



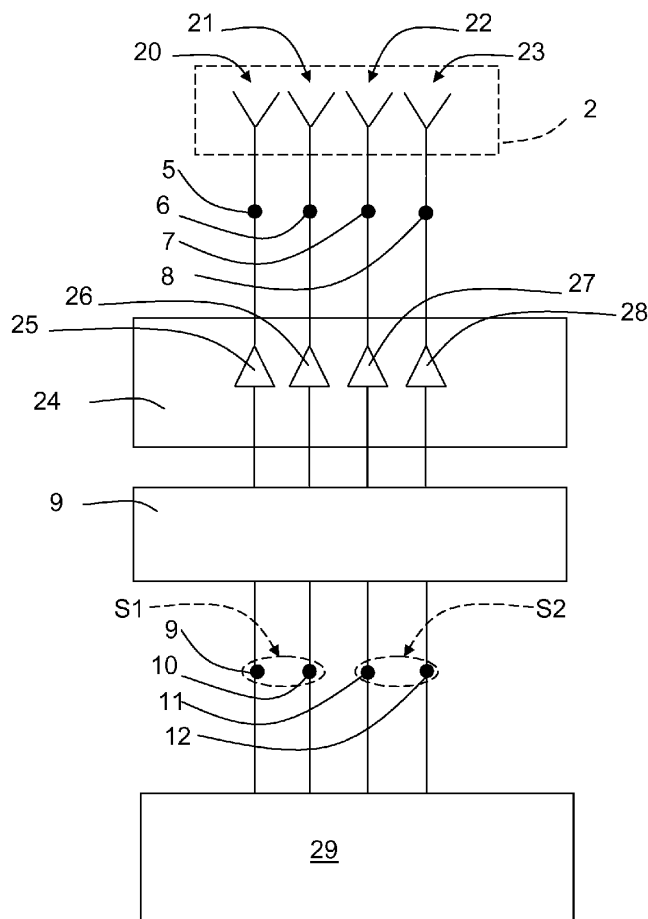
US 20120326928A1

(19) **United States**(12) **Patent Application Publication****Athley et al.**(10) **Pub. No.: US 2012/0326928 A1**(43) **Pub. Date: Dec. 27, 2012**(54) **COMMUNICATION SYSTEM NODE
COMPRISING A TRANSFORMATION
MATRIX****Publication Classification**(51) **Int. Cl.**
H01Q 3/26 (2006.01)(52) **U.S. Cl.** **342/373**(57) **ABSTRACT**

The present invention relates to a node (1) in a wireless communication system, the node (1) comprising at least one antenna (2) which is arranged to cover a first sector (3) in a first direction (4) and comprises a number (A) of antenna ports (5, 6, 7, 8), which number (A) is at least four. The antenna ports (5, 6, 7, 8) are connected to a transformation matrix (9) which is arranged for transforming the antenna ports (5, 6, 7, 8) to at least a first set (S1) of virtual antenna ports (10, 11) and a second set (S2) of virtual antenna ports (12, 13), each set (S1, S2) comprising a number (B) of virtual antenna ports (10, 11; 12, 13). The present invention also relates to a corresponding method.

(75) **Inventors: Fredrik Athley, Kullavik (SE); Sven
Petersson, Savedalen (SE)**(73) **Assignee: Telefonaktiebolaget L M Ericsson
(Publ), Stockholm (SE)**(21) **Appl. No.: 13/580,896**(22) **PCT Filed: Feb. 25, 2010**(86) **PCT No.: PCT/EP10/52382**

§ 371 (c)(1),

(2), (4) **Date: Aug. 23, 2012**



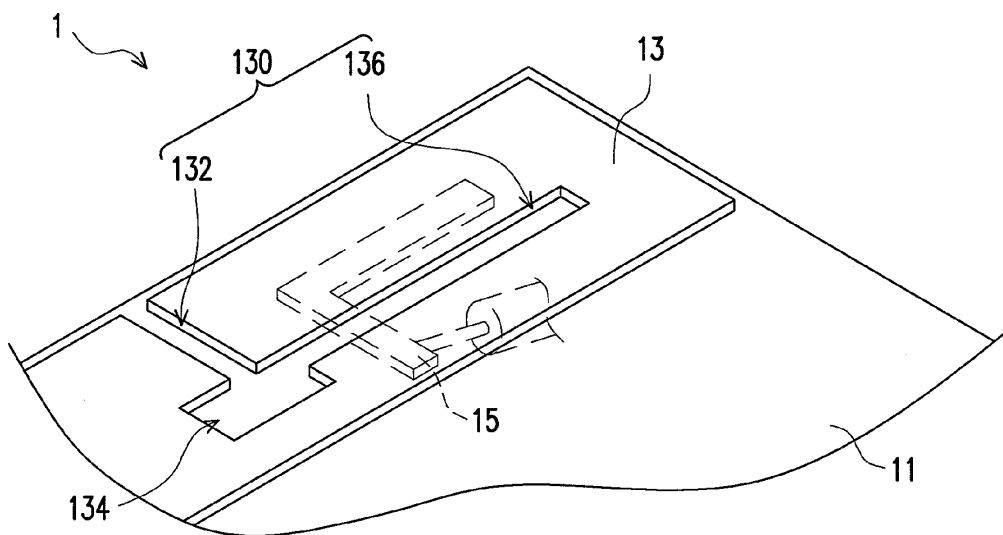
US 20120326936A1

(19) **United States**(12) **Patent Application Publication**
Tu(10) **Pub. No.: US 2012/0326936 A1**(43) **Pub. Date: Dec. 27, 2012**(54) **MONOPOLE SLOT ANTENNA STRUCTURE****Publication Classification**(75) Inventor: **Shu-Yang Tu**, New Taipei City (TW)(51) **Int. Cl.**
H01Q 13/10 (2006.01)(73) Assignees: **INVENTEC APPLIANCES**
(PUDONG) CORPORATION,
Shanghai (CN); **INVENTEC**
APPLIANCES (JIANGNING)
CORPORATION, Nanjing (CN);
INVENTEC APPLIANCES CORP.,
New Taipei City (TW)(52) **U.S. Cl.** **343/767**(57) **ABSTRACT**

A monopole slot antenna structure including a dielectric substrate, a monopole slot antenna and a feed element is provided. The monopole slot antenna is disposed on one side of the dielectric substrate and has a slot including a first slot section, a tuning slot section and a second slot section. One end of the first slot section is located at one edge of the monopole slot antenna with the other end of the first slot section being extended towards internal portions of the monopole slot antenna and being connected to the tuning slot section. One end of the second slot section is connected to the tuning slot section with the other end of the second slot section being extended away from the first slot section. The feed element is disposed correspondingly to the second slot section, and excites the monopole slot antenna to generate two operating frequency bands.

(21) Appl. No.: **13/452,930**(22) Filed: **Apr. 22, 2012**(30) **Foreign Application Priority Data**

Jun. 21, 2011 (CN) 201110166829.5





US 20120326938A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0326938 A1**

(43) **Pub. Date: Dec. 27, 2012**

(54) **ANTENNA CONFIGURATION**

Publication Classification

(75) Inventors: **Ovadia Grossman**, Tel Aviv-Yaffo (IL);
Moshe Ben Ayun, Shoham (IL);
Maksim Berezin, Natanya (IL); **Mark**
Rozenal, Gedera (IL)

(51) **Int. Cl.**
H01Q 19/00 (2006.01)

(52) **U.S. Cl.** **343/833**

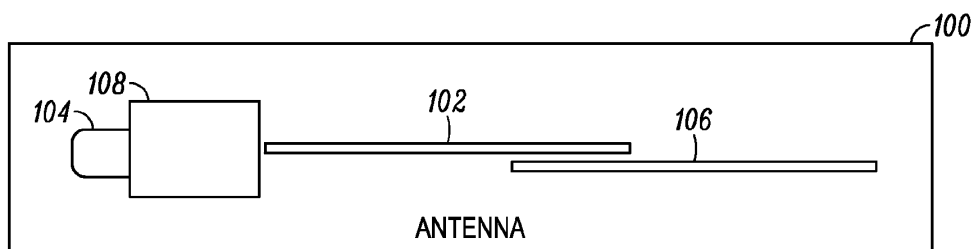
(57) **ABSTRACT**

(73) Assignee: **MOTOROLA SOLUTIONS, INC.**,
SCHAUMBURG, IL (US)

Antenna apparatuses and methods used in wireless communication devices are disclosed. The antenna includes a first portion configured to be coupled to a communication device. The antenna also includes a second portion configured to be coupled to the first portion. The first portion and second portion are coupled by overlapping the first portion and second portion so as to produce an omnidirectional radiation pattern and a vertical radiation pattern.

(21) Appl. No.: **13/166,120**

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





LEE et al.

(43) **Pub. Date:** **Dec. 27, 2012**

(52) **U.S. Cl.** 343/860

(57) **ABSTRACT**

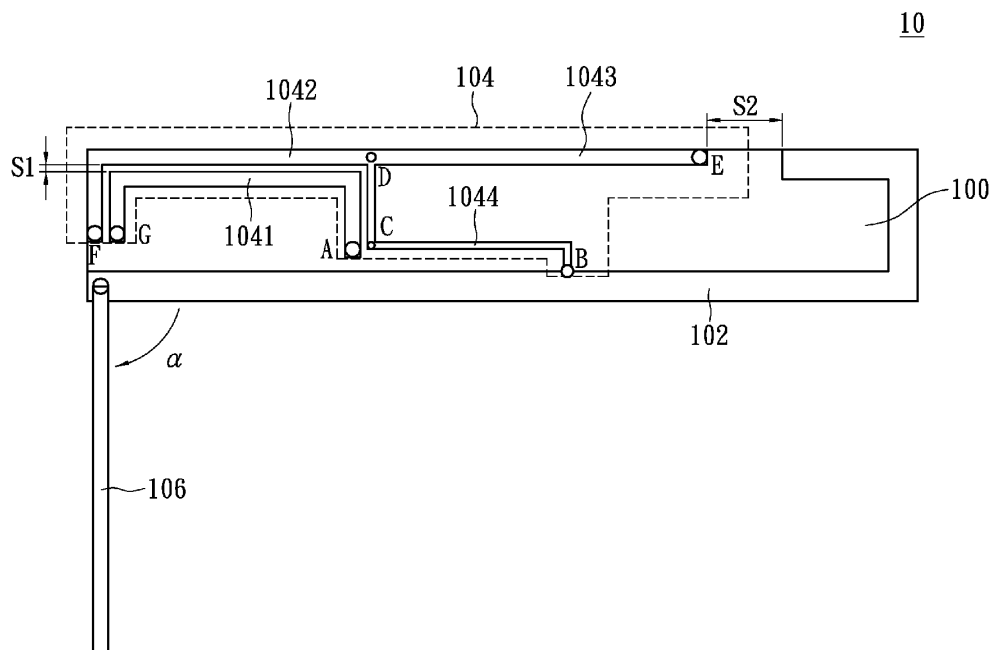
A multi-band antenna includes an antenna substrate, an antenna ground, an antenna unit, and a matching conductor. The antenna ground has a signal ground terminal and at least one bend. The antenna unit is adjacent to the antenna ground. The matching conductor is electrically coupled to the antenna ground, and an angle exists between the matching conductor and the antenna ground. A length of the first matching conductor is about a quarter of the wavelength corresponding to a frequency of the first operating band. The antenna unit includes a coupling conductor, a feeding conductor, a radiating conductor, and a shorting conductor. The feeding conductor has a signal feeding terminal. One end of the radiating conductor is facing to the antenna ground, and a distance exists between the feeding conductor the antenna ground. Two ends of the shorting conductor are respectively electrically coupled to the antenna ground and the coupling conductor.

(22) Filed: **Aug. 10, 2011**

Jun. 27, 2011 (CN) 201110174026.4

Publication Classification

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





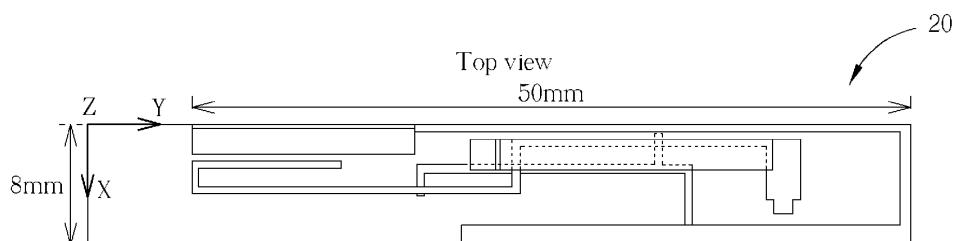
US 20120326941A1

(19) **United States**(12) **Patent Application Publication****Su et al.**(10) **Pub. No.: US 2012/0326941 A1**(43) **Pub. Date: Dec. 27, 2012**(54) **CAPACITIVE LOOP ANTENNA AND
ELECTRONIC DEVICE**(76) Inventors: **Chi-Kang Su**, Hsinchu (TW);
Chia-Tien Li, Hsinchu (TW)(21) Appl. No.: **13/223,323**(22) Filed: **Sep. 1, 2011**(30) **Foreign Application Priority Data**

Jun. 22, 2011 (TW) 100211354

Publication Classification(51) **Int. Cl.**
H01Q 7/00 (2006.01)(52) **U.S. Cl.** **343/866**(57) **ABSTRACT**

A capacitive loop antenna is disclosed. The capacitive loop antenna comprises a shorting-to-ground terminal, for providing grounding, a feeding terminal, for receiving a first radio frequency feeding signal, and a first capacitive loop. The first capacitive loop comprises a first connection element, a first radiator, comprising an end electrically connected to the feeding terminal via the first connection element, to feed the first radio frequency feeding signal to the first radiator, a second connection element, and a second radiator, comprising an end electrically connected to the shorting-to-ground terminal via the second connection element. A first section of another end of the first radiator is capacitively coupled with the second radiator.





US 20130002490A1

(19) **United States**(12) **Patent Application Publication****Liu et al.**(10) **Pub. No.: US 2013/0002490 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **ANTENNA AND WIRELESS
COMMUNICATION APPARATUS**(52) **U.S. CL. 343/700 MS**(76) Inventors: **Ruopeng Liu**, Shenzhen (CN);
Guanxiong Xu, Shenzhen (CN);
Nenghui Fang, Shenzhen (CN)(57) **ABSTRACT**(21) Appl. No.: **13/521,444**

An antenna comprises a medium substrate and grounding units attached on the medium substrate. The antenna further comprises a metal structure attached on the medium substrate. The metal structure comprises an electromagnetic response unit, a metal open ring enclosing the electromagnetic response unit and a feeding point connected to an end of the metal open ring. The electromagnetic response unit comprises an electric-field coupling structure. This design increases the physical length of the antenna equivalently, so an RF antenna operating at an extremely low frequency can be designed within a very small space. This can eliminate the physical limitation imposed by the spatial area when the conventional antenna operates at a low frequency, and satisfy the requirements of miniaturization, a low operating frequency and broadband multi-mode services for the mobile phone antenna. Meanwhile, a solution of a lower cost is provided for design of the antenna of wireless communication apparatuses.

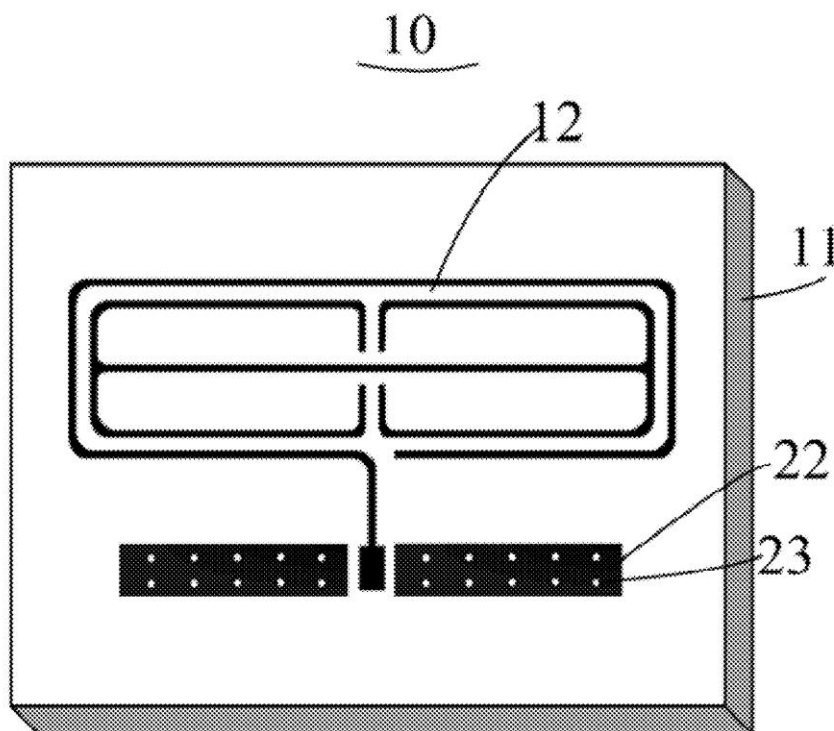
(22) PCT Filed: **Sep. 30, 2011**(86) PCT No.: **PCT/CN11/80410**

§ 371 (c)(1),

(2), (4) Date: **Jul. 10, 2012**(30) **Foreign Application Priority Data**

Jun. 29, 2011 (CN) 201110178651.6

Jun. 29, 2011 (CN) 201110178654.X

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



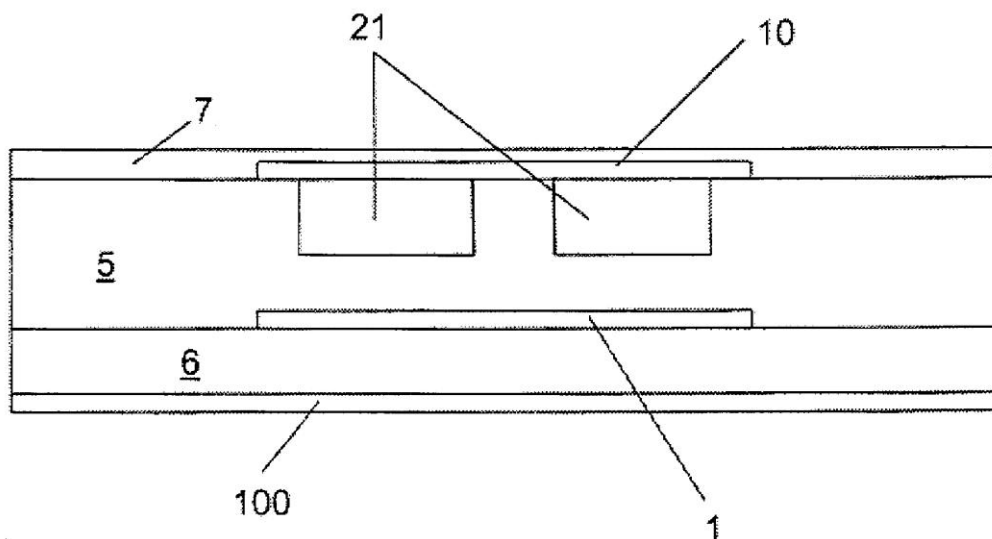
US 20130002491A1

(19) **United States**(12) **Patent Application Publication**
Sabielyny(10) **Pub. No.: US 2013/0002491 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **STACKED MICROSTRIP ANTENNA**(30) **Foreign Application Priority Data**(75) Inventor: **Michael Sabielyny**, Ulm (DE)

Feb. 4, 2010 (DE) 10 2010 006 809.8

(73) Assignee: **EADS Deutschland GmbH**, Ottobrunn (DE)**Publication Classification**(21) Appl. No.: **13/577,147**(51) **Int. Cl.**
H01Q 1/38 (2006.01)(22) PCT Filed: **Nov. 26, 2010**(52) **U.S. Cl.** **343/700 MS**(86) PCT No.: **PCT/DE2010/001377**(57) **ABSTRACT**§ 371 (c)(1),
(2), (4) Date: **Sep. 10, 2012**

A stacked microstrip antenna includes two microstrip antenna elements arranged one above the other, and a dielectric separator between the two microstrip antenna elements. The dielectric separator has one or more cavities.





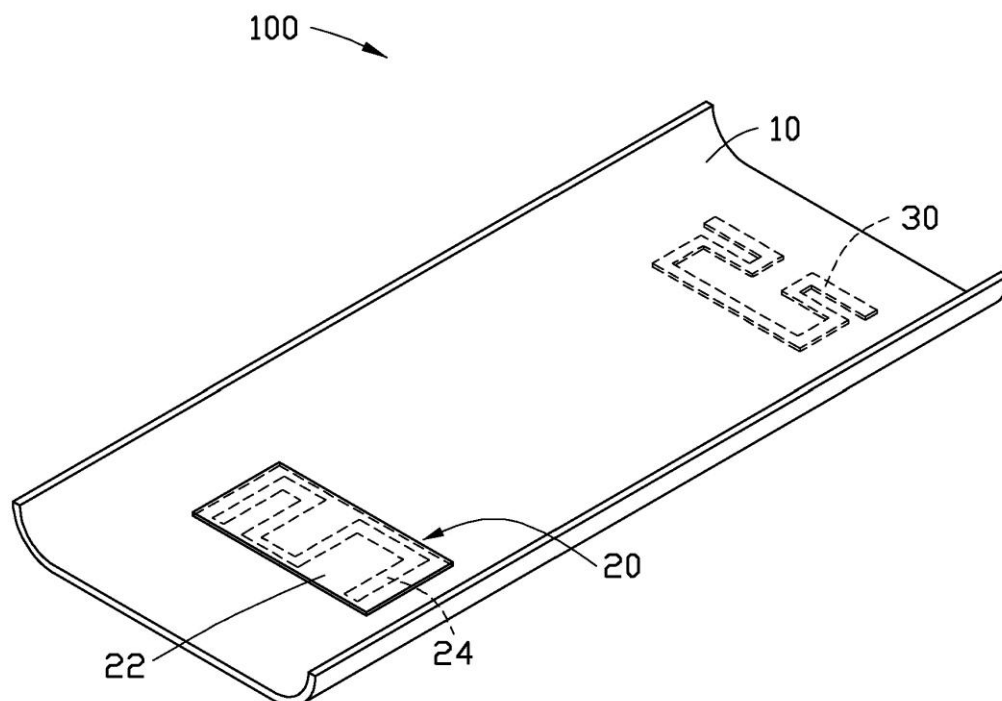
US 20130002493A1

(19) **United States**(12) **Patent Application Publication**
JIA et al.(10) **Pub. No.: US 2013/0002493 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **COVER FOR ELECTRONIC DEVICE**(30) **Foreign Application Priority Data**(75) Inventors: **XIAO-FENG JIA**, Shenzhen City (CN);
YONG YAN, Shenzhen City (CN)

Jun. 28, 2011 (CN) 201120222492.0

Publication Classification(73) Assignees: **FIH (HONG KONG) LIMITED**,
Kowloon (HK); **SHENZHEN**
FUTAIHONG PRECISION
INDUSTRY CO., LTD., ShenZhen City
(CN)(51) **Int. Cl.**
H01Q 1/24 (2006.01)(52) **U.S. Cl.** **343/702**(57) **ABSTRACT**

An electronic device cover includes a base body, a first antenna and a second antenna. The first antenna is at least partially made by laser direct structuring. Both the first antenna and the second antenna are located in the base body by insert-molding.

(21) Appl. No.: **13/289,117**(22) Filed: **Nov. 4, 2011**



US 20130002494A1

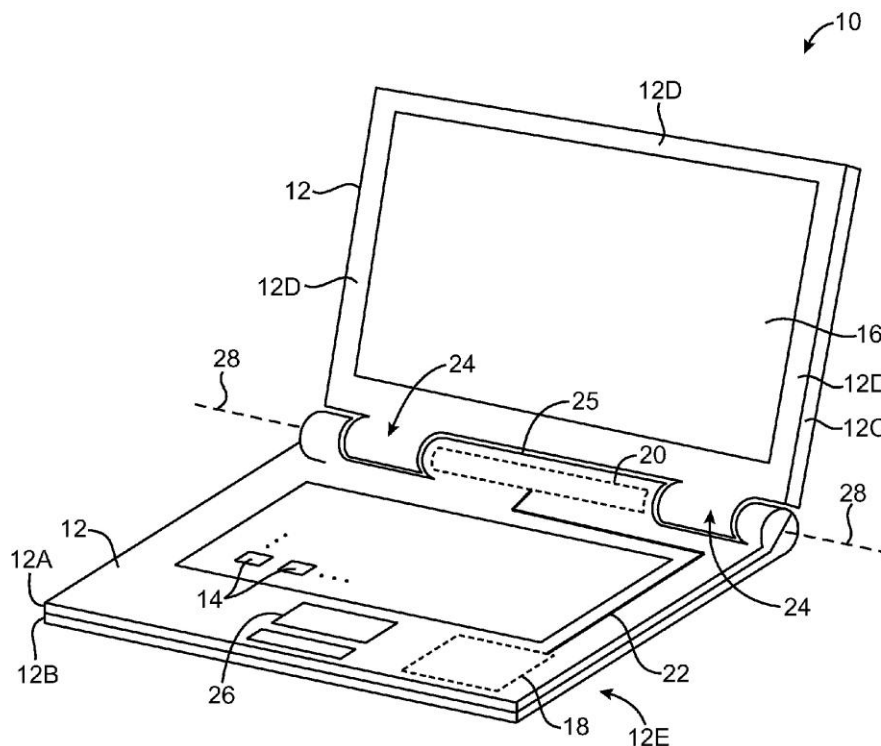
(19) **United States**(12) **Patent Application Publication****Ayala et al.**(10) **Pub. No.: US 2013/0002494 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **ANTENNAS AND ANTENNA CARRIER STRUCTURES FOR ELECTRONIC DEVICES**(52) **U.S. CL. 343/702; 343/878**(76) Inventors: **Enrique Ayala**, Watsonville, CA (US);
Gregory Allen Springer, Sunnyvale, CA (US); **Douglas B. Kough**, San Jose, CA (US); **Matthew Ian McDonald**, San Jose, CA (US)(57) **ABSTRACT**(21) Appl. No.: **13/607,575**(22) Filed: **Sep. 7, 2012****Related U.S. Application Data**

(63) Continuation of application No. 12/142,744, filed on Jun. 19, 2008, now Pat. No. 8,264,412.

(60) Provisional application No. 61/019,218, filed on Jan. 4, 2008.

Publication Classification(51) **Int. Cl.**
H01Q 1/12 (2006.01)
H01Q 1/24 (2006.01)

Antenna support structures and antennas are provided for wireless electronic devices such as portable electronic devices. Antenna resonating elements may be formed from conductive coatings on two-shot molded interconnect device dielectric antenna support structures. The conductive coatings may be formed from wet-plated copper or other conductive materials. The antenna support structure may have tabs that electrically connect antenna resonating elements to the case of a wireless electronic device that serves as an antenna ground plane. The antenna support structure may be curved about its longitudinal axis so that the antenna resonating elements on the support structure protrude upwards to enhance antenna performance. In a portable electronic device such as a portable computer, the antenna support structure may be mounted within a dielectric portion of the computer housing that is located between the display portion of the housing and the base of the housing.



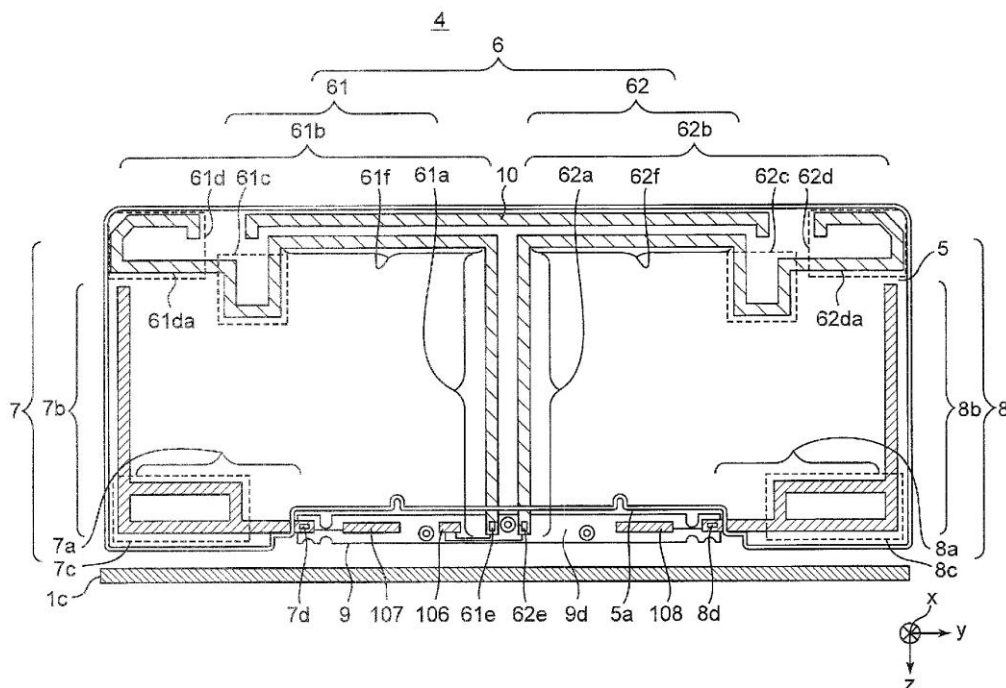


US 20130002497A1

(19) **United States**(12) **Patent Application Publication**
HAMABE(10) **Pub. No.: US 2013/0002497 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **ANTENNA APPARATUS INCLUDING FIRST
AND SECOND MONOPOLE ANTENNAS
EACH HAVING LOOP PORTION****Publication Classification**(51) **Int. Cl.**
H01Q 1/00 (2006.01)(52) **U.S. Cl.** **343/730**(76) **Inventor: Taichi HAMABE, Hyogo (JP)**(21) **Appl. No.: 13/596,482**(57) **ABSTRACT**(22) **Filed: Aug. 28, 2012****Related U.S. Application Data**(63) Continuation of application No. PCT/JP2011/006945,
filed on Dec. 13, 2011.(30) **Foreign Application Priority Data**

Mar. 16, 2011 (JP) 2011-057495

An antenna apparatus includes a dipole antenna, a first monopole antenna and a second monopole antenna, each formed in a form of a conductor pattern on an insulating substrate. A fifth portion of the first monopole antenna and a seventh portion of the second monopole antenna are formed to be adjacent to and to be substantially parallel to a grounding conductor provided outside the antenna apparatus. The fifth portion includes a loop portion, and the seventh portion includes a loop portion.





US 20130002501A1

(19) **United States**(12) **Patent Application Publication****Li et al.**(10) **Pub. No.: US 2013/0002501 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **ANTENNA AND COMMUNICATION DEVICE THEREOF****Publication Classification**(51) **Int. Cl.****H01Q 7/00** (2006.01)**H01Q 9/16** (2006.01)**H01Q 1/36** (2006.01)**H01Q 13/10** (2006.01)(52) **U.S. Cl.** **343/767; 343/843; 343/860; 343/866; 343/793; 343/895**(75) Inventors: **Wei-Yu Li**, Yilan County (TW); **Wei-Ji Chen**, Tainan City (TW)(73) Assignee: **INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE**, Hsinchu (TW)(21) Appl. No.: **13/472,451**(22) Filed: **May 15, 2012****Related U.S. Application Data**

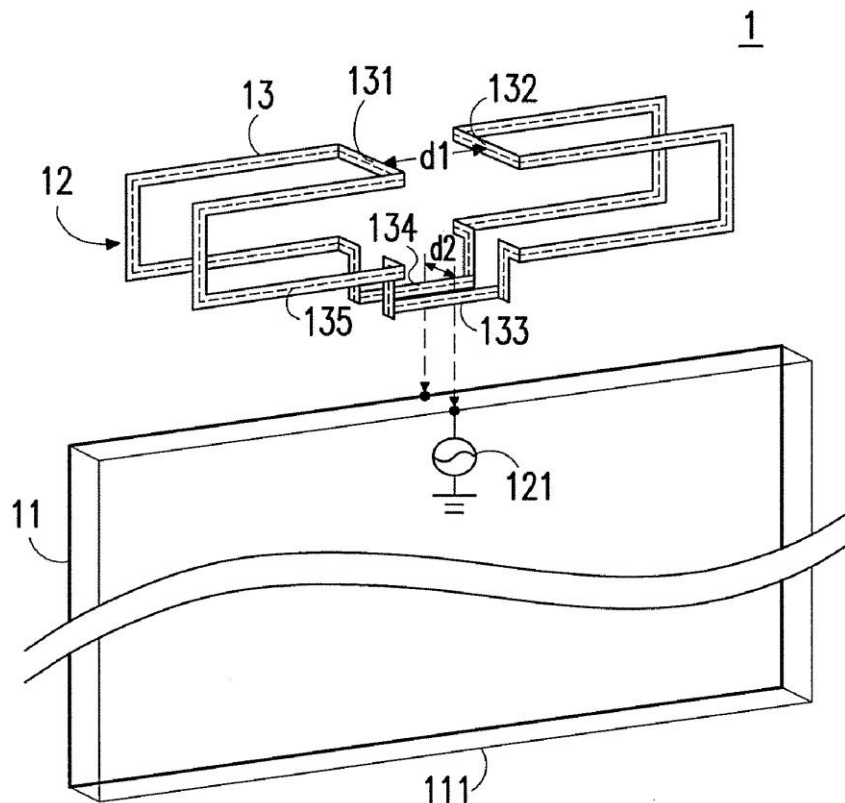
(60) Provisional application No. 61/502,179, filed on Jun. 28, 2011.

(30) **Foreign Application Priority Data**

Mar. 3, 2012 (TW) 101107193

ABSTRACT

An antenna and a communication device thereof are provided. The antenna includes at least one ground and at least one radiating portion. The ground is disposed on a dielectric substrate, and the radiating portion includes at least one signal source and at least one closed conductor loop. The closed conductor loop has a first coupling conductor portion and a second coupling conductor portion, and the closed conductor loop has a plurality of bending portions to form a three-dimensional structure, and a first coupling gap is formed between the first and the second coupling conductor portions. The closed conductor loop further has a feeding portion and a short-circuit portion to form a second coupling gap between them. The feeding portion is electrically connected or coupled to the at least one signal source, and the short-circuit portion is electrically connected or coupled to the ground.

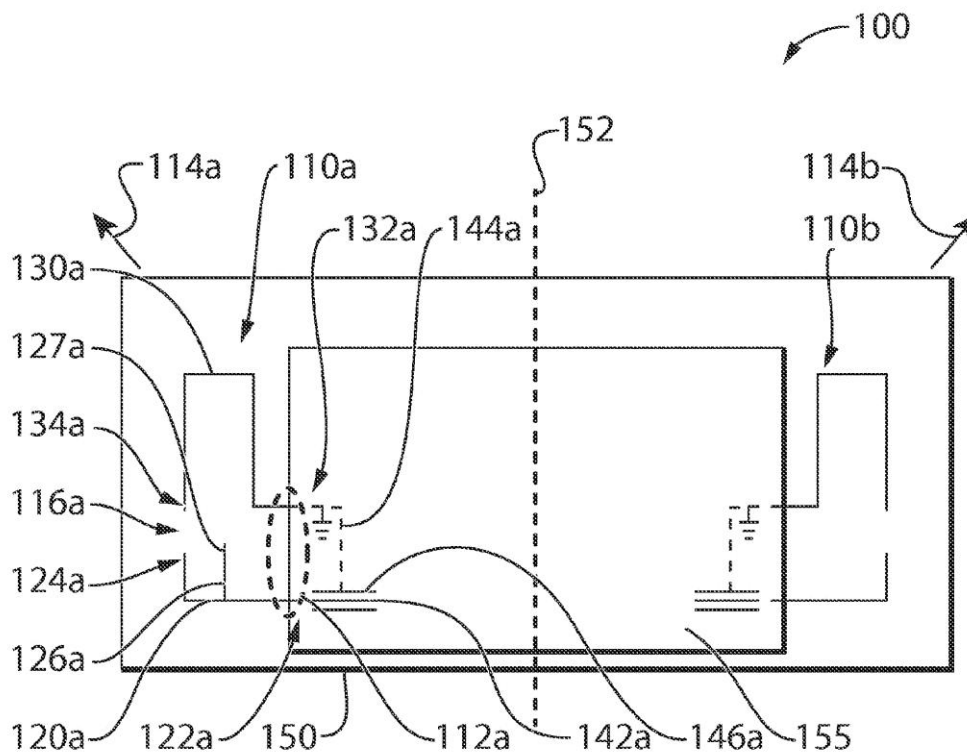




US 20130002503A1

(19) **United States**(12) **Patent Application Publication**
Tan(10) **Pub. No.: US 2013/0002503 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **COMPACT ANTENNA SYSTEM HAVING
FOLDED DIPOLE AND/OR MONOPOLE**(52) **U.S. CL.** **343/803**; 343/700 MS; 343/848;
343/893; 29/428(75) Inventor: **Mack Tan**, Burnaby (CA)(73) Assignee: **SIERRA WIRELESS, INC.**, Richmond
(CA)(57) **ABSTRACT**(21) Appl. No.: **13/536,408**(22) Filed: **Jun. 28, 2012****Related U.S. Application Data**(60) Provisional application No. 61/503,035, filed on Jun.
30, 2011.**Publication Classification**(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/12 (2006.01)
H01Q 9/26 (2006.01)
H01Q 1/48 (2006.01)
H01Q 21/00 (2006.01)

An antenna and multi-antenna system are provided. Each antenna of the system is a mirror image and comprises first and second conductive elements each having a first end and a second end portion, the second end portions being capacitively coupled to each other. Each antenna can be operated as a lower-frequency folded dipole having a series capacitive gap which facilitates electrical lengthening of the antenna, or as a higher-frequency monopole antenna having a parasitic element which facilitates improved bandwidth. The antennas' feedpoints may be placed at opposite corners of a ground plane, and separated by a distance which is less than one quarter of an operating wavelength of the dipole but greater than one quarter of an operating wavelength of the monopole. Locating the feedpoints at the ground plane corners facilitates orthogonal polarization of the two antennas at least in dipole mode. The antennas thus provided exhibit good isolation.





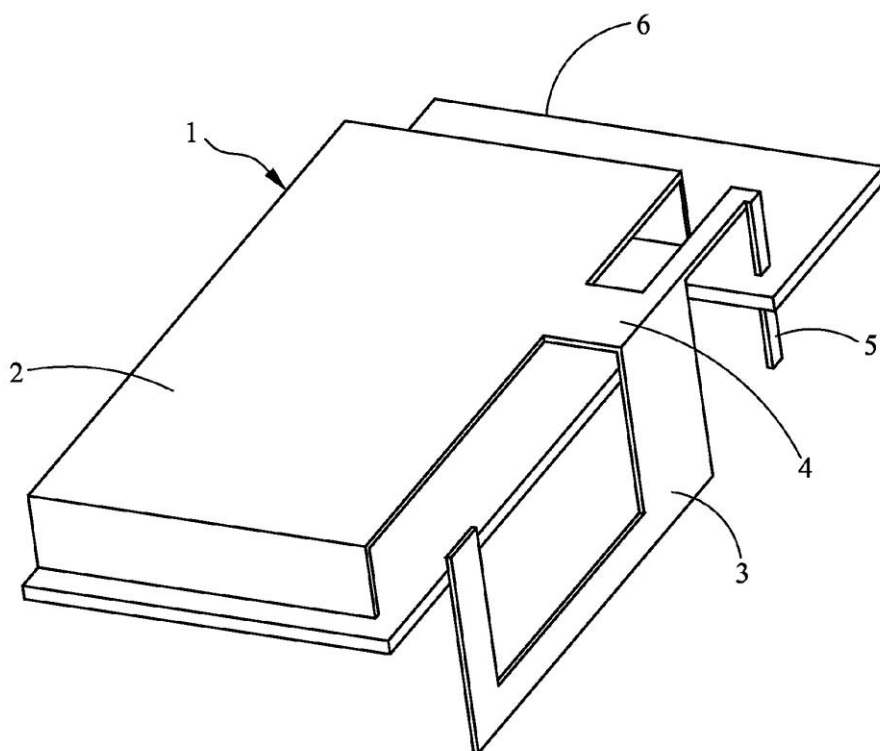
US 20130002506A1

(19) **United States**(12) **Patent Application Publication**
CHENG et al.(10) **Pub. No.: US 2013/0002506 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **ANTENNA WITH EMI SHELTER**(52) **U.S. CL. 343/841**(75) Inventors: **SHIH-CHIEH CHENG**, Kaohsiung
City (TW); **Yong-Xiang Hsieh**, Chiayi
County (TW); **Kuo-Chang Lo**, Miaoli
County (TW)(57) **ABSTRACT**(73) Assignee: **ARCADYAN TECHNOLOGY
CORPORATION**, Hsinchu City (TW)(21) Appl. No.: **13/276,402**(22) Filed: **Oct. 19, 2011**(30) **Foreign Application Priority Data**

Jul. 1, 2011 (TW) 100123279

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

An antenna with electromagnetic interference (EMI) shelter is disclosed, which comprises: an EMI shelter, mounted on a substrate while covering the same; a radiation unit; an induction current steering unit, disposed at a position between the EMI shelter and the radiation unit; and a signal feed-in unit, electrically connected with the radiation unit; wherein, the induction current generated by the radiation unit when it is activating is guided to the EMI shelter through the guidance of the induction current steering unit, and then to be feed into a ground connection (GND), thereby, preventing the operation of radio circuit elements that are mounted on the substrate from being interfered by the electric wave resulting from the induction current. With the aforesaid configuration, not only the EMI effect can be significantly suppressed and the overall manufacturing cost of the antenna can be effectively reduced, but also the signal transmission efficiency is improved.





US 20130002510A1

(19) **United States**(12) **Patent Application Publication****Azulay et al.**(10) **Pub. No.: US 2013/0002510 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **ANTENNAS WITH NOVEL CURRENT DISTRIBUTION AND RADIATION PATTERNS, FOR ENHANCED ANTENNA ISLATION**(75) Inventors: **Snir Azulay**, Tiberias (IL); **Matti Martiskainen**, Tiberias (IL)(73) Assignee: **GALTRONICS CORPORATION LTD.**, Tiberias (IL)(21) Appl. No.: **13/576,117**(22) PCT Filed: **Feb. 17, 2011**(86) PCT No.: **PCT/IL2011/000169**

§ 371 (c)(1),

(2), (4) Date: **Sep. 10, 2012****Related U.S. Application Data**

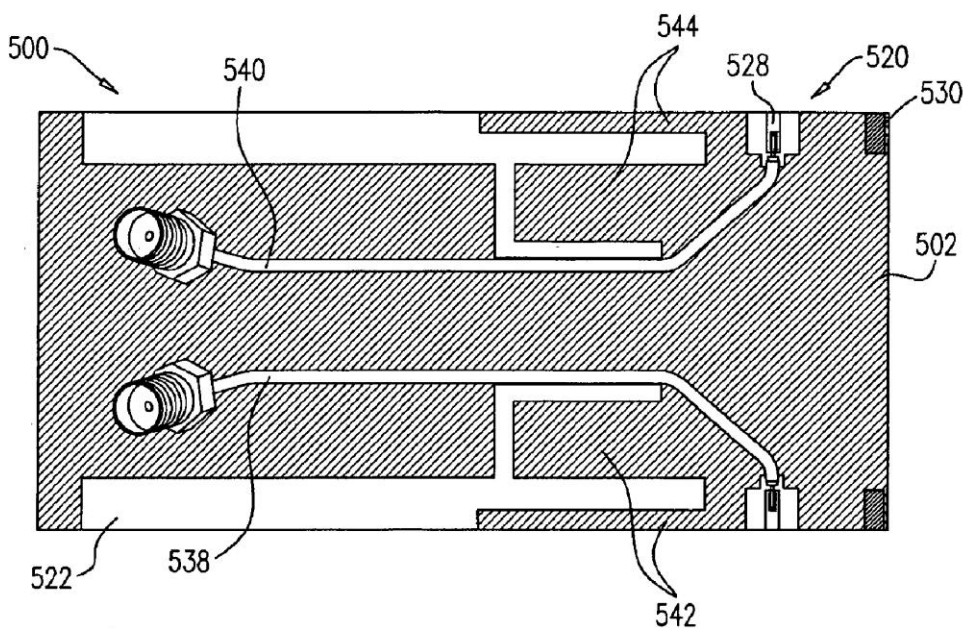
(60) Provisional application No. 61/338,378, filed on Feb. 17, 2010.

Publication Classification(51) **Int. Cl.****H01Q 5/00** (2006.01)**H01Q 1/50** (2006.01)**H01Q 21/00** (2006.01)(52) **U.S. Cl.** **343/860; 343/700 MS; 343/893**

(57)

ABSTRACT

An antenna including a ground plane, at least one first conductive element located in proximity to an edge of the ground plane and having first and second ends, the first end extending generally parallel to the ground plane, the second end in contact with a feed point, and at least one second conductive element located in proximity to the edge of the ground plane and having first and second ends, the first end extending generally parallel to the ground plane and to the first end of the at least one first conductive element, the second end in contact with the ground plane.





Camacho et al.

(43) **Pub. Date:**

Jan. 3, 2013

(52) **U.S. Cl.** **343/905**; 343/700 MS

(57) **ABSTRACT**

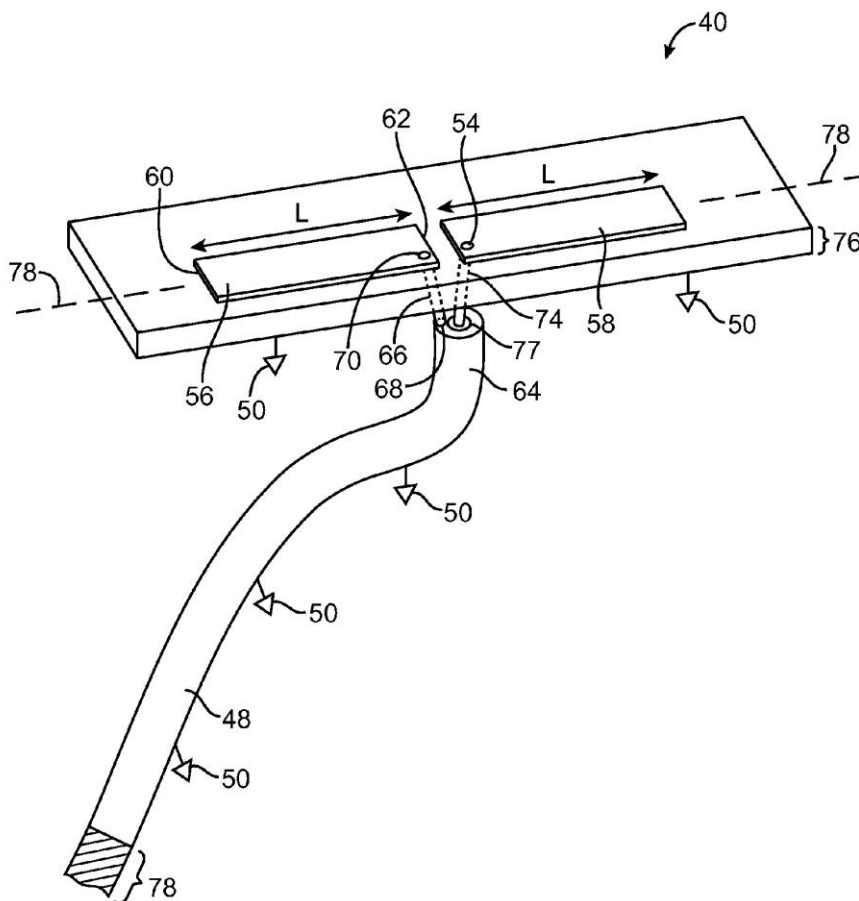
(22) Filed: **Sep. 14, 2012**

Related U.S. Application Data

Antennas for electronic devices such as portable computers are provided. An antenna may have a dipole structure in which one antenna element serves as a matching element and another antenna element serves as a radiating element. The antenna elements may be mounted on a substrate. The substrate may be mounted on a support structure that is attached to a grounding plate. The grounding plate may be grounded to a conductive housing portion of a portable computer. The antenna may be mounted within the conductive housing in the vicinity of an opening in the housing. The opening may be a slot opening that is used to accommodate optical disks or other storage media. Radio-frequency signals for the antenna may pass through the opening.

Publication Classification

(51) **Int. Cl.**
H01Q 1/00 (2006.01)
H01Q 1/38 (2006.01)

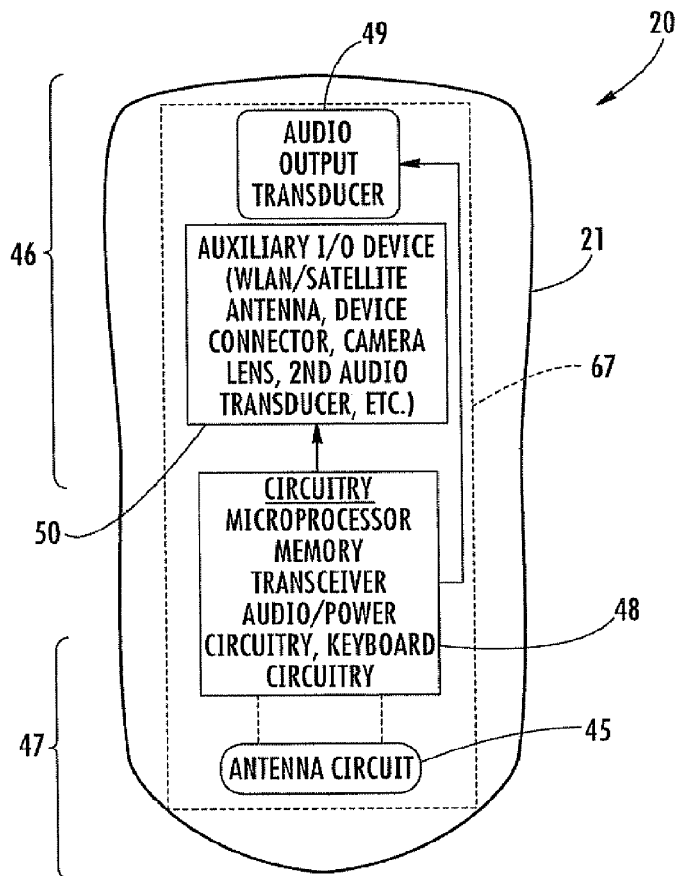




US 20130003793A1

(19) **United States**(12) **Patent Application Publication****ZHU et al.**(10) **Pub. No.: US 2013/0003793 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE WITH SEPARATE IN-PHASE AND
QUADRATURE POWER AMPLIFICATION****Publication Classification**(51) **Int. Cl.**
H04B 15/02 (2006.01)
H04B 1/40 (2006.01)(52) **U.S. Cl.** 375/219(57) **ABSTRACT**

A mobile wireless communications device includes a housing an antenna, and radio frequency (RF) circuitry. A transceiver is connected to the antenna and a processor is operative with the RF circuitry. The transceiver includes an In-phase and Quadrature (I/Q) Modulation and Power Amplification circuit having an In-phase (I) circuit with a modulator mixer and power amplifier circuit. A Quadrature (Q) circuit includes a modulator mixer and power amplifier circuit. A power combiner receives the separately amplified In-phase and Quadrature signals and sums and outputs the signals as a combined I and Q signal. The I and Q circuits are isolated from the combined I and Q signal to enhance antenna matching and transmitted radiated power (TRP) and reduce harmonic emission from the power amplification circuits.

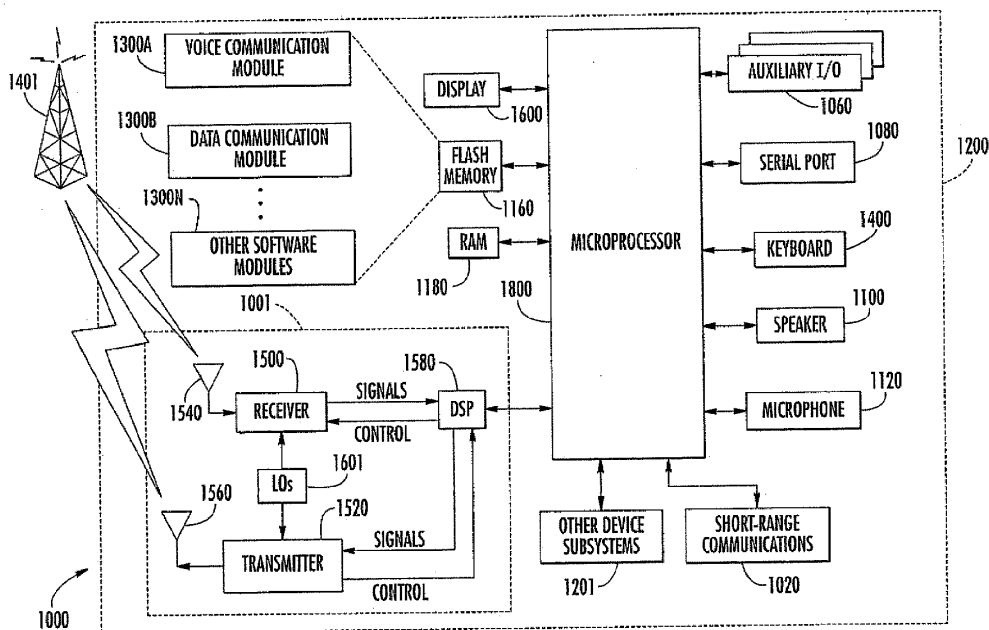
(75) Inventors: **LIZHONG ZHU**, WATERLOO (CA);
GEORGE MANKARUSE,
KITCHENER (CA); **MICHAEL**
CORRIGAN, WATERLOO (CA);
PERRY JARMUSZEWSKI,
WATERLOO (CA)(73) Assignee: **RESEARCH IN MOTION LIMITED**,
WATERLOO (CA)(21) Appl. No.: **13/611,756**(22) Filed: **Sep. 12, 2012****Related U.S. Application Data**(63) Continuation of application No. 12/173,045, filed on
Jul. 15, 2008, now Pat. No. 8,315,578.



US 20130005321A1

(19) **United States**(12) **Patent Application Publication**
KEZYS et al.(10) **Pub. No.: US 2013/0005321 A1**(43) **Pub. Date: Jan. 3, 2013**(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE WITH HUMAN INTERFACE
DIVERSITY ANTENNA AND RELATED
METHODS**continuation of application No. 11/067,935, filed on
Feb. 28, 2005, now Pat. No. 7,187,332.**Publication Classification**(75) Inventors: **VYTAS KEZYS**, ANCASTER (CA);
YIHONG QI, WATERLOO (CA)(51) **Int. Cl.**
H04W 88/02 (2009.01)
H04W 4/00 (2009.01)(73) Assignee: **RESEARCH IN MOTION LIMITED**,
WATERLOO (CA)(52) **U.S. Cl.** **455/418**; 455/575.7; 455/566(21) Appl. No.: **13/611,439**(57) **ABSTRACT**(22) Filed: **Sep. 12, 2012**

A mobile wireless communications device may include a portable handheld housing, and a wireless transceiver carried by the housing. A pair of antennas are positioned in side-by-side relation preferably in the upper portion of the portable handheld housing. A human interface diversity controller is connected to the wireless transceiver to preferentially operate with the plurality of antennas based upon a relative position of the portable handheld housing with respect to a hand of a human user. The device can select or weight the antennas based upon the position of the device when being held by a user.

Related U.S. Application Data(63) Continuation of application No. 13/357,230, filed on
Jan. 24, 2012, now Pat. No. 8,299,973, which is a
continuation of application No. 12/112,955, filed on
Apr. 30, 2008, now Pat. No. 8,115,687, which is a
continuation of application No. 11/616,405, filed on
Dec. 27, 2006, now Pat. No. 7,379,027, which is a



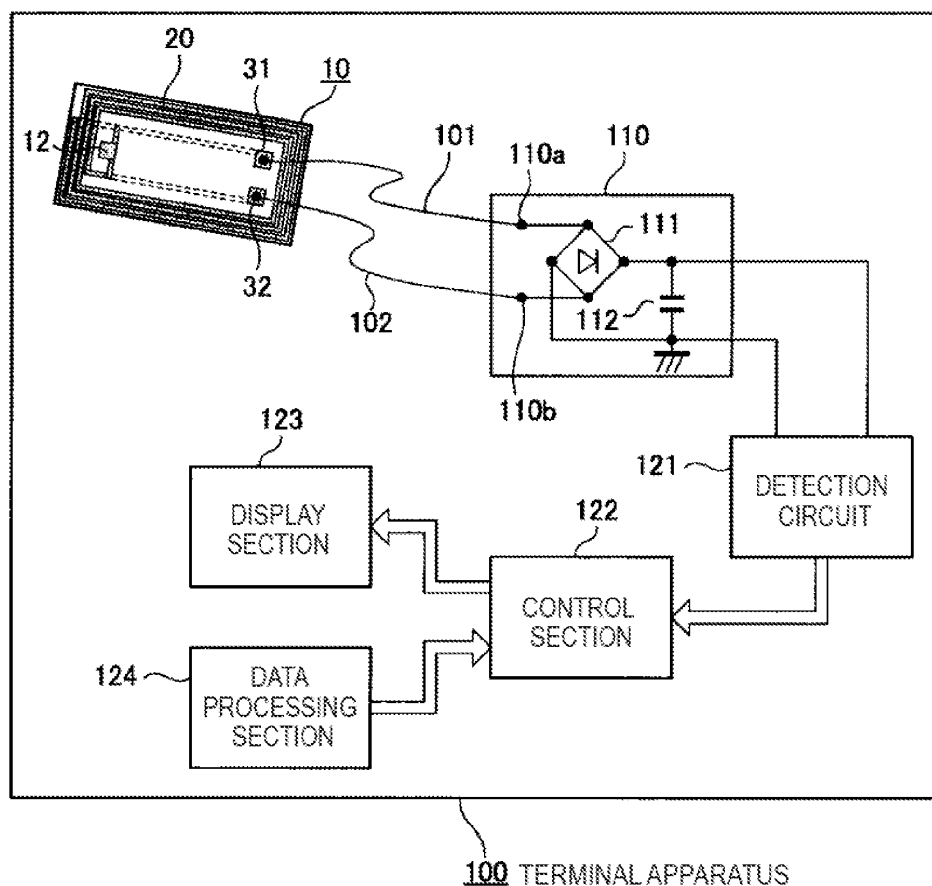
US 20130008969A1

(19) **United States**(12) **Patent Application Publication**
Sakai(10) **Pub. No.: US 2013/0008969 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **IC TAG AND ELECTRONIC APPARATUS**(52) **U.S. CL. 235/492**(75) Inventor: **Yuji Sakai**, Saitama (JP)(57) **ABSTRACT**(73) Assignee: **SONY CORPORATION**, Tokyo (JP)(21) Appl. No.: **13/531,850**(22) Filed: **Jun. 25, 2012**(30) **Foreign Application Priority Data**

Jul. 5, 2011 (JP) 2011-149464

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

There is provided an IC tag, including a substrate made of a dielectric material, an antenna pattern disposed on a surface of the substrate, a communication circuit chip connected to one end and other end of the antenna pattern on the substrate surface, which performs transmission processing and/or reception processing of a radio signal, and external circuit connection parts connected to the antenna pattern in a vicinity of the one end and the other end thereof on the surface or a rear surface of the substrate, in which a conductive part having a predetermined area opposes to other conductive part having a predetermined area on an opposed surface at an opposite side of the substrate, and the conductive part on the opposed surface at the opposite side is formed as a pad to be connected to an external circuit.





US 20130009488A1

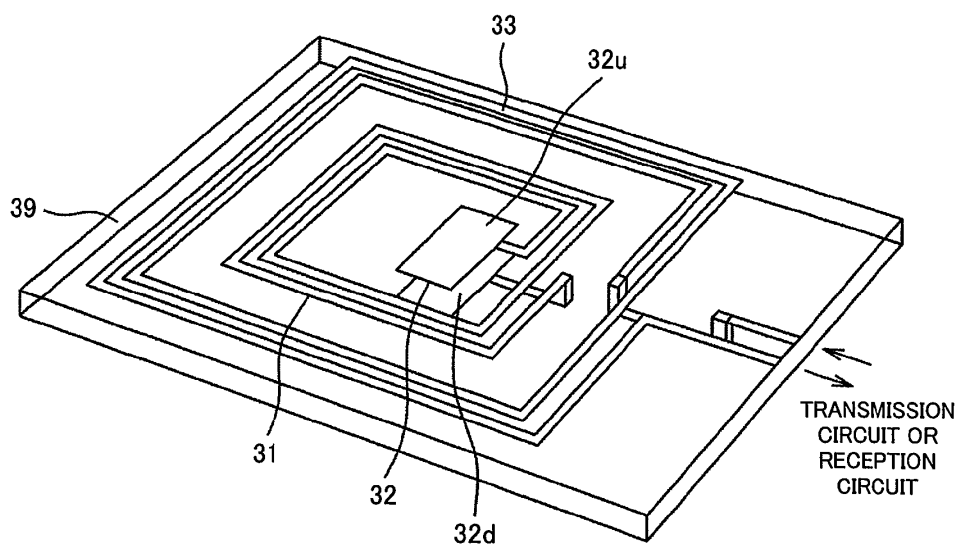
(19) **United States**(12) **Patent Application Publication****Choe et al.**(10) **Pub. No.: US 2013/0009488 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **NON-CONTACT POWER TRANSMISSION
DEVICE AND NEAR-FIELD ANTENNA FOR
SAME****Publication Classification**(51) **Int. Cl.**
H01F 38/14 (2006.01)(52) **U.S. Cl.** **307/104**(75) Inventors: **Seong-Hun Choe**, Mito (JP); **Masatoshi
Kanamaru**, Inashiki (JP)(57) **ABSTRACT**(73) Assignee: **HITACHI, LTD.**, Tokyo (JP)(21) Appl. No.: **13/520,267**(22) PCT Filed: **Aug. 27, 2010**(86) PCT No.: **PCT/JP2010/064618**

§ 371 (c)(1),

(2), (4) Date: **Jul. 2, 2012**(30) **Foreign Application Priority Data**

Jan. 6, 2010 (JP) 2010-001254

Disclosed is a structure for raising the Q-value of a near-field antenna used by a non-contact power transmission device that utilizes magnetic field coupling in the near field in a manner improving the efficiency of power transmission. The near-field antenna used by the non-contact power transmission device galvanically isolates a resonant circuit including a resonant first inductor **31** and a first capacitor **32** from a transmission circuit or a reception circuit and, through electromagnetic coupling or inductive coupling established between the transmission or reception circuit and the near-field antenna using a second inductor **33** or a second capacitor **34**, maintains a high Q even if the coupling between the antennas weakens due to an extended distance the antennas.





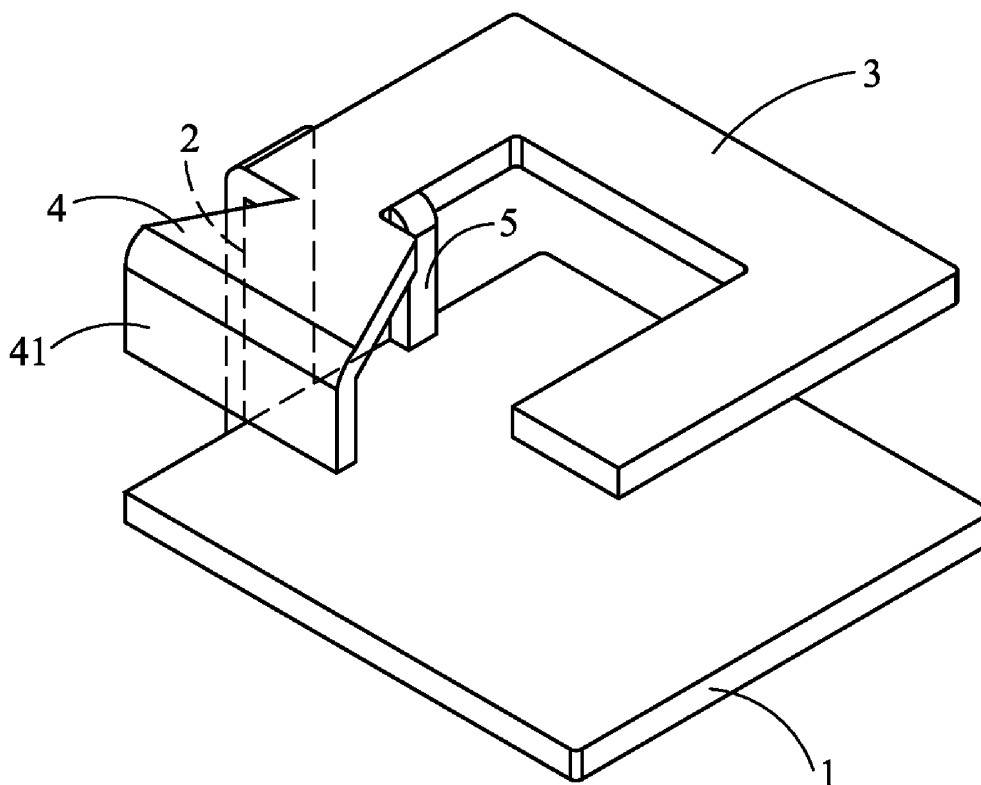
US 20130009824A1

(19) **United States**(12) **Patent Application Publication**
CHANG(10) **Pub. No.: US 2013/0009824 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **INVERTED-F ANTENNA**(52) **U.S. CL. 343/700 MS**(75) Inventor: **JIN-SU CHANG**, Hsinchu County
(TW)(57) **ABSTRACT**(73) Assignee: **ARCADYAN TECHNOLOGY**
CORPORATION, Hsinchu City (TW)(21) Appl. No.: **13/277,294**(22) Filed: **Oct. 20, 2011**(30) **Foreign Application Priority Data**

Jul. 5, 2011 (TW) 100123645

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

An improved inverted-F antenna, adapted for wireless communication devices, is disclosed, which comprises: a ground plane; a pin, coupled to a side of the ground plane while extending vertically upward therefrom; a first radiation unit, connected to an end of the pin that is not connected to the ground plane while enabling the periphery of the same to align with the periphery of the ground plane. Moreover, the inverted-F antenna is further comprised of: a second radiation unit, connected to the end of the first radiation unit that is not connected to the pin while enabling the same to be enveloped within the periphery of the ground plane, and being shaped like a fan tapering toward the end thereof that is connected to the first radiation unit; and a feed point, disposed extending from an end of the first radiation unit for feeding electrical signals.





US 20130009826A1

(19) **United States**

(12) **Patent Application Publication**
Wu

(10) **Pub. No.: US 2013/0009826 A1**

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

(54) **HANDHELD DEVICE**

(75) Inventor: **Wei-Yang Wu**, Taoyuan County (TW)

(73) Assignee: **HTC CORPORATION**, Taoyuan City (TW)

(21) Appl. No.: **13/177,682**

(22) Filed: **Jul. 7, 2011**

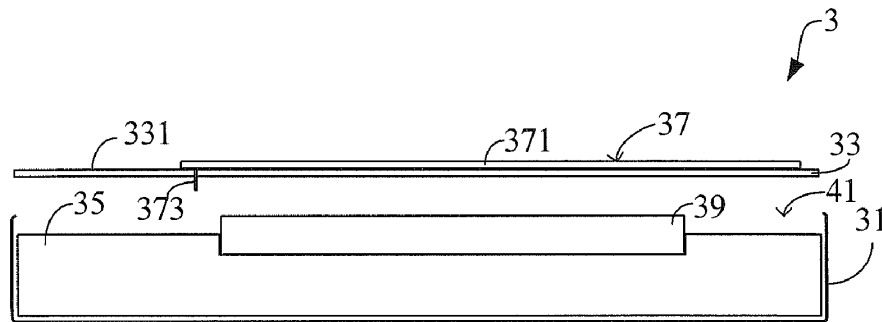
Publication Classification

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

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

(57) **ABSTRACT**

A handheld device is provided. The handheld device comprises a housing, a covering means, a circuit board, a battery and a near-field communication (NFC) antenna. The covering means is assembled with the housing to form a receiving space. The covering means comprises an outer surface and a through hole. The circuit board and the battery are disposed in the receiving space and electrically connected to each other. The NFC antenna comprises a metal layer and a transmission element. The metal layer is patterned on the outer surface of the covering means. The transmission element electrically couples the metal layer to the circuit board via the through hole. The NFC antenna is separated from the battery and the circuit board with a distance by the covering means.





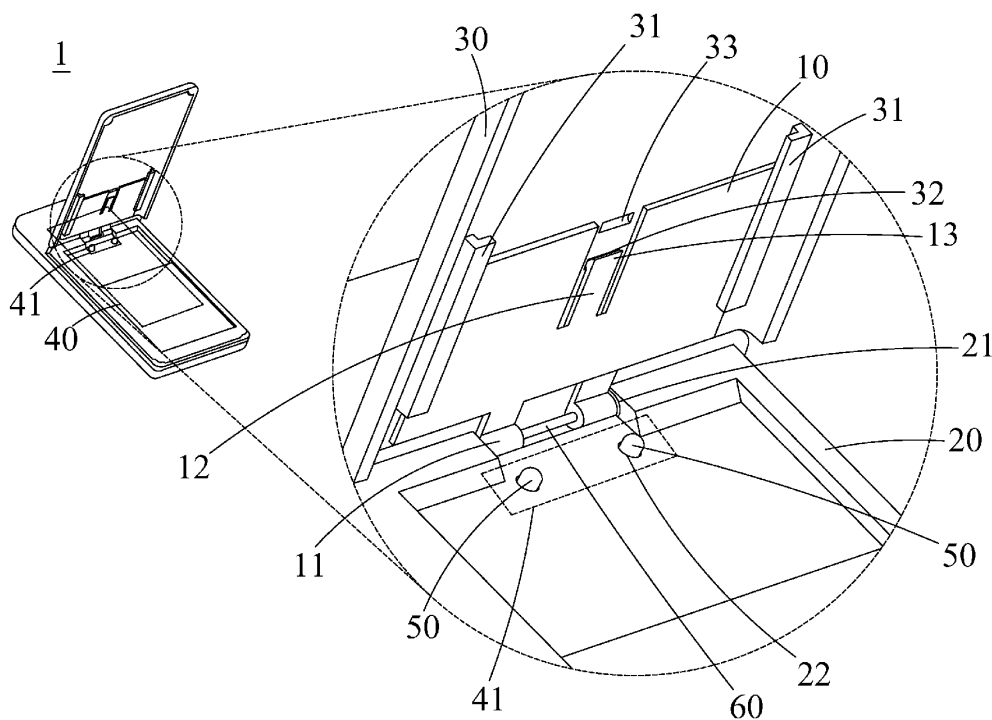
US 20130009827A1

(19) **United States**(12) **Patent Application Publication**
Lu(10) **Pub. No.: US 2013/0009827 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **ANTENNA SPRING STRUCTURE AND
ELECTRONIC DEVICE USING THE SAME**(52) **U.S. CL. 343/702**(75) **Inventor: Ding Lu, Shanghai (CN)**(57) **ABSTRACT**(73) **Assignees: INVENTEC APPLIANCES CORP.,
New Taipei City (TW); INVENTEC
APPLIANCES (SHANGHAI) CO.,
LTD., Shanghai (CN)**(21) **Appl. No.: 13/399,383**(22) **Filed: Feb. 17, 2012**(30) **Foreign Application Priority Data**

Jul. 4, 2011 (CN) 201110185272.X

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

An antenna spring structure and an electronic device using the same. The antenna spring structure includes an antenna spring provided with an elastic arm and a protruding portion coupled to the elastic arm, a casing having at least one opening and pivotally coupled to an end of the casing; a cover disposed on the antenna spring and having a first positioning groove and a second positioning groove formed on the protruding portion and disposed with an interval apart, a circuit board disposed inside the casing, and at least one conductive component installed on the circuit board and corresponding to at least one opening, and passed through the at least one opening and exposed from the casing. When the antenna spring is switched from a first position to a second position, the at least one conductive component presses the antenna spring.





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

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

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

(57) **ABSTRACT**

(21) Appl. No.: 13/620,188

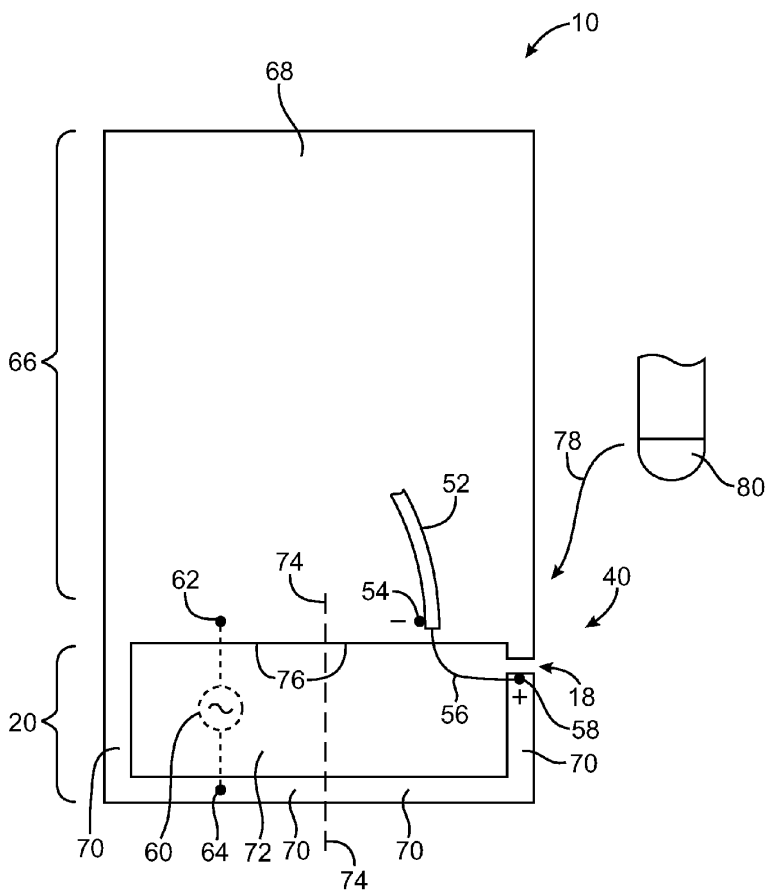
(22) Filed: **Sep. 14, 2012**

Related U.S. Application Data

(63) Continuation of application No. 12/630,756, filed on Dec. 3, 2009, now Pat. No. 8,270,914.

Publication Classification

(51) **Int. Cl.**
H01O 1/24 (2006.01)





US 20130009833A1

(19) **United States**(12) **Patent Application Publication****Kough et al.**(10) **Pub. No.: US 2013/0009833 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **ANTENNAS FOR ELECTRONIC DEVICES
WITH CONDUCTIVE HOUSING**(52) **U.S. CL.** **343/770**

(76) Inventors: **Douglas B. Kough**, San Jose, CA (US);
Gregory A. Springer, Sunnyvale, CA
(US); **Bing Chiang**, Melbourne, FL
(US); **Enrique Ayala Vazquez**,
Watsonville, CA (US); **Hao Xu**,
Cupertino, CA (US)

(57) **ABSTRACT**

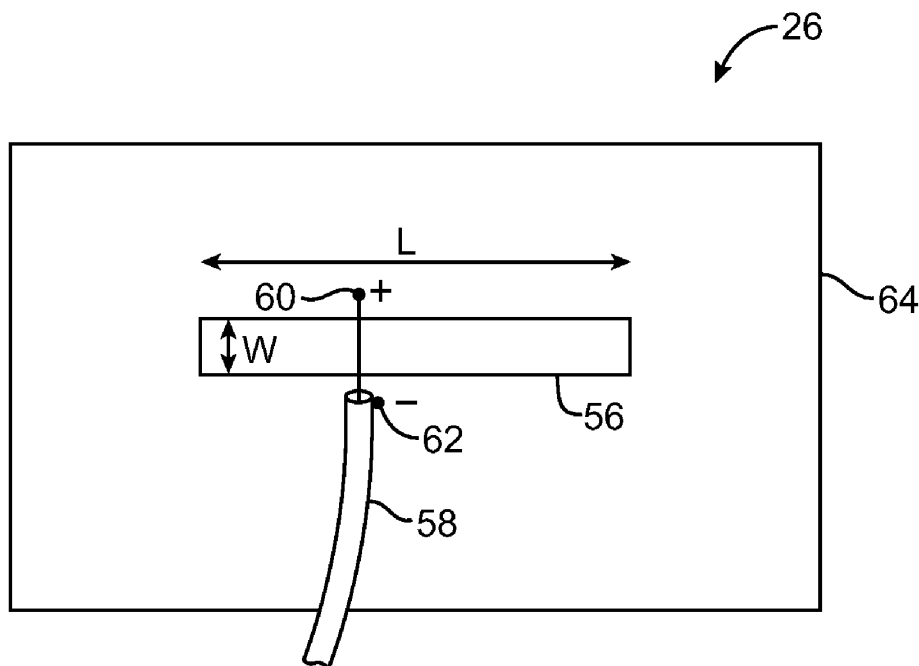
An electronic device may be provided with a conductive housing. The conductive housing may be formed from a metal. Slots may be formed in the housing. The slots may serve as an antenna and may be fed using an antenna feed structure within the electronic device housing. The electronic device may have a frame to which housing structures are attached and may have a stand or other support structure. The frame may be used to mount a display, to support housing walls, to support clutch barrel structures, etc. The slots may be formed in the frame or in a space between the frame and the housing walls. The slots or other antenna structures may also be formed in the stand. Multiple slots may be used together to support operations in two or more communications bands. There may be multiple dual slot antennas in the electronic device.

(21) Appl. No.: **13/619,614**(22) Filed: **Sep. 14, 2012****Related U.S. Application Data**

(62) Division of application No. 12/490,286, filed on Jun.
23, 2009, now Pat. No. 8,269,675.

Publication Classification

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





US 20130009838A1

(19) **United States**(12) **Patent Application Publication****Nghiem et al.**(10) **Pub. No.: US 2013/0009838 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **MULTI-BAND LOADED ANTENNA****Publication Classification**

(76) Inventors: **David Nghiem**, Shoreview, MN (US);
Peter J. Musto, Prior Lake, MN (US);
Larry D. Canady, Ham Lake, MN (US);
Keith R. Maile, New Brighton, MN (US)

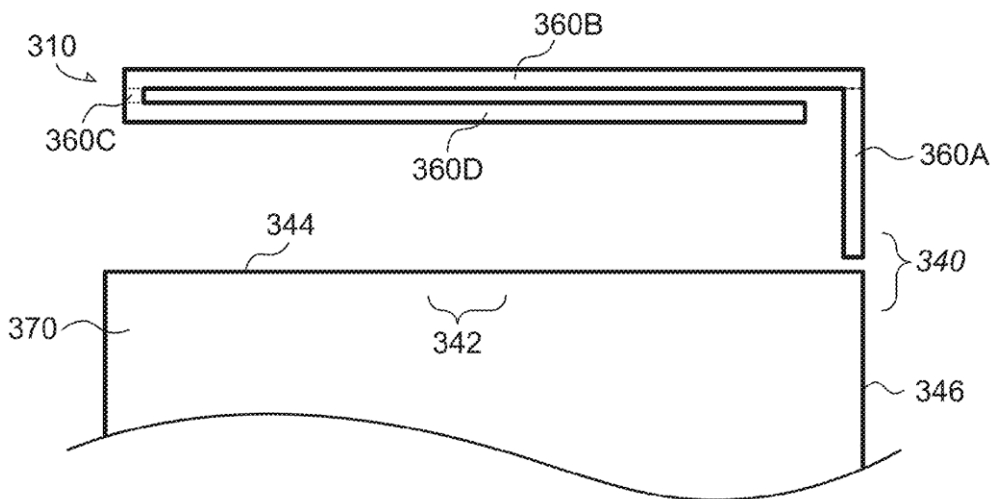
(51) **Int. Cl.**
H01Q 5/01 (2006.01)
H01P 11/00 (2006.01)
(52) **U.S. Cl.** **343/843**; 343/700 MS; 29/601

(57) **ABSTRACT**

A planar antenna for wireless information transfer can include a planar loading portion electrically coupled to a driven node of a wireless communication circuit, and a folded conductive strip portion coupled to the planar loading portion, the folded conductive strip portion comprising at least two segments laterally offset from each other and at least partially laterally overlapping with each other. The planar loading portion can be configured to establish a specified bandwidth of a second operating frequency range, leaving a first specified operating frequency range substantially unchanged.

(21) Appl. No.: **13/537,822**(22) Filed: **Jun. 29, 2012****Related U.S. Application Data**

(60) Provisional application No. 61/504,950, filed on Jul. 6, 2011, provisional application No. 61/504,954, filed on Jul. 6, 2011.





US 20130009839A1

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

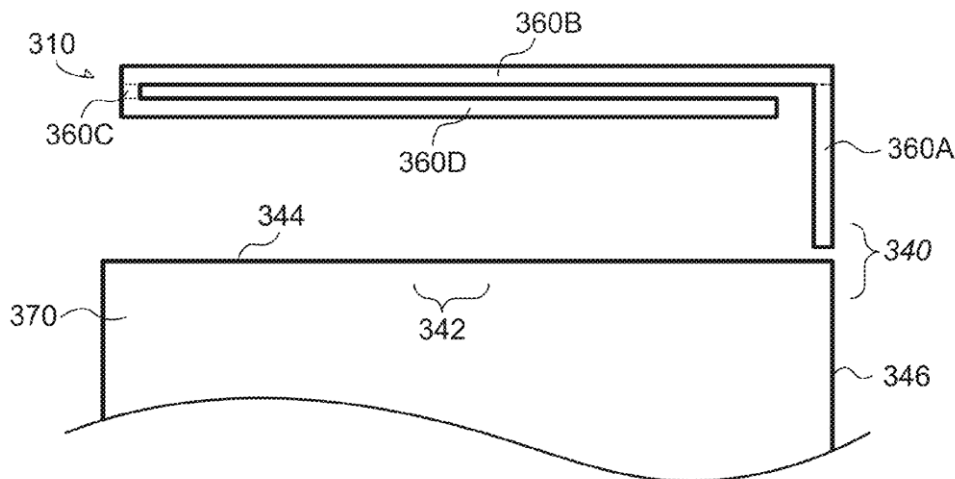
Nghiem et al.

(10) **Pub. No.: US 2013/0009839 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **MULTI-BAND MULTI-POLARIZATION
STUB-TUNED ANTENNA**(52) **U.S. CL.** **343/843**; 343/700 MS; 29/600(76) Inventors: **David Nghiem**, Shoreview, MN (US);
Peter J. Musto, Prior Lake, MN (US);
Larry D. Canady, Ham Lake, MN (US);
Keith R. Maile, New Brighton, MN
(US); **Thao Nguyen**, Eagan, MN (US)(57) **ABSTRACT**

Apparatus and techniques can include a planar antenna that can include a folded conductive strip portion coupled to a driven node of a wireless communication circuit, the folded conductive strip portion comprising at least two segments laterally offset from each other and at least partially laterally overlapping with each other, and a first region oriented along a first axis in a plane of the planar antenna and a second region oriented along a second axis in the plane of the planar antenna, the two axes and the two regions specified to provide polarization diversity of radiation from the planar antenna. The planar antenna can include a stub coupled to the folded conductive strip portion, the stub configured to provide a first specified operating frequency range at or near resonance using a mode corresponding to a total physical path length along the folded conductive strip portion.

(21) Appl. No.: **13/537,873**(22) Filed: **Jun. 29, 2012****Related U.S. Application Data**

(60) Provisional application No. 61/504,954, filed on Jul. 6, 2011, provisional application No. 61/504,950, filed on Jul. 6, 2011.

Publication Classification(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01P 11/00 (2006.01)



US 20130009840A1

(19) **United States**(12) **Patent Application Publication****Liu et al.**(10) **Pub. No.: US 2013/0009840 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **WHIP DUAL-BAND ANTENNA**(52) **U.S. CL.** **343/843; 343/895**(75) Inventors: **Peng Liu**, Shenzhen (CN); **Gee Siong Kok**, Shenzhen (CN)(57) **ABSTRACT**(73) Assignee: **Hytera Communications Corp., Ltd.**, Shenzhen, Guangdong (CN)

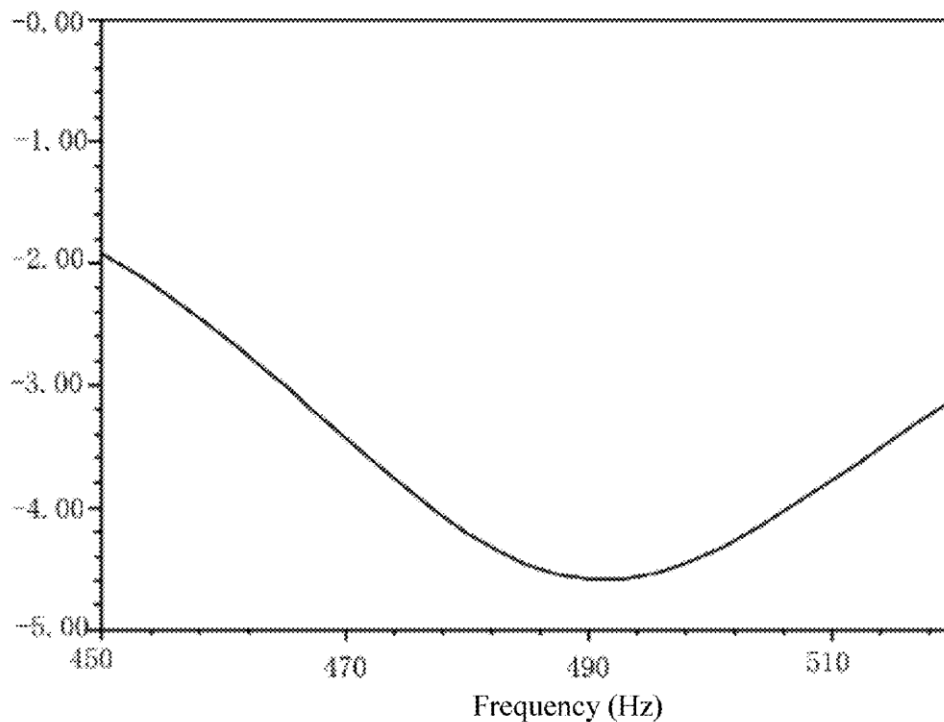
A whip dual-band antenna is disclosed in the present invention, and includes a radiator which is connected with a radio via a feed point of the radio, wherein the radiator includes a linear first radiator for generating a first resonance, a helical second radiator is set on the top of the first radiator in an inverse series manner, and the second radiator is used for generating a second resonance whose frequency is higher than the resonance frequency of the first radiator. In the present invention, by adding additionally a second radiator with a higher resonance frequency on the top of a first radiator dexterously, the length of the model of the second resonance frequency is increased, and the effect of the change of the UltraHigh Frequency (UHF) band is decreased. The antenna performance is better concentrated on the upper hemisphere when the dual-band antenna is operating in the Global Positioning System (GPS) frequency band, so as to implement a better GPS gain performance without affecting the effect in the UHF band.

(21) Appl. No.: **13/636,641**(22) PCT Filed: **Mar. 24, 2010**(86) PCT No.: **PCT/CN2010/071272**

§ 371 (c)(1),

(2), (4) Date: **Sep. 21, 2012****Publication Classification**(51) **Int. Cl.**
H01Q 5/01 (2006.01)
H01Q 9/06 (2006.01)

Echo coefficient(dB)

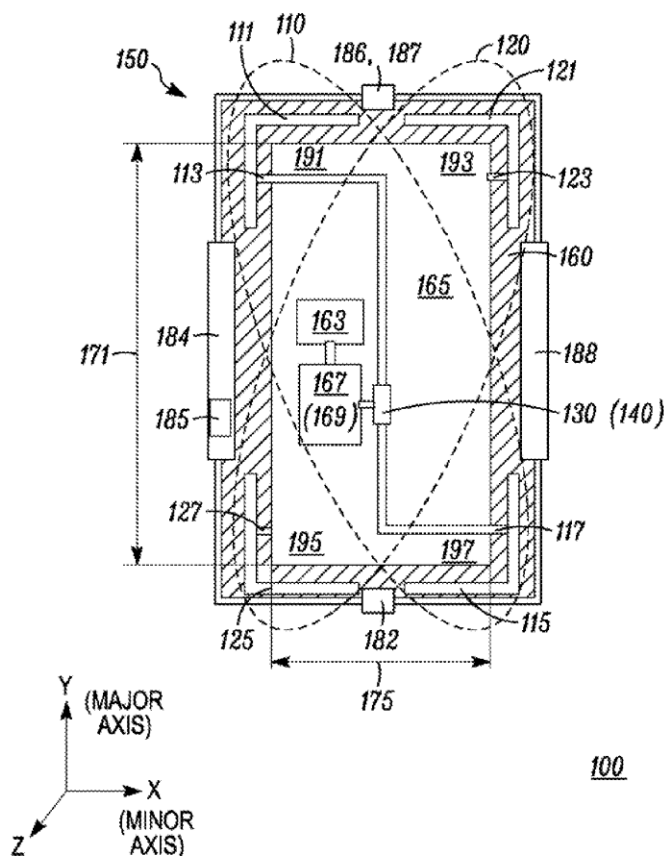




US 20130009842A1

(19) **United States**(12) **Patent Application Publication****Smith et al.**(10) **Pub. No.: US 2013/0009842 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **DIAGONALLY-DRIVEN ANTENNA SYSTEM
AND METHOD**(52) **U.S. CL. 343/853**(75) Inventors: **Hugh K. Smith**, Palatine, IL (US); **Eric
L. Krenz**, Crystal Lake, IL (US); **Karan
J. Juman**, Palatine, IL (US); **Andrew A.
Efanov**, Crystal Lake, IL (US)(57) **ABSTRACT**(73) Assignee: **Motorola Mobility LLC**, Libertyville,
IL (US)(21) Appl. No.: **13/615,807**(22) Filed: **Sep. 14, 2012****Related U.S. Application Data**(63) Continuation of application No. 13/107,560, filed on
May 13, 2011.**Publication Classification**(51) **Int. Cl.**
H01Q 21/24 (2006.01)

An electronic device (100) includes an antenna system (150) having two antennas (110, 120). A first antenna (110) has a first antenna element (111) positioned outside a first corner (191) of a planar, rectangular ground plane (165) and a second antenna element (115) positioned outside a second corner of the ground plane that is diagonally across from the first corner. A second antenna (120) has a third antenna element (121) positioned near a third corner (193) of the ground plane that is adjacent to the first corner and a fourth antenna element (125) positioned near a fourth corner (195) of the ground plane that is diagonally across from the third corner. At low-band frequencies, the antenna elements (111, 115) of the first antenna (110) are driven out-of-phase relative to each other. Similarly, at low-band frequencies, the antenna elements (121, 125) of the second antenna (120) are driven out-of-phase relative to each other.

100



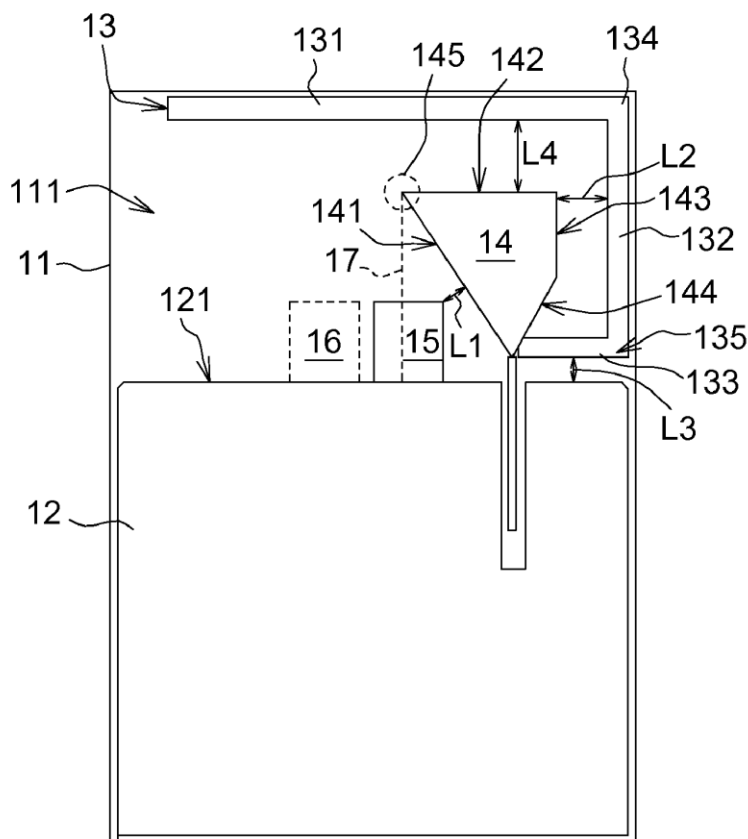
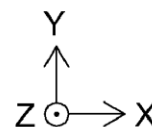
US 20130009843A1

(19) **United States**(12) **Patent Application Publication**
CHENG(10) **Pub. No.: US 2013/0009843 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **PRINTED ANTENNA**(52) **U.S. CL.** **343/860**(75) Inventor: **Shih-Chieh CHENG**, Tainan City (TW)(57) **ABSTRACT**(73) Assignee: **ARCADYAN TECHNOLOGY CORPORATION**, Hsinchu (TW)(21) Appl. No.: **13/434,126**(22) Filed: **Mar. 29, 2012**(30) **Foreign Application Priority Data**

Jul. 4, 2011 (TW) 100123559

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

A printed antenna comprising a substrate, a first ground plane, a low frequency radiation, a high frequency radiation, a first matching portion, a second matching portion is provided. The first ground plane, the low frequency radiation portion, the high frequency radiation portion and the first matching portion are located on an upper surface of the substrate. The low frequency radiation portion is connected to the high frequency radiation portion, and the first matching portion is extended from the first ground plane and towards the high frequency radiation portion. The second matching portion is adjacent to the first matching portion but does not overlap the first matching portion.

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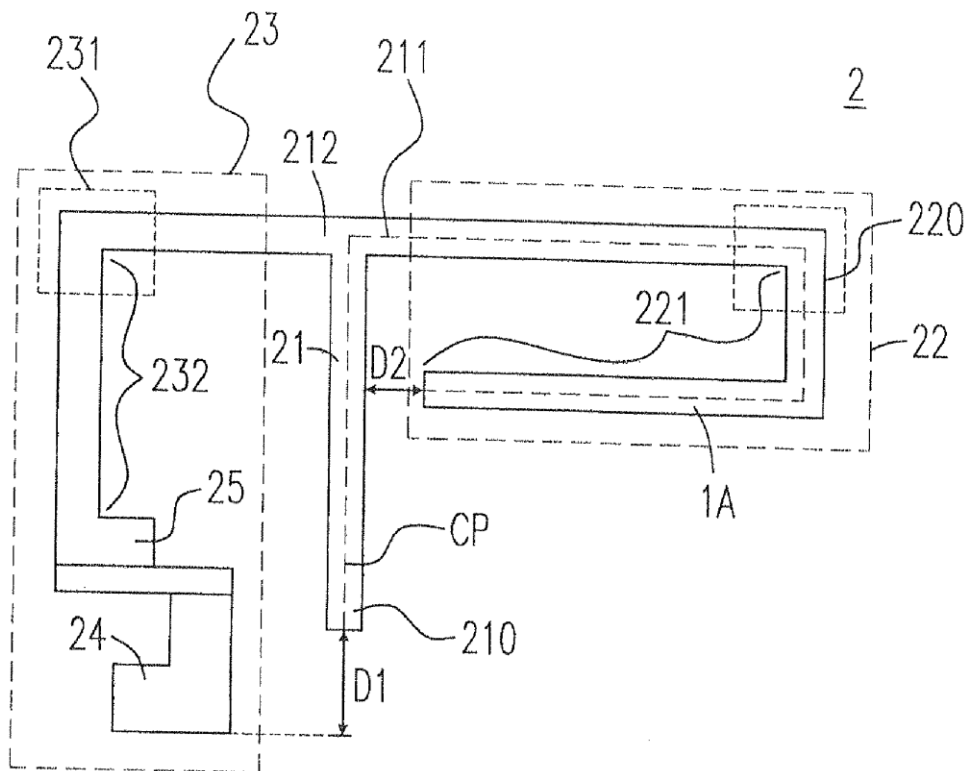


US 20130009845A1

(19) **United States**(12) **Patent Application Publication**
Huang et al.(10) **Pub. No.: US 2013/0009845 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **MULTI-FREQUENCY ANTENNA****Publication Classification**(75) Inventors: **Chih-Yung Huang**, Taichung City
(TW); **Kuo-Chang Lo**, Miaoli County
(TW); **Sy-Ben Wang**, Hsinchu County
(TW)(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/50 (2006.01)(52) **U.S. Cl.** **343/860; 343/700 MS**(73) Assignee: **ARCADYAN TECHNOLOGY CORP.**,
Hsinchu City (TW)(57) **ABSTRACT**(21) Appl. No.: **13/530,666**(22) Filed: **Jun. 22, 2012**(30) **Foreign Application Priority Data**

Jul. 6, 2011 (TW) 100123960

An antenna for receiving and transmitting a signal is provided. The antenna includes a connection portion receiving and transmitting the signal, a first radiation portion and a second radiation portion. The connection portion includes a first end, a second end and a third end, wherein the first end is configured at a first distance from a ground. The first radiation portion is connected to the second end, and includes at least one folding area forming thereon at least one folding segment, wherein the folding segment and the connection portion have therebetween a shortest distance being a second distance. The second radiation portion is connected to the third end.





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

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

(52) **U.S. Cl.** 343/893

(57) **ABSTRACT**

(22) PCT Filed: **May 31, 2011**

(86) PCT No.: **PCT/JP2011/062541**

§ 371 (c)(1),
(2), (4) Date: **Sep. 13, 2012**

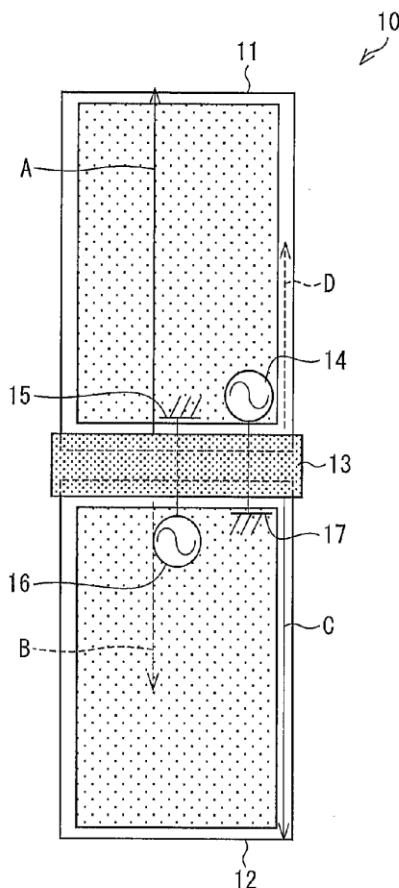
(30) **Foreign Application Priority Data**

Jun. 2, 2010 (JP) 2010-126791

Publication Classification

(51) **Int. Cl.**
H01O 21/29 (2006.01)

It is possible to provide a mobile phone (10) including: a first feeding section (14); a first ground (15) for providing a reference potential to the first feeding section (14); a second feeding section (16); a second ground (17) for providing a reference potential to the second feeding section (16); a first transmission line via which the first feeding section (14) and the second ground (17) are electrically connected to each other; and a second transmission line via which the second feeding section (16) and the first ground (15) are electrically connected to each other. With the arrangement, it is possible to provide a portable wireless device having antennas employing excitation of bodies, which portable wireless device can reduce deterioration of antenna characteristics even in a case where one of the bodies is held in a hand.





US 20130012127A1

(19) **United States**(12) **Patent Application Publication**
Orihara et al.(10) **Pub. No.: US 2013/0012127 A1**(43) **Pub. Date: Jan. 10, 2013**(54) **ANTENNA DEVICE AND COMMUNICATION
DEVICE****Publication Classification**(75) Inventors: **Katsuhisa Orihara**, Tochigi (JP);
Yoshito Ikeda, Tochigi (JP); **Norio
Saito**, Tochigi (JP); **Satoru Sugita**,
Tochigi (JP)(51) **Int. Cl.**
H04B 5/00 (2006.01)
H01Q 7/06 (2006.01)
(52) **U.S. Cl.** **455/41.1; 455/90.2; 336/221**(73) Assignee: **SONY CHEMICAL &
INFORMATION DEVICE
CORPORATION**, Tokyo (JP)(57) **ABSTRACT**

The present invention provides a communication device that can reduce a housing of an electronic device in size and thickness when the communication device is built in the electronic device. The communication device includes: an antenna coil (11a) arranged on an outer peripheral portion (134) of a housing (131) surface facing a reader/writer (120) of a mobile phone (130); a magnetic sheet (13) that attracts a magnetic field transmitted from the reader/writer (120) to the antenna coil (11a); and a communication processing unit (12) that is driven by a current flowing in the antenna coil (11a) and performs communication with the reader/writer (120), wherein the magnetic sheet (13) is arranged on the reader/writer (120) side of the antenna coil (11a) at a center portion (132a), and the antenna coil (11a) is arranged on the reader/writer (120) side on an outer periphery (130d) side.

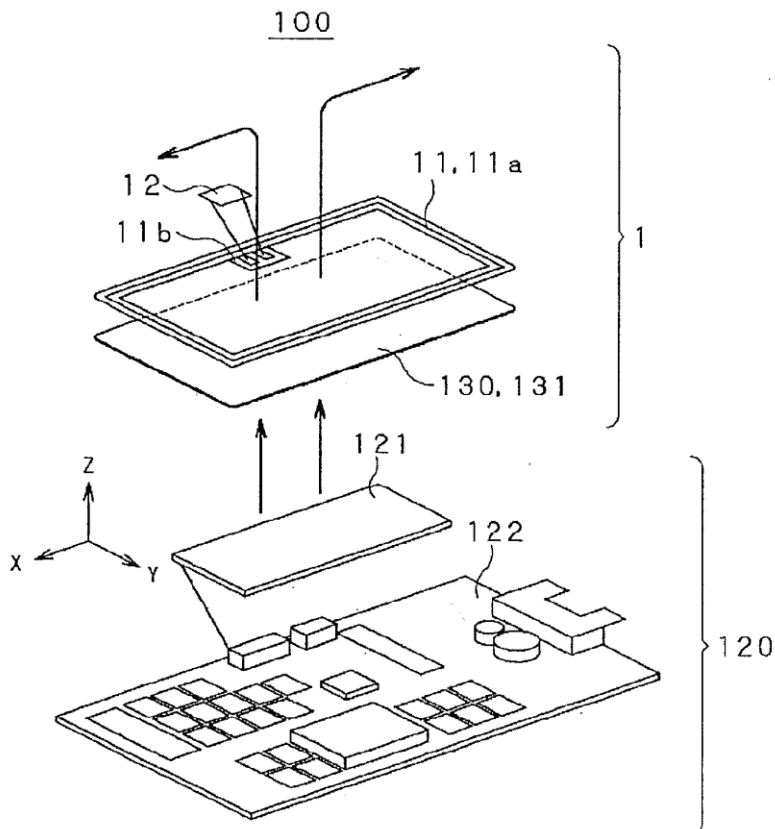
(21) Appl. No.: **13/635,997**(22) PCT Filed: **Mar. 31, 2011**(86) PCT No.: **PCT/JP2011/058245**

§ 371 (c)(1),

(2), (4) Date: **Sep. 19, 2012**(30) **Foreign Application Priority Data**

Mar. 31, 2010 (JP) 2010-082037

Mar. 28, 2011 (JP) 2011-070666

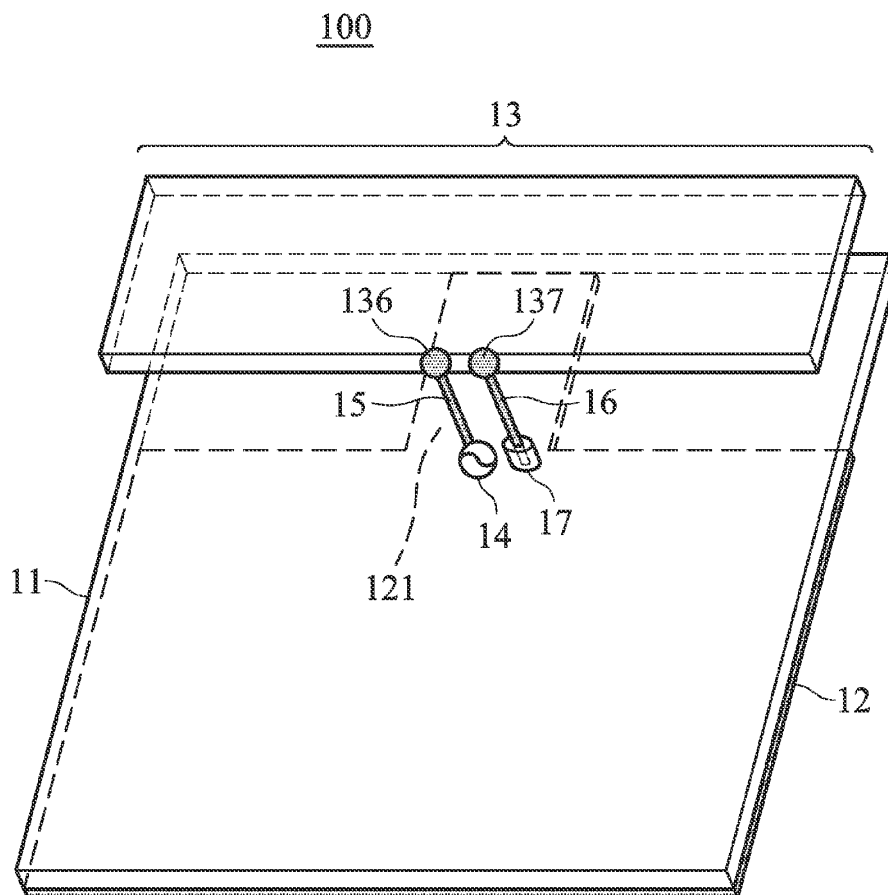




US 20130016013A1

(19) **United States**(12) **Patent Application Publication****Wong et al.**(10) **Pub. No.: US 2013/0016013 A1**(43) **Pub. Date: Jan. 17, 2013**(54) **MOBILE COMMUNICATION DEVICE AND ANTENNA DEVICE**(52) **U.S. CL. 343/700 MS**(75) Inventors: **Kin-Lu Wong**, Kaohsiung City (TW);
Ting-Wei Kang, Kaohsiung City (TW);
Shih-Wei Hsieh, Taipei City (TW); **Wei Yu Chen**, New Taipei City (TW)(57) **ABSTRACT**(73) Assignees: **NATIONAL SUN YAT-SEN UNIVERSITY**, Kaohsiung (TW);
MEDIATEK SINGAPORE PTE. LTD., Solaris (SG)

A mobile communication device for operating in LTE and WWAN bands is provided in the invention. The mobile communication device includes a system circuit board and an antenna. The system circuit board includes a system ground plane. The antenna includes: an antenna substrate, substantially parallel to the system ground plane; a first radiation element, disposed on the antenna substrate; a second radiation element, disposed on the antenna substrate; an antenna ground plane, disposed on the antenna substrate, and coupled to the system ground plane; and a transmission line, disposed on the antenna substrate, coupled to the first and second radiation elements, and having a feed point. The mobile communication device is further configured to accommodate a data transmission component.

(21) Appl. No.: **13/182,277**(22) Filed: **Jul. 13, 2011****Publication Classification**(51) **Int. Cl.**
H01Q 1/38 (2006.01)



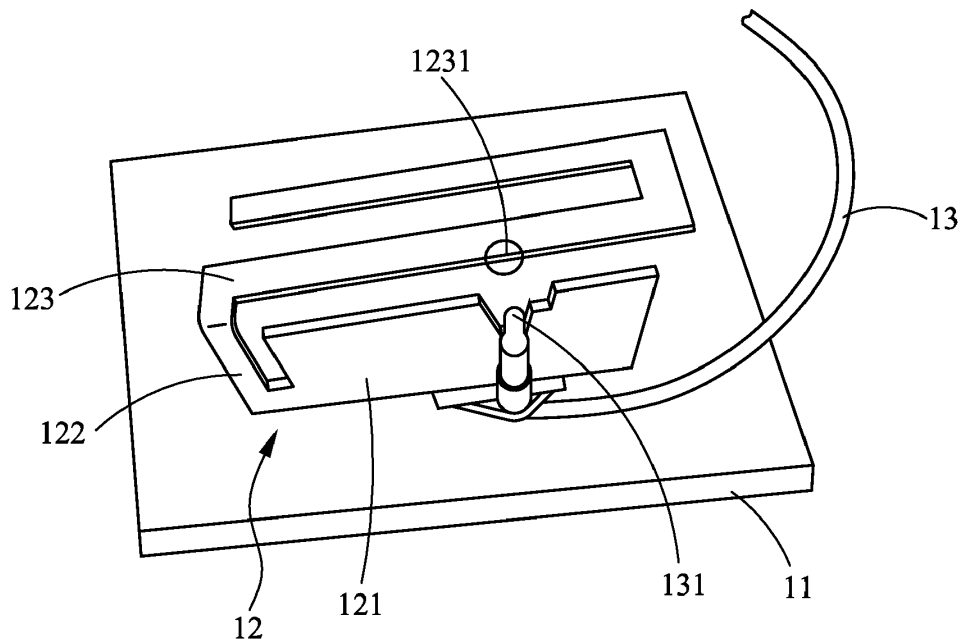
US 20130016014A1

(19) **United States**(12) **Patent Application Publication**
Cheng et al.(10) **Pub. No.: US 2013/0016014 A1**(43) **Pub. Date: Jan. 17, 2013**(54) **DUAL BAND ANTENNA**(52) **U.S. CL. 343/700 MS**(75) Inventors: **Shih-Chieh Cheng**, Kaohsiung City
(TW); **Kuo-Chang Lo**, Miaoli County
(TW)(57) **ABSTRACT**(73) Assignee: **ARCADYAN TECHNOLOGY
CORPORATION**, Hsinchu City (TW)(21) Appl. No.: **13/277,313**(22) Filed: **Oct. 20, 2011**(30) **Foreign Application Priority Data**

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

A dual band antenna with improved radiation characteristic, comprising: a ground plane, formed at the bottom thereof; two impedance matching elements formed respectively at the two arms thereof while connecting to the ground plane so as to form a first joint and a second joint at the connections in respective; a first radiation unit, connected to the first joint, being formed like an arc connected to the first joint that is disposed concave to the bottom ground plane while extending from the first joint toward the second joint, and then turning vertically upward from the end of the arc for enabling the end of the vertical portion to connect to a second radiation unit; and the second radiation unit, being formed like an arc that is disposed concave to the bottom ground plane while extending from the joint with the first radiation unit toward the first joint.

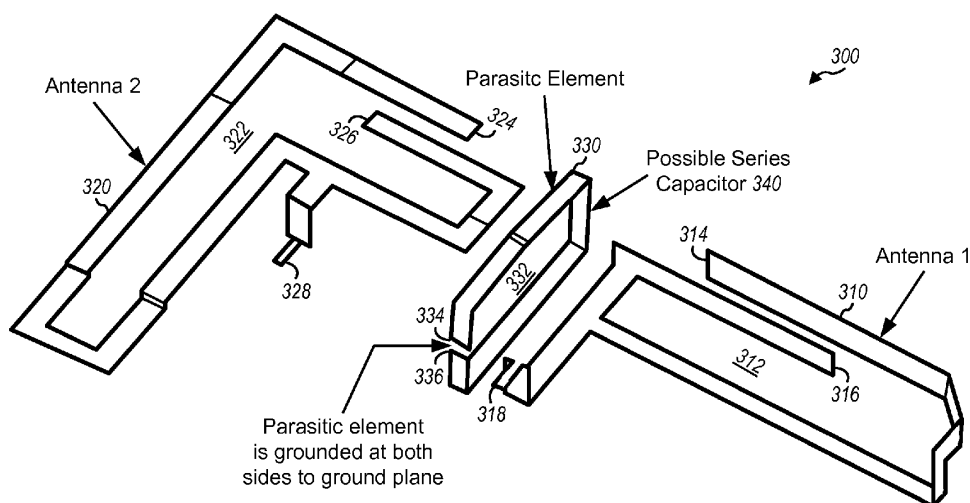




US 20130016024A1

(19) **United States**(12) **Patent Application Publication****Shi et al.**(10) **Pub. No.: US 2013/0016024 A1**(43) **Pub. Date: Jan. 17, 2013**(54) **WIDEBAND ANTENNA SYSTEM WITH
MULTIPLE ANTENNAS AND AT LEAST ONE
PARASITIC ELEMENT**(52) **U.S. CL.** **343/833; 29/600; 29/729**(75) Inventors: **Guining Shi**, San Diego, CA (US);
Allen Minh-Triet Tran, San Diego, CA
(US); **Elizabeth M. Wyrwich**, San
Diego, CA (US)(57) **ABSTRACT**(73) Assignee: **QUALCOMM INCORPORATED**, San
Diego, CA (US)

A wideband antenna system with multiple antennas and at least one parasitic element is disclosed. In an exemplary design, an apparatus includes a first antenna, a second antenna, and a parasitic element. The first antenna has a shape of an open-ended loop with two ends that overlap and are separated by a gap. The second antenna may also have a shape of an open-ended loop with two ends that overlap and are separated by a gap. The parasitic element is located between the first and second antennas. The first and second antennas may be placed side by side on a board, located at either the top end or the bottom end of a wireless device, and/or formed on opposite sides (e.g., the front and back sides) of the board. The parasitic element may be formed on a plane that is perpendicular to the plane on which the first and second antennas are formed.

(21) Appl. No.: **13/181,796**(22) Filed: **Jul. 13, 2011****Publication Classification**(51) **Int. Cl.**
H01Q 19/02 (2006.01)
H05K 13/04 (2006.01)
H01P 11/00 (2006.01)



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(19) **United States**(12) **Patent Application Publication****Choi et al.**(10) **Pub. No.: US 2013/0016026 A1**(43) **Pub. Date: Jan. 17, 2013**(54) **BROADBAND INTERNAL ANTENNA USING
ELECTROMAGNETIC COUPLING
SUPPORTING IMPROVED IMPEDANCE
MATCHING**(30) **Foreign Application Priority Data**

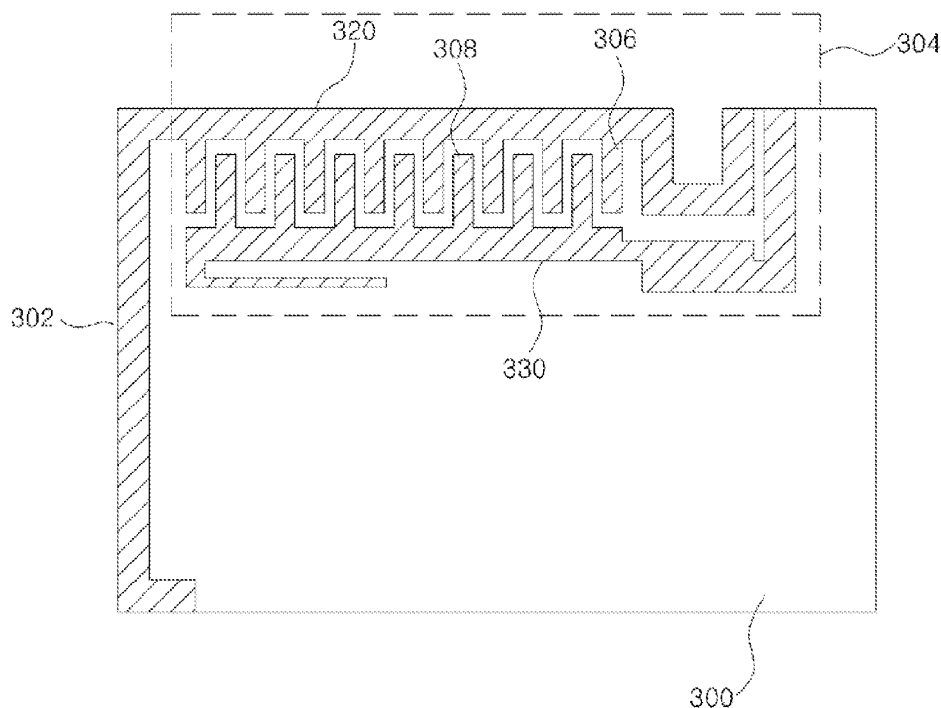
Mar. 31, 2010 (KR) 10-2010-0029083

Publication Classification(75) Inventors: **Su-Hyun Choi**, Seoul (KR); **Sung-Nam An**, Seoul (KR); **Byoung-Nam Kim**, Gyeonggi-do (KR); **Seung-Yong Lee**, Gyeonggi-do (KR); **Jong-Ho Jung**, Gyeonggi-do (KR)(51) **Int. Cl.**
H01Q 1/50 (2006.01)(52) **U.S. Cl.** **343/860**(57) **ABSTRACT**

Disclosed is an internal antenna using electromagnetic coupling that supports improved impedance matching. The antenna includes a first conductive member having one end electrically connected with a power feed point; a second conductive member separated from the first conductive member by a particular distance and electrically connected with a ground; a radiator extending from the second conductive member; and a grounding plate joined with the other end of the first conductive member. This antenna provides the advantages of adequately ensuring wide-band and multi-band characteristics while improving impedance matching properties.

(73) Assignee: **ACE & PARTNERS**, Incheon (KR)(21) Appl. No.: **13/637,960**(22) PCT Filed: **Mar. 29, 2011**(86) PCT No.: **PCT/KR2011/002128**

§ 371 (c)(1),

(2), (4) Date: **Sep. 27, 2012**



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KVIST et al.

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(54) **ANTENNA DEVICE**

Publication Classification

(75) Inventors: **Søren KVIST**, Vaerlose (DK); **Sinasi ÖZDEN**, Soborg (DK)

(51) **Int. Cl.**
H01Q 21/00 (2006.01)
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(73) Assignee: **GN RESOUND A/S**, Ballerup (DK)

(52) **U.S. Cl.** **455/41.2; 343/893**

(21) Appl. No.: **13/229,634**

(57) **ABSTRACT**

(22) Filed: **Sep. 9, 2011**

Related U.S. Application Data

(60) Provisional application No. 61/508,485, filed on Jul. 15, 2011.

An antenna device includes a first antenna configured to operate within a first frequency band, a second antenna configured to operate within a second frequency band, wherein the second antenna is separated from the first antenna by a distance, and at least one parasitic antenna element, wherein the at least one parasitic element is substantially orthogonal to the first antenna, to the second antenna, or to both the first and second antennas, so as to substantially isolate between the first antenna and the second antenna.

Foreign Application Priority Data

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