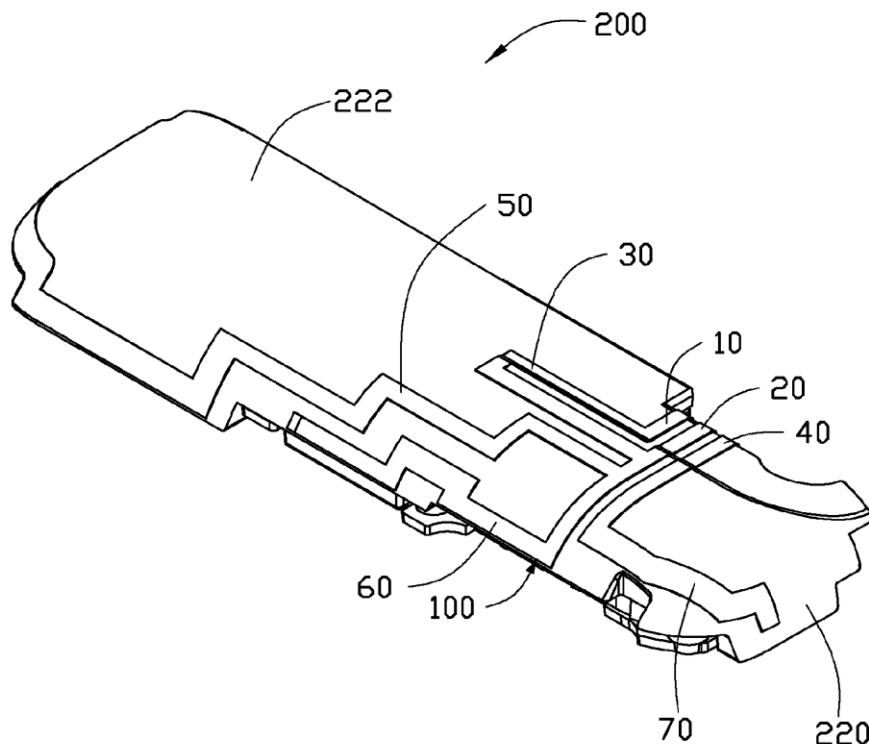
US 20140078003A1

(19) **United States**(12) **Patent Application Publication****LIN et al.**(10) **Pub. No.: US 2014/0078003 A1**(43) **Pub. Date: Mar. 20, 2014**(54) **ANTENNA MODULE AND WIRELESS COMMUNICATION DEVICE**(71) Applicant: **Chiun Mai Communication Systems, Inc.**, New Taipei (TW)(72) Inventors: **TE-CHANG LIN**, New Taipei (TW);  
**CHO-KANG HSU**, New Taipei (TW)(73) Assignee: **CHIUN MAI COMMUNICATION SYSTEMS, INC.**, New Taipei (TW)(21) Appl. No.: **14/017,427**(22) Filed: **Sep. 4, 2013**(30) **Foreign Application Priority Data**

Sep. 18, 2012 (TW) ..... 101134072

**Publication Classification**(51) **Int. Cl.**  
**H01Q 5/00** (2006.01)(52) **U.S. Cl.**CPC ..... **H01Q 5/0027** (2013.01)USPC ..... **343/700 MS**(57) **ABSTRACT**

An antenna module for a wireless communication device includes a first ground portion for grounding to the antenna module, a feed portion, a connecting portion connected to the first ground portion and the feed portion, a first radiating body, a second radiating body connected to the feed portion and the first radiating body, a second ground portion, and an extending portion connected to the second ground portion and spaced from the feed portion. The first radiating body operates within a first working frequency band. The second radiating body operates within a second working frequency band. The second ground portion, the feed portion, and the first ground portion are parallel to and spaced from each other. The extending portion is configured to adjust a bandwidth of a preset frequency band of the antenna module.





US 20140078004A1

(19) **United States**(12) **Patent Application Publication****Christensen et al.**(10) **Pub. No.: US 2014/0078004 A1**(43) **Pub. Date: Mar. 20, 2014**(54) **ANTENNA SYSTEM****Publication Classification**(75) Inventors: **Morten Christensen**, Aalborg (DK);  
**Ole Jagielski**, Frederikshavn (DK);  
**Simon Svendsen**, Aalborg (DK)(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)(73) Assignee: **Molex Incorporated**, Lisle, IL (US)(52) **U.S. Cl.**  
CPC ..... **H01Q 9/04** (2013.01)  
USPC ..... **343/700 MS**(21) Appl. No.: **14/118,252**(22) PCT Filed: **May 21, 2012**(86) PCT No.: **PCT/US2012/038839**

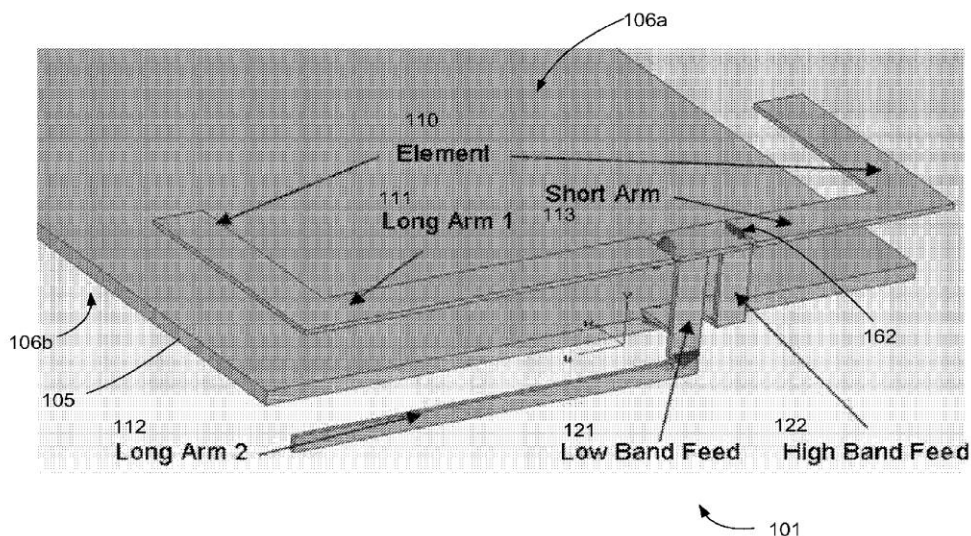
§ 371 (c)(1),

(2), (4) Date: **Nov. 18, 2013****Related U.S. Application Data**

(60) Provisional application No. 61/487,777, filed on May 19, 2011.

(57) **ABSTRACT**

An antenna is disclosed where a third resonator is added to the resonating structure. Impedance bandwidth improvements can be obtained for both high and low bands, with only a small increase of the antenna volume. The low band bandwidth can be further enhanced by active switching of the low band feed.





US 20140078008A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0078008 A1**

(43) **Pub. Date: Mar. 20, 2014**

(54) **MOBILE TERMINAL**

**Publication Classification**

(71) Applicants: **Yunmo Kang**, Seoul (KR); **Kangjae Jung**, Seoul (KR); **Sungjoon Hong**, Seoul (KR); **Byungwoon Jung**, Seoul (KR); **Sungjung Rho**, Seoul (KR)

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

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/30** (2013.01)  
USPC ..... **343/702**

(72) Inventors: **Yunmo Kang**, Seoul (KR); **Kangjae Jung**, Seoul (KR); **Sungjoon Hong**, Seoul (KR); **Byungwoon Jung**, Seoul (KR); **Sungjung Rho**, Seoul (KR)

(57) **ABSTRACT**

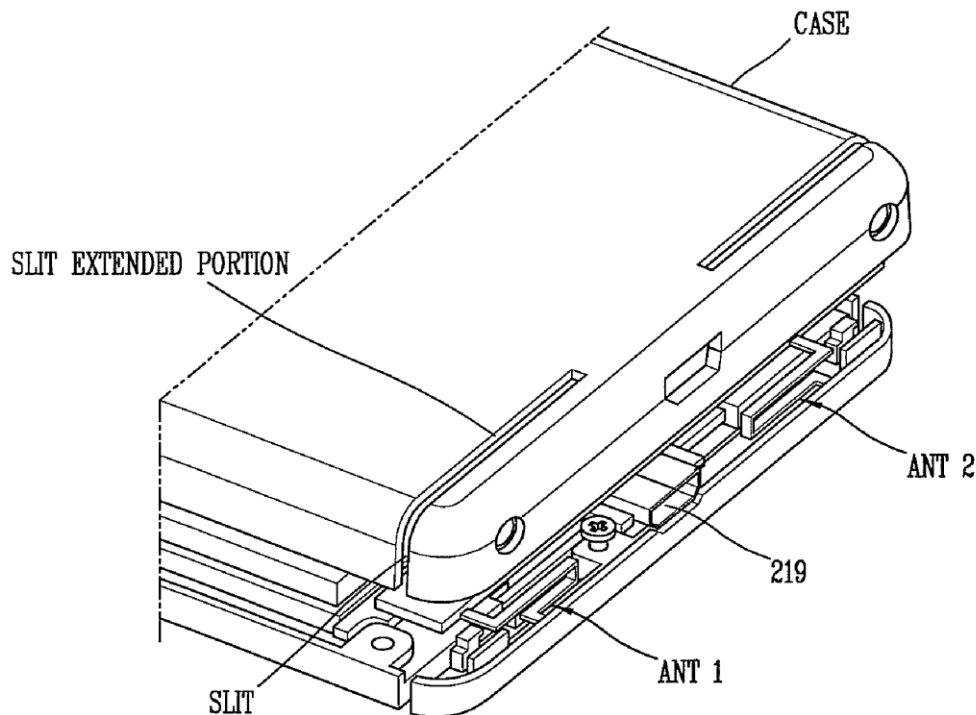
(21) Appl. No.: **14/010,900**

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

(30) **Foreign Application Priority Data**

Sep. 19, 2012 (KR) ..... 10-2012-0104152

A mobile terminal comprises: a terminal body; and a first antenna device and a second antenna device disposed at one side of the terminal body in an adjacent manner, and formed to operate at different frequency bands, wherein the first antenna device and the second antenna device are provided with conductive members each having a slit at one side thereof, and wherein the conductive members form part of an appearance of the terminal body.





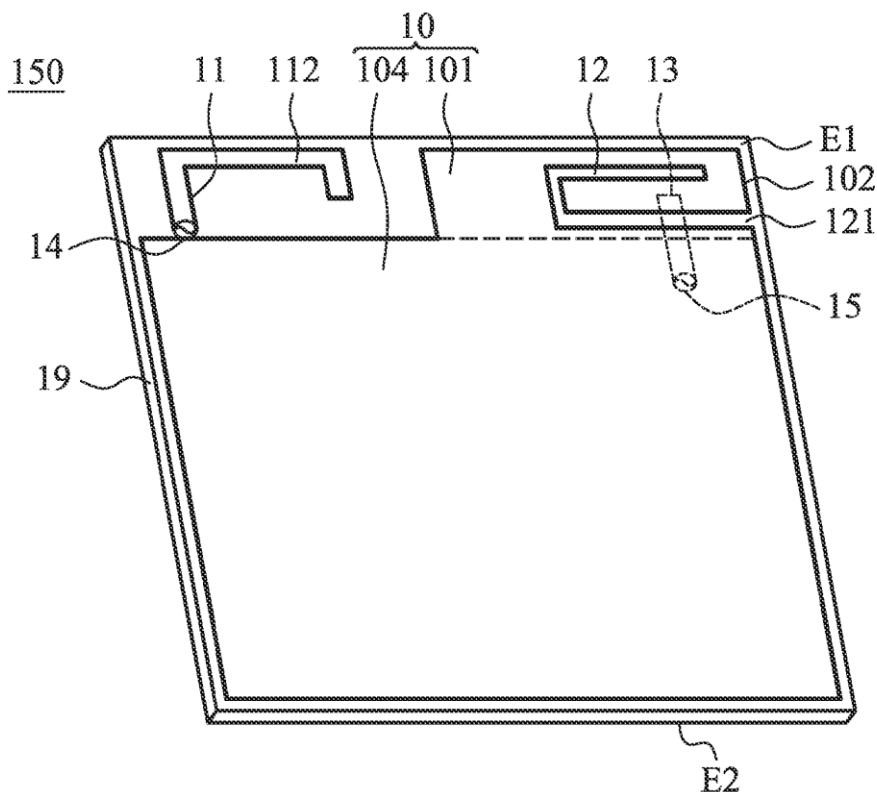
US 20140078009A1

(19) **United States**(12) **Patent Application Publication**  
**WONG et al.**(10) **Pub. No.: US 2014/0078009 A1**(43) **Pub. Date: Mar. 20, 2014**(54) **COMMUNICATION DEVICE AND ANTENNAS  
WITH HIGH ISOLATION  
CHARACTERISTICS****Publication Classification**(51) **Int. Cl.**  
**H01Q 21/28** (2006.01)(52) **U.S. Cl.**  
CPC ..... **H01Q 21/28** (2013.01)  
USPC ..... **343/728; 343/725**(71) Applicant: **ACER INCORPORATED**, Taipei  
Hsien (TW)(72) Inventors: **Kin-Lu WONG**, Kaohsiung City (TW);  
**Po-Wei LIN**, Kaohsiung City (TW)(73) Assignee: **ACER INCORPORATED**, Taipei  
Hsien (TW)(21) Appl. No.: **13/712,136**(22) Filed: **Dec. 12, 2012**(30) **Foreign Application Priority Data**

Sep. 20, 2012 (TW) ..... 101134407

(57) **ABSTRACT**

The present invention is related to a communication device which includes a ground element and an antenna system. The ground element includes a main ground plane and a protruded ground plane. The antenna system includes a first antenna and a second antenna. The first antenna includes a metal radiation element and is adjacent to the main ground plane of the ground element. The second antenna is a slot antenna and is formed in the protruded ground plane of the ground element. The protruded ground plane is adjacent to the first antenna.





US 20140078010A1

(19) **United States**(12) **Patent Application Publication****Li et al.**(10) **Pub. No.: US 2014/0078010 A1**(43) **Pub. Date: Mar. 20, 2014**

(54) **MULTIPLE INPUT MULTIPLE OUTPUT (MIMO) ANTENNAS HAVING POLARIZATION AND ANGLE DIVERSITY AND RELATED WIRELESS COMMUNICATIONS DEVICES**

**Publication Classification**

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

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/0075** (2013.01)  
USPC ..... **343/729**

(75) Inventors: **Hui Li**, Stockholm (SE); **Buon Kiong Lau**, Lund (SE); **Ying Zhinong**, Lund (SE)

(73) Assignee: **Sony Ericsson Mobile Communications AB**, Lund (SE)

(57) **ABSTRACT**

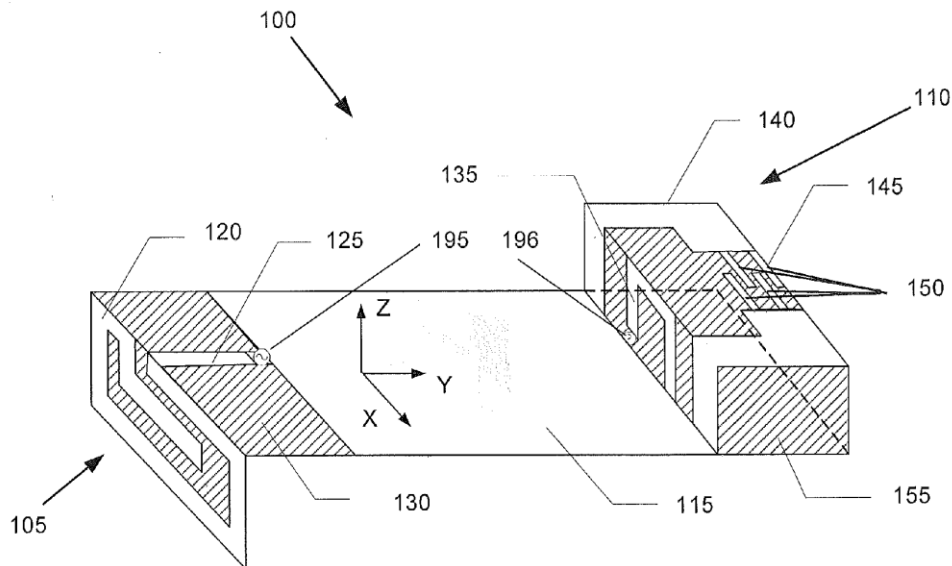
(21) Appl. No.: **14/115,461**

(22) PCT Filed: **Jun. 30, 2011**

(86) PCT No.: **PCT/IB2011/001532**

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

Antenna systems are provided including a chassi and first and second radiating elements coupled to the chassi. The first radiating element is configured to amplify excitation of the chassi and the second radiating element is configured to reduce excitation of the chassi so as to reduce mutual coupling in the antenna system. Related co-located antennas and methods of controlling mutual coupling are also provided.





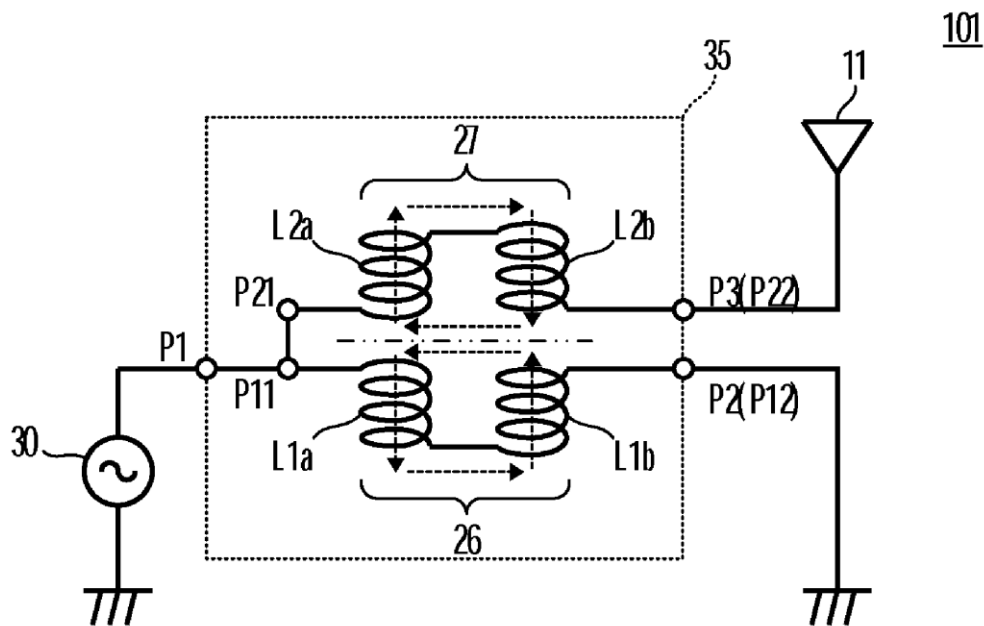
US 20140078014A1

(19) **United States**(12) **Patent Application Publication**  
**KATO et al.**(10) **Pub. No.: US 2014/0078014 A1**(43) **Pub. Date: Mar. 20, 2014**(54) **ANTENNA DEVICE AND COMMUNICATION  
TERMINAL APPARATUS****Publication Classification**(71) Applicant: **Murata Manufacturing Co., Ltd.**,  
Nagaokakiyo-shi (JP)(51) **Int. Cl.**  
**H01Q 1/50** (2006.01)(72) Inventors: **Noboru KATO**, Nagaokakyō-shi (JP);  
**Tsutomu IEKI**, Nagaokakyō-shi (JP)(52) **U.S. Cl.**  
CPC ..... **H01Q 1/50** (2013.01)  
USPC ..... **343/860**(73) Assignee: **MURATA MANUFACTURING CO.,  
LTD.**, Nagaokakyō-shi (JP)(57) **ABSTRACT**(21) Appl. No.: **14/085,888**

An antenna device includes an antenna element and an impedance conversion circuit connected to the antenna element. The impedance conversion circuit is inserted between the antenna element and a feeding circuit, and includes a first series circuit where a first coil conductor and a second coil conductor are connected in series, and a second series circuit where a third coil conductor and a fourth coil conductor are connected in series. The first and second coil conductors define a closed magnetic circuit through which a closed loop of a first magnetic flux passes, and the third and fourth coil conductors define a closed magnetic circuit through which a closed loop of a second magnetic flux passes. Consequently, the antenna device performs impedance matching with the feeding circuit in a wide frequency band.

(22) Filed: **Nov. 21, 2013****Related U.S. Application Data**(63) Continuation of application No. PCT/JP2012/062577,  
filed on May 17, 2012.(30) **Foreign Application Priority Data**

May 31, 2011 (JP) ..... 2011-122909





US 20140078017A1

(19) **United States**

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

(10) **Pub. No.: US 2014/0078017 A1**

(43) **Pub. Date: Mar. 20, 2014**

(54) **MULTI LAYER 3D ANTENNA CARRIER  
ARRANGEMENT FOR ELECTRONIC  
DEVICES**

**Publication Classification**

(71) Applicants: **Kiran Vanjani**, San Diego, CA (US);  
**Jorge Fabrega Sanchez**, San Diego, CA  
(US); **Hui Vicki Tan**, San Diego, CA  
(US)

(51) **Int. Cl.**  
**H01Q 1/12** (2006.01)  
**H01Q 5/01** (2006.01)  
**H01Q 1/24** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **343/878**

(72) Inventors: **Kiran Vanjani**, San Diego, CA (US);  
**Jorge Fabrega Sanchez**, San Diego, CA  
(US); **Hui Vicki Tan**, San Diego, CA  
(US)

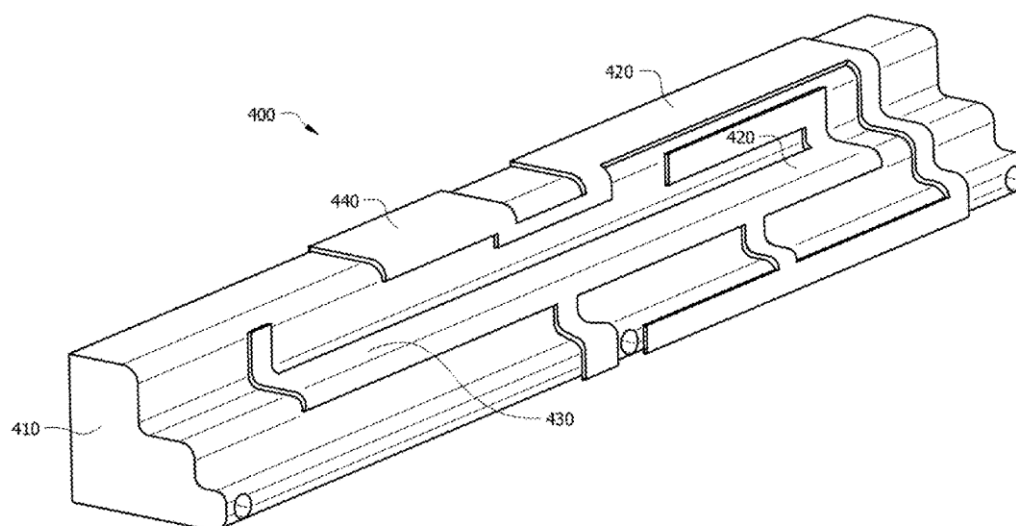
(57) **ABSTRACT**

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

An antenna comprising a plurality of carrier blocks, wherein each carrier block is coupled to at least one other carrier block, and a plurality of radiators, wherein each radiator is connected to at least one carrier block. Further, an antenna comprising a plurality of carrier blocks, wherein each carrier block is coupled with at least one other carrier block, and a radiator connected to at least two of the plurality of carrier blocks.

(21) Appl. No.: **13/622,134**

(22) Filed: **Sep. 18, 2012**







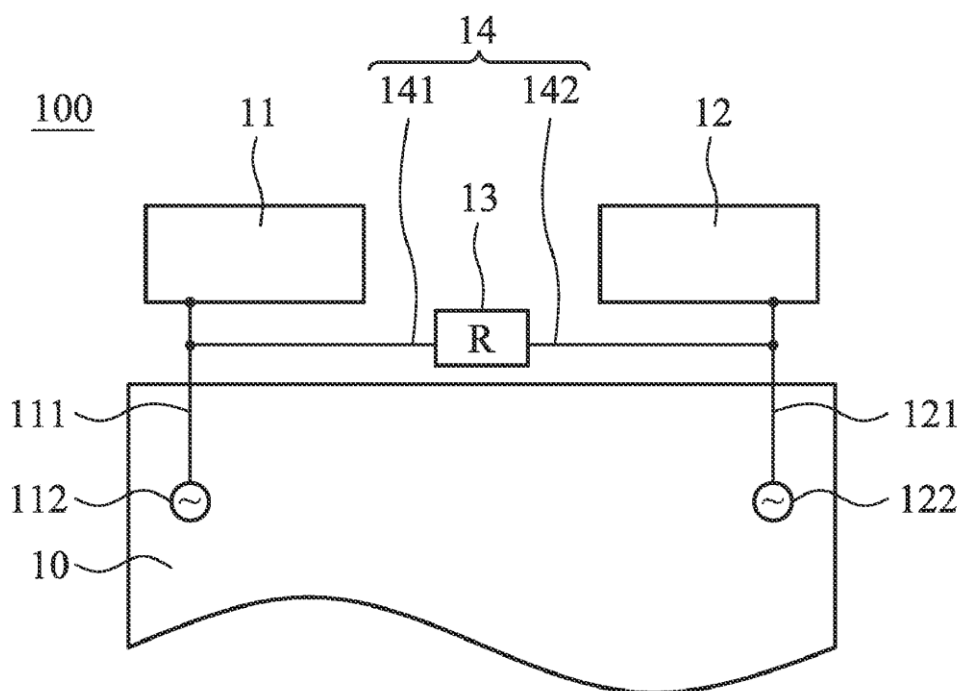
US 20140078018A1

(19) **United States**(12) **Patent Application Publication**  
**WONG et al.**(10) **Pub. No.: US 2014/0078018 A1**(43) **Pub. Date: Mar. 20, 2014**(54) **COMMUNICATION DEVICE AND ANTENNA  
SYSTEM WITH HIGH ISOLATION****Publication Classification**(71) Applicant: **ACER INCORPORATED**, Hsichih  
(TW)(51) **Int. Cl.**  
**H01Q 21/28** (2006.01)(72) Inventors: **Kin-Lu WONG**, Hsichih (TW);  
**Wun-Jian LIN**, Hsichih (TW)(52) **U.S. Cl.**  
CPC ..... **H01Q 21/28** (2013.01)  
USPC ..... **343/893**(73) Assignee: **Acer Incorporated**, Hsichih (TW)(57) **ABSTRACT**(21) Appl. No.: **13/777,587**

A communication device including a ground element and an antenna system is provided. The antenna system is adjacent to the ground element. The antenna system includes at least a first antenna, a second antenna, a connection element, and a resistive element. The second antenna is adjacent to the first antenna. The connection element includes a first portion and a second portion, wherein the first portion is coupled to the first antenna, and the second portion is coupled to the second antenna. The resistive element is coupled between the first portion and the second portion of the connection element. The connection element and the resistive element increase the isolation between the first antenna and the second antenna.

(22) Filed: **Feb. 26, 2013**(30) **Foreign Application Priority Data**

Sep. 14, 2012 (TW) ..... 101133609





US 20140078019A1

(19) **United States**(12) **Patent Application Publication**  
**KIM et al.**(10) **Pub. No.: US 2014/0078019 A1**(43) **Pub. Date: Mar. 20, 2014**(54) **ANTENNA USING LIQUID METAL AND  
ELECTRONIC DEVICE EMPLOYING THE  
SAME**(71) Applicant: **Samsung Electronics Co., Ltd.**,  
Gyeonggi-do (KR)(72) Inventors: **Hosaeng KIM**, Gyeonggi-do (KR);  
**Yoonjae LEE**, Gyeonggi-do (KR)(73) Assignee: **Samsung Electronics Co., Ltd.**,  
Gyeonggi-do (KR)(21) Appl. No.: **14/028,732**(22) Filed: **Sep. 17, 2013**(30) **Foreign Application Priority Data**

Sep. 17, 2012 (KR) ..... 10-2012-0102569

**Publication Classification**(51) **Int. Cl.**  
**H01Q 3/01** (2006.01)  
**H01Q 1/36** (2006.01)(52) **U.S. Cl.**  
CPC . **H01Q 3/01** (2013.01); **H01Q 1/364** (2013.01)  
USPC ..... **343/908**(57) **ABSTRACT**

An antenna using a liquid metal is provided. The antenna includes a plurality of antenna structures, each having an inner cavity of a form corresponding to a radiator pattern; and at least one actuator connected to at least two of the plurality of antenna structures to control movement of the liquid metal to supply the liquid metal to at least one of the antenna structures. Thereby, deterioration of an antenna performance due to an influence of a human body can be prevented, and deterioration of an antenna performance can be prevented due to a form change of an electronic device including the antenna. In this manner, optimal antenna radiation performance can be dynamically realized.

