US 20110080324A1

(19) **United States**

(12) **Patent Application Publication**

CHANG

(10) **Pub. No.: US 2011/0080324 A1**

(43) **Pub. Date: Apr. 7, 2011**

(54) **SINGLE-BAND ANTENNA**

(75) Inventor: **JIN-SU CHANG**, Hsinchu County (TW)

(73) Assignee: **ARCADYAN TECHNOLOGY CORPORATION**, Hsinchu City (TW)

(21) Appl. No.: **12/896,208**

(22) Filed: **Oct. 1, 2010**

(30) **Foreign Application Priority Data**

Oct. 2, 2009 (TW) 098133580

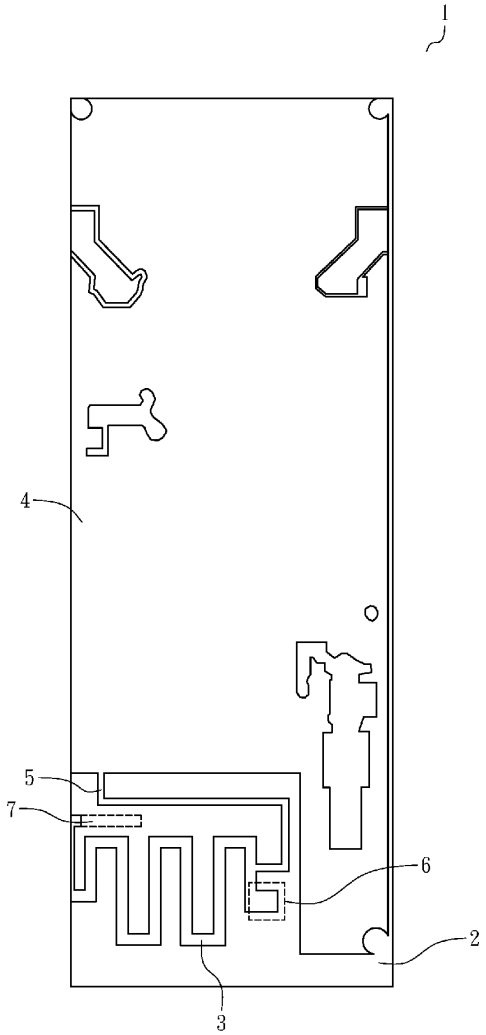
Publication Classification

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

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

(57) **ABSTRACT**

A single-band antenna, comprising: a substrate; a first radiation unit; a conductive material; an impedance matching circuit; a signal feed-in terminal; a second radiation unit; and a wire connecting unit. Therefore, the single-band antenna can be miniaturized to be installed with or inside a compact wireless transmission device with enhanced transceiving performance.



US 20110080327A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2011/0080327 A1

(43) Pub. Date: Apr. 7, 2011

Kobayashi et al.

(54) **PORTABLE WIRELESS MACHINE**

(75) Inventors: **Hiroaki Kobayashi**, Miyagi (JP); **Haruhiko Kakitsu**, Miyagi (JP); **Takeshi Yamaguchi**, Kanagawa (JP)

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

(21) Appl. No.: **12/997,235**

(22) PCT Filed: **Feb. 19, 2009**

(86) PCT No.: **PCT/JP2009/000703**

§ 371 (c)(1), (2), (4) Date: **Dec. 9, 2010**

(30) **Foreign Application Priority Data**

Jun. 10, 2008 (JP) 2008-151976

Publication Classification

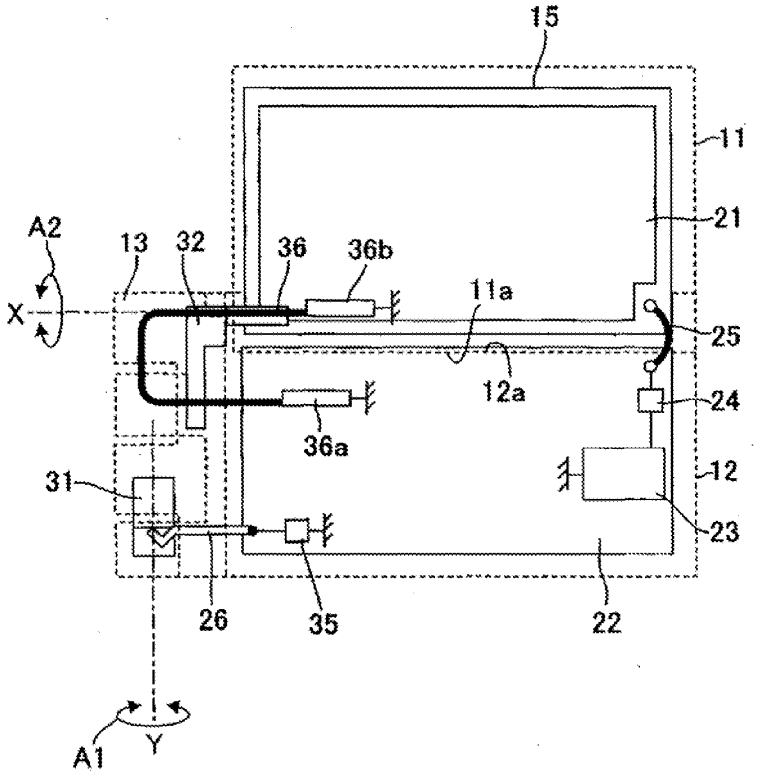
(51) **Int. Cl.**
H01Q 1/24 (2006.01)

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

(57) **ABSTRACT**

A decrease in antenna currents that are oriented in opposite directions and that flow through enclosures and enhancement of an antenna characteristic are accomplished without impairment of a design characteristic of the enclosures and while being made feasible to achieve a reduction in size and thickness.

In a portable radio that has an upper enclosure **11**, a lower enclosure **12**, and an intermediate enclosure **13** and that can assume a portrait open state and a landscape open state, when the landscape open state is achieved as a result of turning action of a second hinge member **32**, an antenna element **15** of the upper enclosure **11** is connected to a radio circuit **23** on a second circuit board **22** of the lower enclosure **12** by way of a connection line **25**. A first hinge member **31** in the intermediate enclosure **13** is earthed to a ground of the second circuit board **22** of the lower enclosure **12** by way of a connection conductor **26** and a reactance element **35**. The first hinge member **31** is thereby caused to act as an earth line, to thus reduce opposite-phase antenna currents flowing through the upper enclosure **11** and the lower enclosure **12** that oppose each other.



US 20110080330A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2011/0080330 A1

(43) Pub. Date: Apr. 7, 2011

LEE et al.

(54) **MULTIBAND ANTENNA SYSTEM WITH SHIELD**

(75) Inventors: **Joong Hee LEE**, Seongnam-si (KR); **Yong JEE**, Seoul (KR); **Young Min SEO**, Seoul (KR); **Yo Han JEONG**, Seoul (KR)

(73) Assignees: **SAMSUNG ELECTRONICS CO. LTD.**, Suwon-si (KR); **INDUSTRY-UNIVERSITY COOPERATION FOUNDATION SOKANG UNIVERSITY**, Seoul (KR)

(21) Appl. No.: **12/899,824**

(22) Filed: **Oct. 7, 2010**

(30) **Foreign Application Priority Data**

Oct. 7, 2009 (KR) 10-2009-0095350

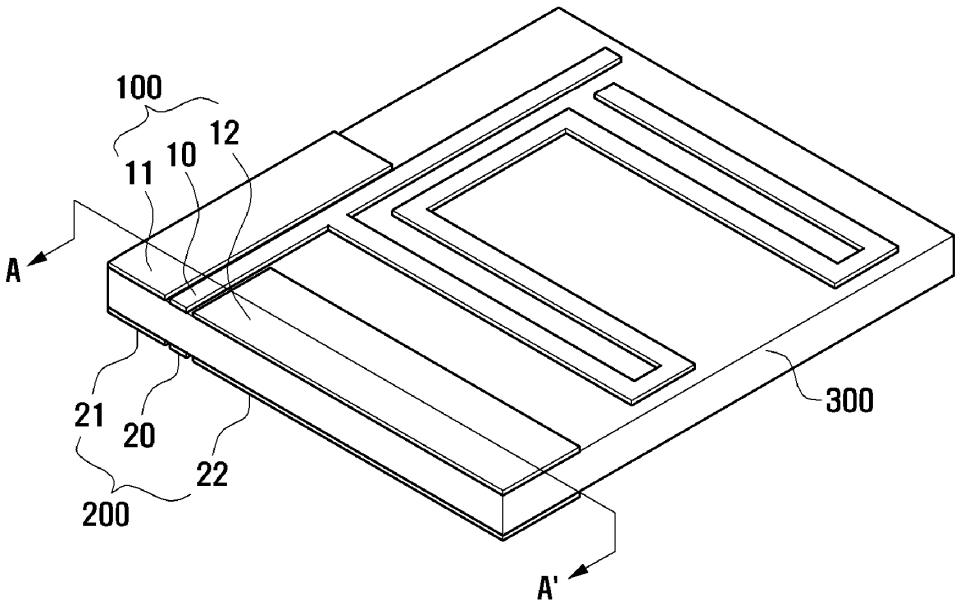
Publication Classification

(51) **Int. Cl.**
H01Q 5/01 (2006.01)
H01Q 13/00 (2006.01)

(52) **U.S. Cl.** **343/785**

(57) **ABSTRACT**

A multiband antenna system installed onto a circuit board of a mobile device is provided. The antenna system includes a planar dielectric substrate, an upper conductor formed on an upper surface of the dielectric substrate and shaped as a coplanar wave guide and includes first and second ground parts and a radiator, and a lower conductor formed on the lower surface of the dielectric substrate and shaped as a coplanar wave guide and includes third and fourth ground parts and an electrode part, via-holes that pass through the dielectric substrate and are electrically connected to the first ground part to the third, the second ground part to the fourth, and the radiator to the electrode part, respectively, and solder balls connect the electrode part to an electric wire of the circuit board and also the third and fourth ground parts to the ground of the circuit board.



US 20110080332A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2011/0080332 A1

(43) Pub. Date: Apr. 7, 2011

Montgomery et al.

(54) MULTIMODE ANTENNA STRUCTURE

(75) Inventors: **Mark T. Montgomery**, Melbourne Beach, FL (US); **Frank M. Caimi**, Vero Beach, FL (US); **Mark W. Kishler**, Rockledge, FL (US)

(73) Assignee: **SkyCross, Inc.**, Viera, FL (US)

(21) Appl. No.: **12/750,196**

(22) Filed: **Mar. 30, 2010**

Related U.S. Application Data

(63) 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.

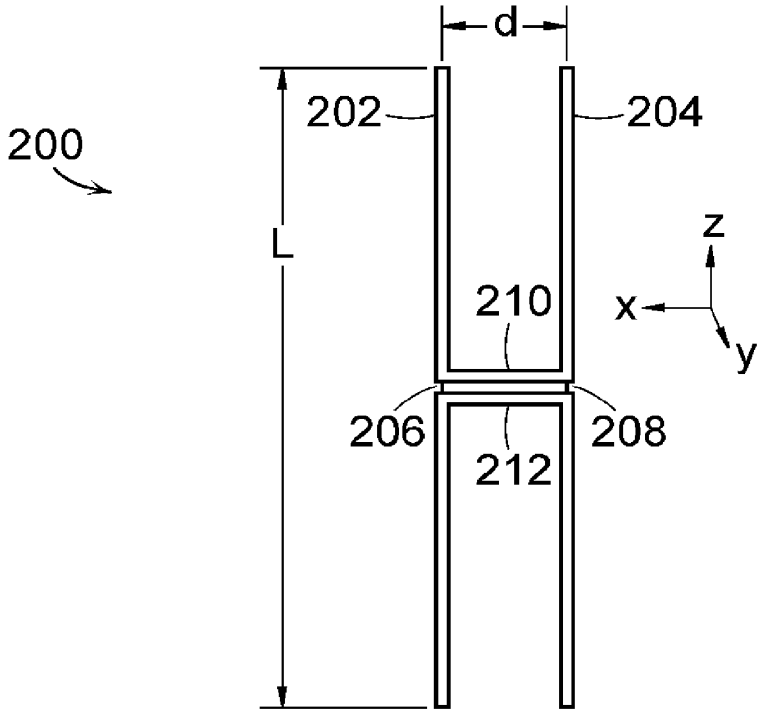
Publication Classification

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

(52) **U.S. Cl.** **343/843**

(57) **ABSTRACT**

One or more embodiments are directed to a multimode antenna structure for transmitting and receiving electromagnetic signals in 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. The antenna structure also includes one or more connecting elements electrically connecting the antenna elements such that 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. The electrical currents flowing through the one antenna element and the neighboring antenna element are generally equal in magnitude, such that an antenna mode excited by one antenna port is generally electrically isolated from a mode excited by another antenna port at a given desired signal frequency range without the use of a decoupling network connected to the antenna ports, and the antenna structure generates diverse antenna patterns.



US 20110080333A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2011/0080333 A1

(43) Pub. Date: Apr. 7, 2011

Wu et al.

(54) **ELECTRONIC DEVICE WITH EMBEDDED ANTENNA**

(76) Inventors: **Min-Chung Wu**, Taoyuan County (TW); **Shao-Chin Lo**, Miaoli City (TW)

(21) Appl. No.: **12/894,191**

(22) Filed: **Sep. 30, 2010**

(30) **Foreign Application Priority Data**

Oct. 6, 2009 (TW) 098133844
Nov. 26, 2009 (TW) 098140322

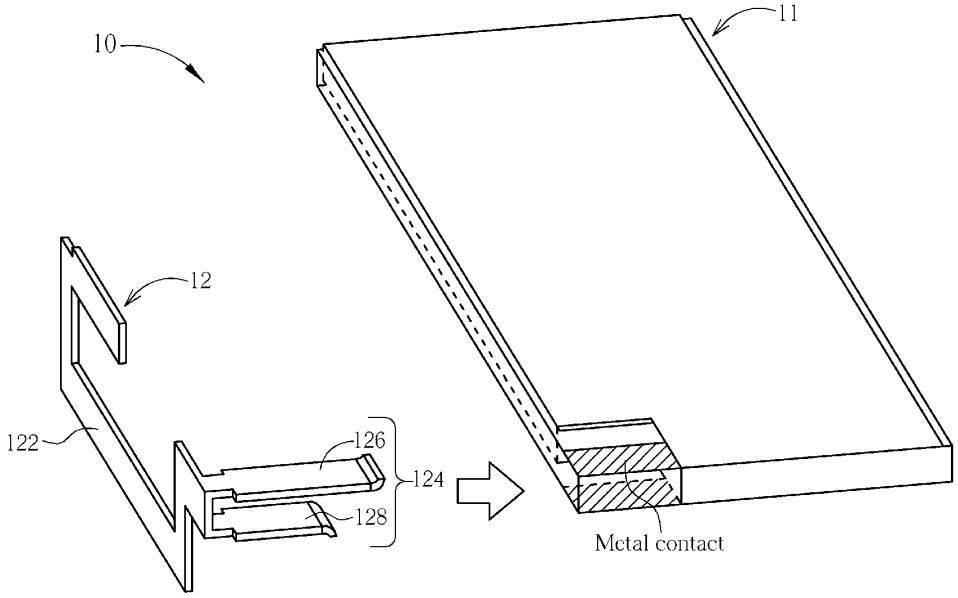
Publication Classification

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

(52) **U.S. Cl.** **343/906**

(57) **ABSTRACT**

An electronic device with an embedded three-dimensional antenna is disclosed. The electronic device includes a printed circuit board (PCB) and an embedded three-dimensional antenna. The embedded three-dimensional antenna includes a radiation element and a connection element. The connection element includes a first connection part and a second connection part. The first and second connection parts are coupled to the PCB, and utilized for transferring signals of the embedded three-dimensional antenna to the PCB. The first and second connection parts further clamp the PCB to attach the embedded three-dimensional antenna on the PCB.



US 20110081876A1

(19) **United States**

(12) **Patent Application Publication**

Kuehn et al.

(10) **Pub. No.: US 2011/0081876 A1**

(43) **Pub. Date: Apr. 7, 2011**

(54) **DEVICE WITH DUAL-BAND ANTENNA TUNED BY TANK NETWORK**

(75) Inventors: **Michael Kuehn**, Bochum (DE); **Andreas Handro**, Bochum (DE)

(73) Assignee: **RESEARCH IN MOTION LIMITED**, Waterloo (CA)

(21) Appl. No.: **12/722,740**

(22) Filed: **Mar. 12, 2010**

Related U.S. Application Data

(60) Provisional application No. 61/248,732, filed on Oct. 5, 2009.

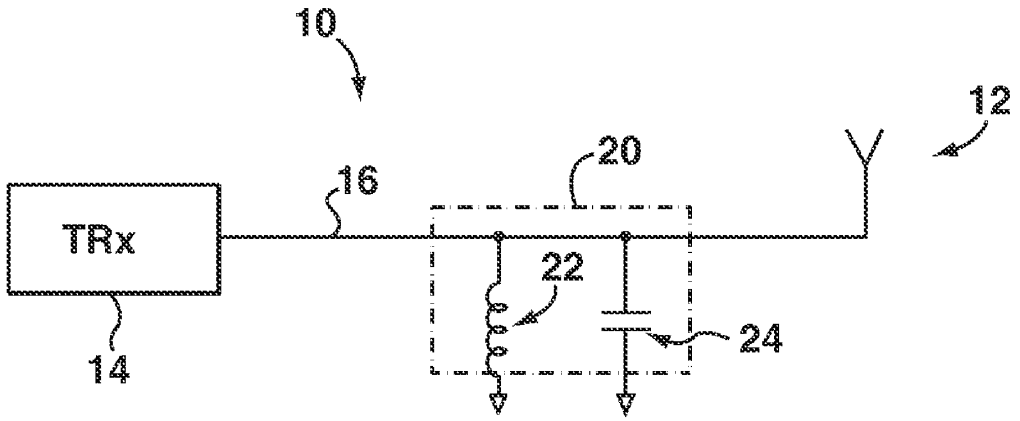
Publication Classification

(51) **Int. Cl.**
H04B 1/04 (2006.01)

(52) **U.S. Cl.** **455/103**

(57) **ABSTRACT**

A communication device having an antenna tuned by a tank network at its input port to realize dual-band resonance. The antenna alone has a wideband but weak resonance, while the device antenna circuit with the tank network has a narrowband resonance between the two desired frequencies when the antenna is open-circuited. Together, the device antenna circuit with the tank network and antenna realize dual narrowband resonance at the two desired frequencies.



US 20110084882A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2011/0084882 A1

(43) Pub. Date: Apr. 14, 2011

TSAI et al.

(54) **DUAL-BAND ANTENNA AND ANTENNA DEVICE HAVING THE SAME**

(76) Inventors: **Tiao-Hsing TSAI**, Yunghe City (TW); **Chieh-Ping Chiu**, Erlun Township (TW); **Feng-Jen Weng**, Kuei Shan Hsiang (TW); **I-Ping Yen**, Yonghe City (TW)

(21) Appl. No.: **12/709,830**

(22) Filed: **Feb. 22, 2010**

(30) **Foreign Application Priority Data**

Oct. 8, 2009 (TW) 098134111

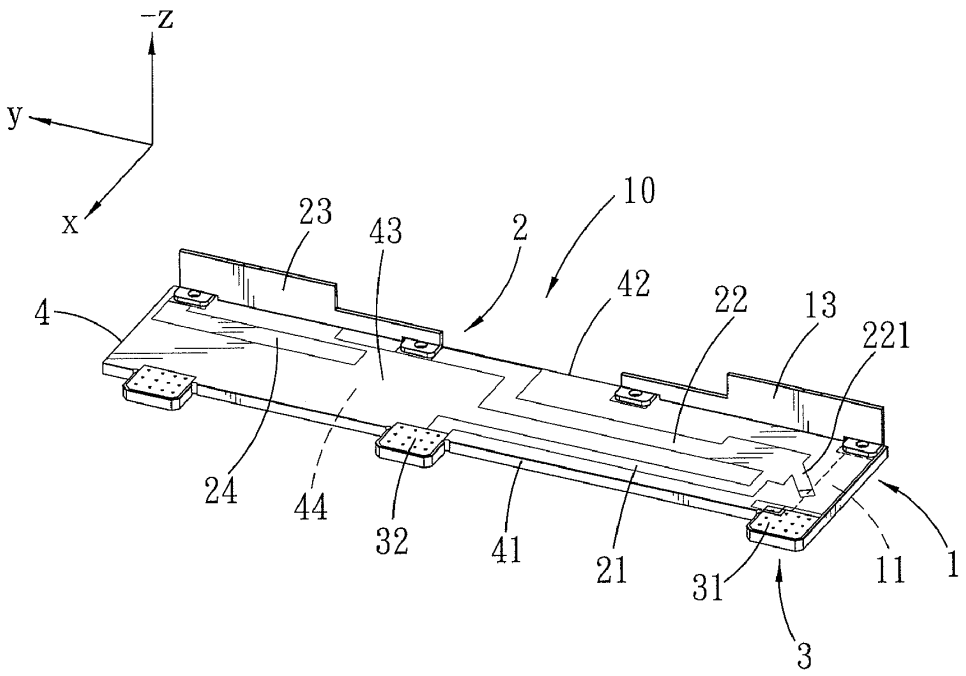
Publication Classification

(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 1/38 (2006.01)

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

(57) **ABSTRACT**

A dual-band antenna includes first and second connecting sections coupled to a ground unit, and first, second, and third radiator sections. The first connecting section extends in a direction from the ground unit toward an inner wall face of a housing of an electronic device. The first radiator section is connected to the first connecting section and is disposed to extend along the inner wall face. A feed-in section extends between the second connecting section and the inner wall face, and has a portion extending parallel to the first radiator section. The second radiator section is connected to the feed-in section and is disposed to extend along the inner wall face. The third radiator section is connected to the second radiator section, extends between the second radiator section and the feed-in section, and has a portion extending parallel to the second radiator section.



US 20110084883A1

(19) **United States**

(12) **Patent Application Publication**

Wong et al.

(10) **Pub. No.: US 2011/0084883 A1**

(43) **Pub. Date: Apr. 14, 2011**

(54) **MOBILE COMMUNICATION DEVICE AND ANTENNA THEREOF**

(76) Inventors: **Kin-Lu Wong**, Tapei Hsien (TW); **Cheng-Tse Lee**, Tapei Hsien (TW)

(21) Appl. No.: **12/648,365**

(22) Filed: **Dec. 29, 2009**

(30) **Foreign Application Priority Data**

Oct. 8, 2009 (TW) 098134200

Publication Classification

(51) **Int. Cl.**

H01Q 9/04 (2006.01)

H01Q 1/24 (2006.01)

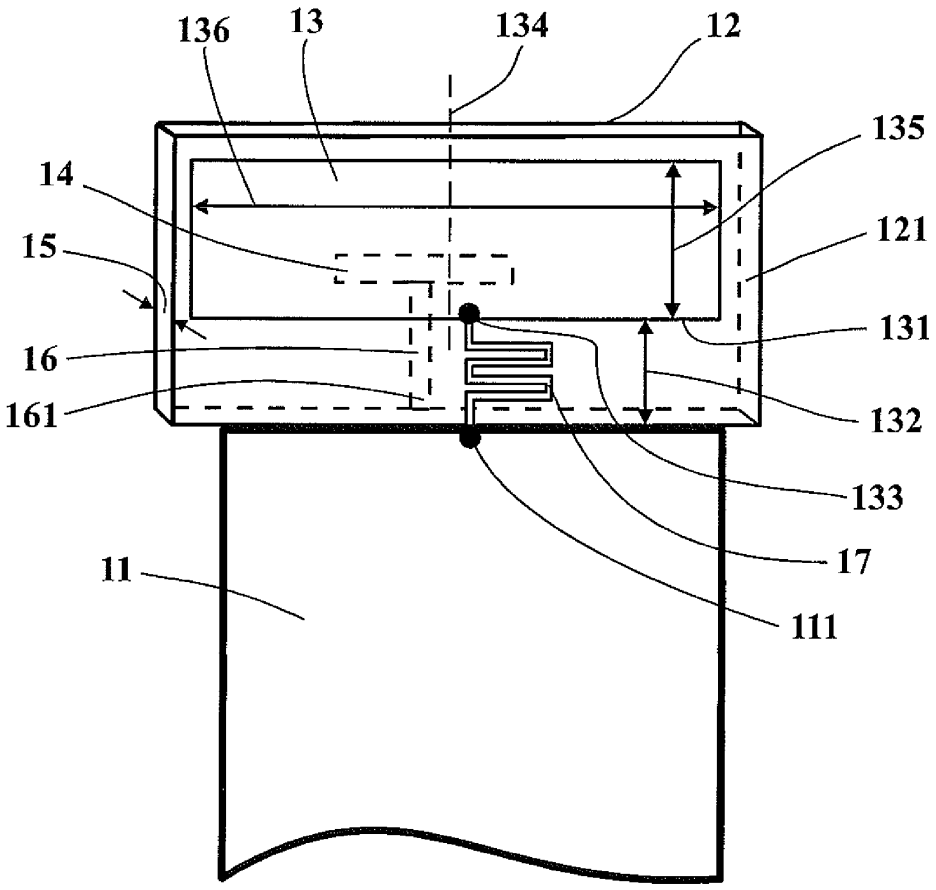
H01Q 5/00 (2006.01)

(52) **U.S. Cl.** ..... **343/702**; 343/700 MS

(57) **ABSTRACT**

The present invention is related to a mobile communication device. The device has a ground plane and an antenna. The antenna is disposed on a dielectric substrate and comprises a radiating metal portion, a coupling metal portion, and a shorting metal portion. One edge of the radiating metal portion faces the ground plane and has a distance between the edge and the ground plane. The coupling metal portion is electrically connected to a source via a connecting metal strip. One end of the shorting metal portion is electrically connected to the radiating metal portion, and the other end of the shorting metal portion is electrically connected to the ground plane.

1



US 20110084889A1

(19) **United States**

(12) **Patent Application Publication**

TSAI et al.

(10) **Pub. No.: US 2011/0084889 A1**

(43) **Pub. Date: Apr. 14, 2011**

(54) **ANTENNA DEVICE AND DUAL-BAND ANTENNA**

(76) Inventors: **Tiao-Hsing TSAI**, Yunghe City (TW); **Chieh-Ping Chiu**, Erlun Township (TW); **I-Ping Yen**, Yonghe City (TW); **Feng-Jen Weng**, Kuei Shan Hsiang (TW)

(21) Appl. No.: **12/709,785**

(22) Filed: **Feb. 22, 2010**

(30) **Foreign Application Priority Data**

Oct. 8, 2009 (TW) 098134112

Publication Classification

(51) **Int. Cl.**

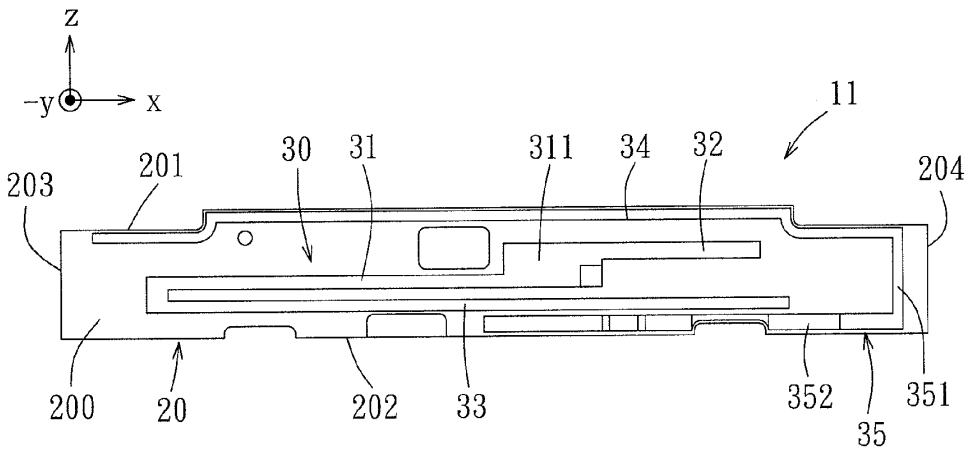
H01Q 1/36 (2006.01)

H01Q 1/48 (2006.01)

(52) **U.S. Cl.** ..... **343/846**; 343/700 MS

(57) **ABSTRACT**

An antenna device includes a substrate, and a dual-band antenna disposed on a surface of the substrate. The dual-band antenna includes a feed-in section, a first radiator arm, a second radiator arm, a third radiator arm, and a ground section. The feed-in section is for signal feed-in, and has opposite first and second ends. The first radiator arm extends from the first end of the feed-in section and is parallel to the feed-in section. The second radiator arm is connected to the second end of the feed-in section and extends parallel to the feed-in section. The third radiator arm is disposed adjacent to and extends parallel to the first radiator arm in a manner that the feed-in section is disposed between the third radiator arm and the second radiator arm. The ground section is connected to the third radiator arm.



US 20110090125A1

(19) **United States**

(12) **Patent Application Publication**

Minard et al.

(10) **Pub. No.: US 2011/0090125 A1**

(43) **Pub. Date: Apr. 21, 2011**

(54) **FRONT END BLOCK WITH INTERGRATED ANTENNA**

(75) Inventors: **Philippe Minard**, Saint Medard Sur Ille (FR); **Dominique Lo Hine Tong**, Rennes (FR); **Philippe Chambelin**, Chateaugiron (FR); **Corinne Nicolas**, Des Fougeretz (FR)

(73) Assignee: **Thomson Licensing**

(21) Appl. No.: **12/737,204**

(22) PCT Filed: **Jun. 25, 2009**

(86) PCT No.: **PCT/EP2009/058006**

§ 371 (c)(1),
(2), (4) Date: **Dec. 17, 2010**

(30) **Foreign Application Priority Data**

Jun. 26, 2008 (FR) 0854289

Publication Classification

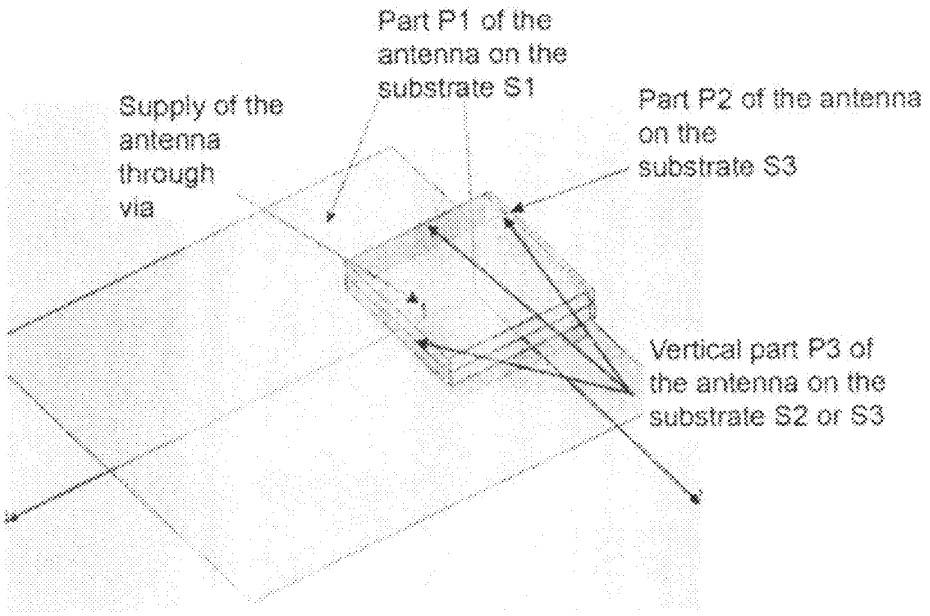
(51) **Int. Cl.**
H01Q 9/04 (2006.01)

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

(57) **ABSTRACT**

The invention relates to an RF reception front end block comprising a first substrate and an RF integrated front end module integrated onto a second substrate supporting a radiating part of the antenna.

The antenna is in addition formed by:
- a first radiating part supported by the substrate and
- by a junction constituted by a third radiating part connecting the first radiating part and the part supported by the substrate.



US 20110090128A1

(19) **United States**

(12) **Patent Application Publication**

Sulima et al.

(10) **Pub. No.: US 2011/0090128 A1**

(43) **Pub. Date: Apr. 21, 2011**

(54) **TRANSMISSION LINE SLOT ANTENNA**

(76) Inventors: **Oleksandr Sulima**, Toronto (CA); **Volodimir Veremey**, Santa Clara, CA (US)

(21) Appl. No.: **12/581,345**

(22) Filed: **Oct. 19, 2009**

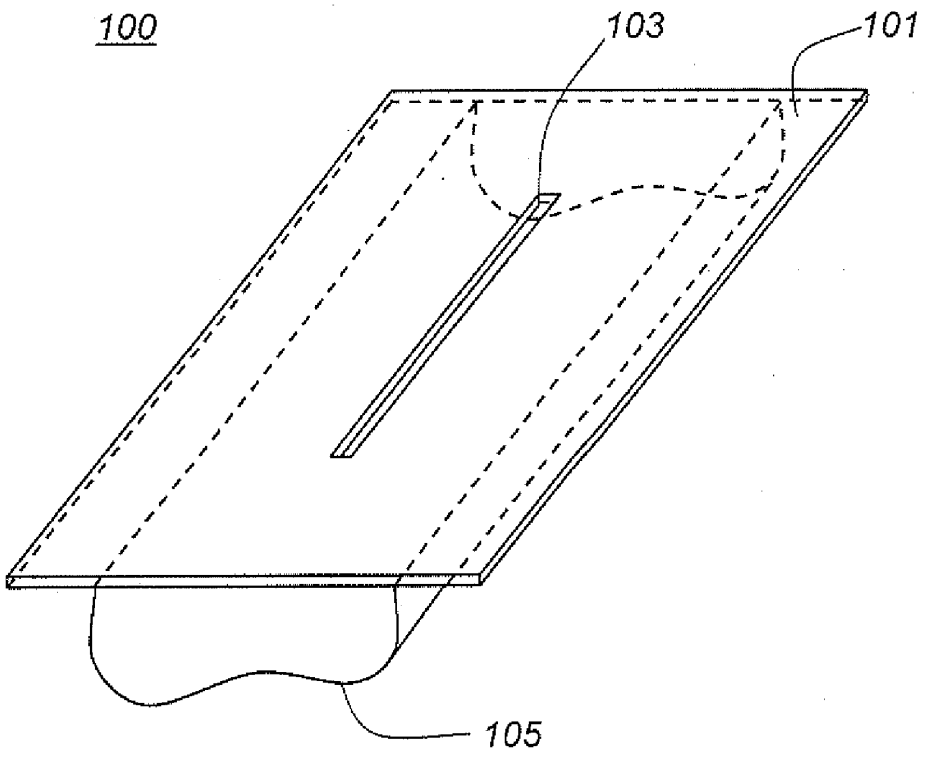
Publication Classification

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

(52) **U.S. Cl.** **343/767**

(57) **ABSTRACT**

A transmission line slot antenna is described. Although more generally applicable, the antenna is particularly adapted to conformal applications. The antenna has a ground plate with a conductive top surface having a slot with a feed whose ground reference terminal is connected to one side of the slot and whose signal terminal is connected to the other side of the slot. A conductive cylindrical screen, which can be of an arbitrary cross section and non-uniform in the longitudinal direction, is formed of one or more sections attached along the bottom surface of the ground plate, with each of the sections having a first and second edge conductively connected to the top surface of the ground plate along opposite sides of the slot. The antenna is tuned to support the fundamental mode (H_{00}) of a slotted cylinder transmission line formed by the screen sections and a part of the ground plate with the slot.



US 20110090131A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2011/0090131 A1**

(43) **Pub. Date: Apr. 21, 2011**

Chen et al.

(54) **PRINTED DUAL-BAND YAGI-UDA ANTENNA AND CIRCULAR POLARIZATION ANTENNA**

(76) Inventors: **Xin-Chang Chen**, Taipei City (TW); **Min-Chung Wu**, Taoyuan County (TW)

(21) Appl. No.: **12/895,765**

(22) Filed: **Sep. 30, 2010**

(30) **Foreign Application Priority Data**

Oct. 19, 2009 (TW) 098135250
Oct. 22, 2009 (TW) 098135749

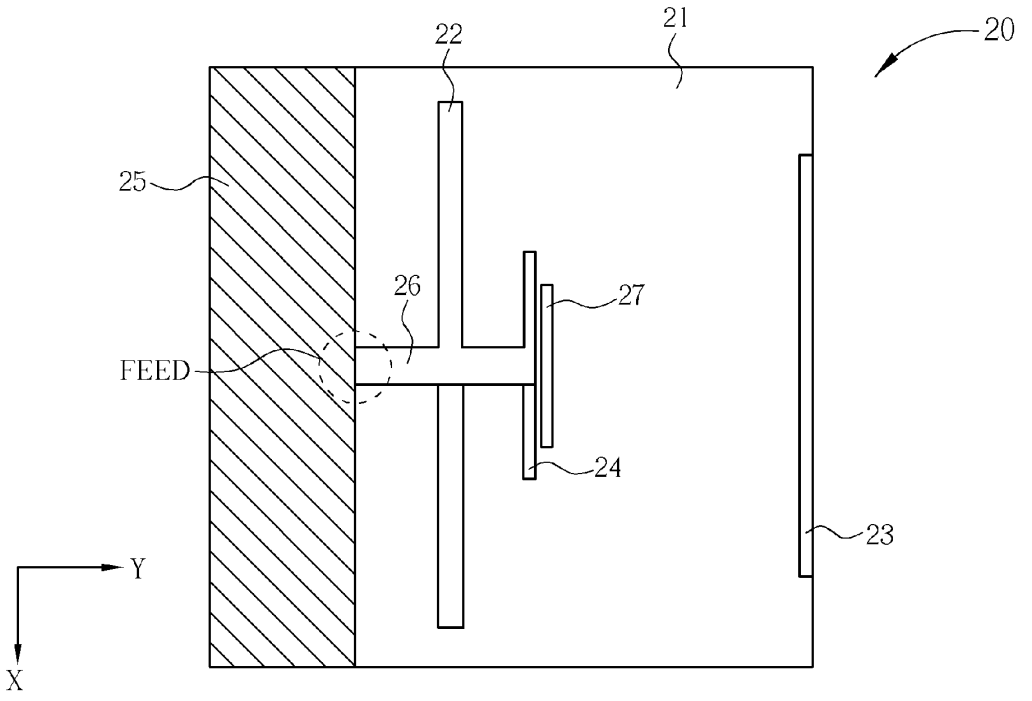
Publication Classification

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

(52) **U.S. Cl.** **343/815**; 343/812

(57) **ABSTRACT**

A printed dual-band Yagi-Uda antenna is disclosed, which includes a substrate, a first driver, a first director, a second driver and a reflector. The first driver is formed on the substrate, and is utilized for generating a radiation pattern of a first frequency band. The first director is formed at a side of the first driver on the substrate, and is utilized for directing the radiation pattern of the first frequency band toward a first direction. The second driver is formed between the first driver and the first director on the substrate, and is utilized for generating a radiation pattern of a second frequency band. The reflector is formed at another side of the first driver on the substrate, and is utilized for reflecting both the radiation patterns of the first frequency band and the second frequency band toward the first direction.



US 20110094666A1

(19) **United States**

(12) **Patent Application Publication**

Sun et al.

(10) **Pub. No.: US 2011/0094666 A1**

(43) **Pub. Date: Apr. 28, 2011**

(54) **ANTENNA MANUFACTURING METHOD**

(76) Inventors: **Yuan-Cheng Sun**, Taipei Hsien (TW); **Chia-Tien Li**, Taipei Hsien (TW)

(21) Appl. No.: **12/841,183**

(22) Filed: **Jul. 22, 2010**

(30) **Foreign Application Priority Data**

Oct. 23, 2009 (TW) 098135893

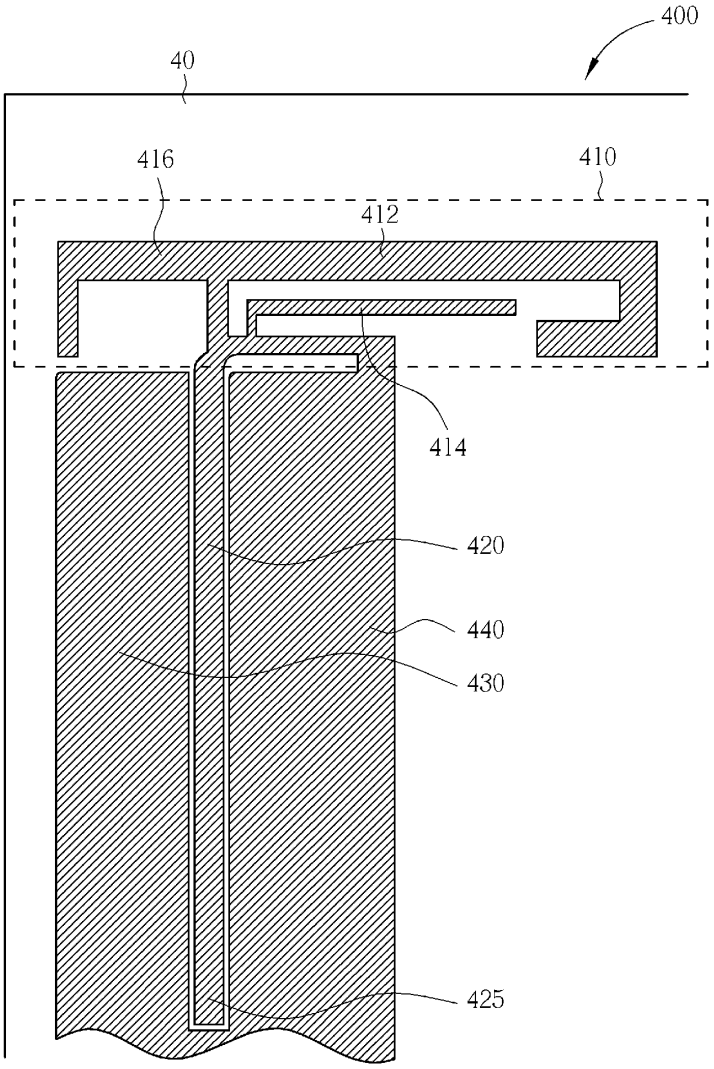
Publication Classification

(51) **Int. Cl.**
B29C 65/72 (2006.01)

(52) **U.S. Cl.** **156/245**

(57) **ABSTRACT**

An antenna manufacturing method includes printing an antenna pattern on a film, and forming a substrate on the film via an in-mold forming process.



US 20110095947A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2011/0095947 A1**

(43) **Pub. Date: Apr. 28, 2011**

CHOU

(54) **MINIATURE MULTI-FREQUENCY ANTENNA**

(76) Inventor: **Chih-Shen CHOU**, Jhunan Township (TW)

(21) Appl. No.: **12/888,163**

(22) Filed: **Sep. 22, 2010**

(30) **Foreign Application Priority Data**

Oct. 23, 2009 (TW) 98219658

Publication Classification

(51) **Int. Cl.**

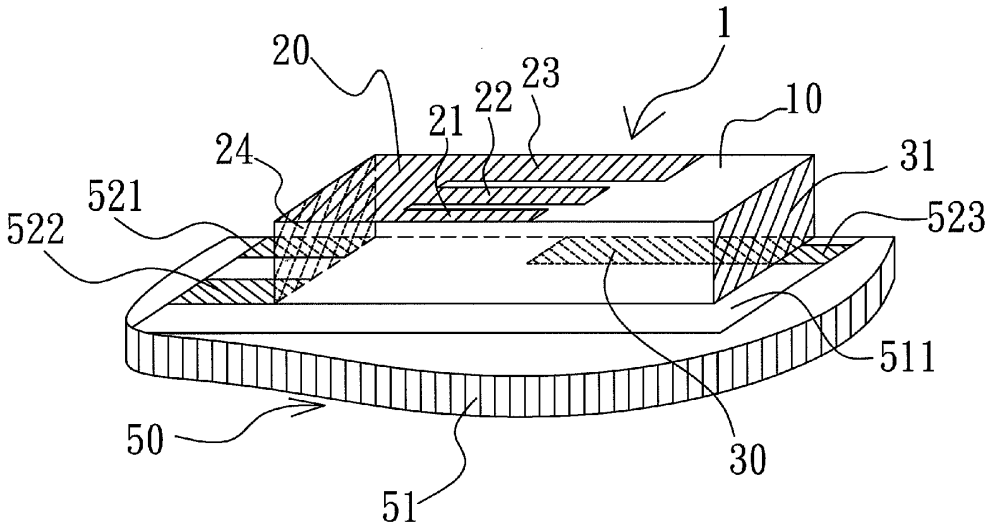
H01Q 1/38 (2006.01)

H01Q 5/00 (2006.01)

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

(57) **ABSTRACT**

A miniature multi-frequency antenna, comprising at least one dielectric substrate, at least one signal electrode and at least one ground electrode. The signal electrode and the ground electrode are disposed on a substrate. The signal electrode contains at least two branches and at least one branch is partially overlapped with the ground electrode. Each interlayer region between the partially overlapped electrodes forms a specific capacitance. By utilizing this interlayer capacitive effect, the resonant frequency of lower frequency band is achieved while the size of the antenna is effectively reduced. For obtaining the resonant frequency of the high frequency bands, the design concept of PIFA is applied on other branches of the signal electrode. A miniature antenna thus obtained is capable of transmitting/receiving multi-frequency signals having the benefits of easily adjusting impedance and resonant frequency.



US 20110095948A1

(19) **United States**

(12) **Patent Application Publication**

Alexopoulos et al.

(10) **Pub. No.: US 2011/0095948 A1**

(43) **Pub. Date: Apr. 28, 2011**

(54) **THREE-DIMENSIONAL ANTENNA STRUCTURE**

(75) Inventors: **Nicolaos G. Alexopoulos**, Irvine, CA (US); **Yunhong Liu**, Irvine, CA (US)

(73) Assignee: **BROADCOM CORPORATION**, Irvine, CA (US)

(21) Appl. No.: **12/985,300**

(22) Filed: **Jan. 5, 2011**

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/642,360, filed on Dec. 18, 2009.

(60) Provisional application No. 61/293,303, filed on Jan. 8, 2010, provisional application No. 61/145,049, filed on Jan. 15, 2009.

Publication Classification

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

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

(57) **ABSTRACT**

A three-dimensional antenna structure includes first and second antenna components and a via. The first antenna component is on a first layer of a substrate and the second antenna component is on a second layer of a substrate. The via couples the first antenna component to the second antenna component, wherein the first antenna overlaps, from a radial perspective, the second antenna component by an angle of overlap.

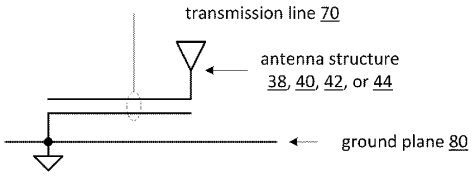
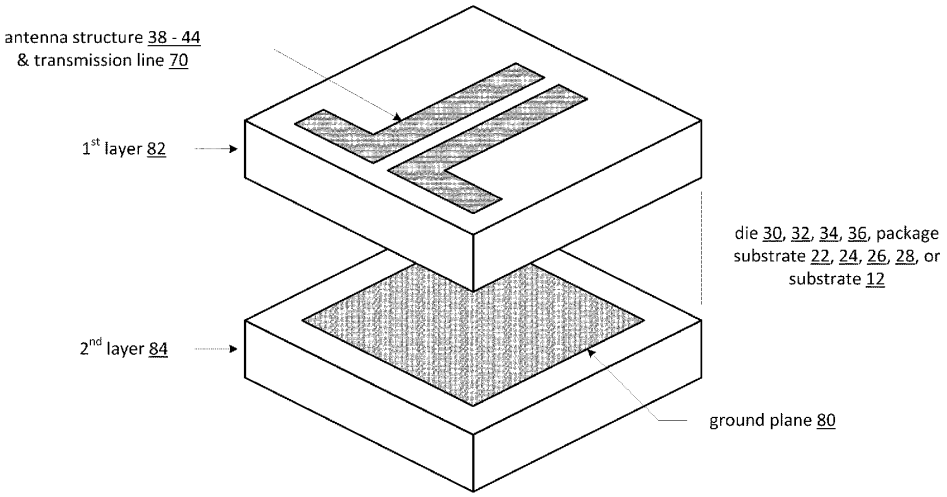


FIG. 3



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(43) Pub. Date: Apr. 28, 2011

Wong et al.

(54) MULTIBAND MOBILE COMMUNICATION DEVICE AND ANTENNA THEREOF

(76) Inventors: **Kin-Lu Wong**, Tapei Hsien (TW); **Wei-Yu Chen**, Tapei Hsien (TW)

(21) Appl. No.: **12/648,341**

(22) Filed: **Dec. 29, 2009**

(30) **Foreign Application Priority Data**

Oct. 26, 2009 (TW) 098136192

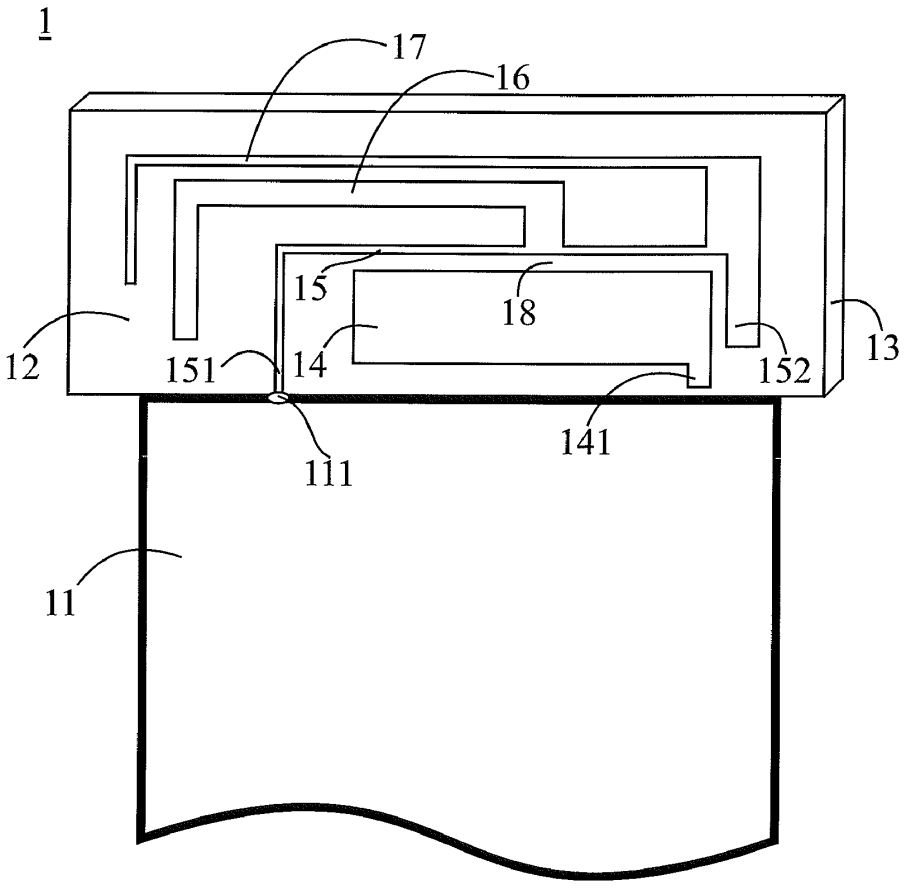
Publication Classification

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

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

(57) **ABSTRACT**

The present invention is related to a multiband mobile communication device. The mobile communication device has a ground plane and an antenna. The antenna is disposed on a dielectric substrate. The antenna comprises a monopole, a shorted radiating portion, a first radiating branch, and a second radiating branch. The monopole comprises a feeding end, and the feeding end is the feeding point of the antenna. The shorted radiating portion has a shorting end electrically connected to the ground plane, and its other end is left open. The shorted radiating portion is extended along the monopole and has a coupling gap to the monopole. The first radiating branch has an end electrically connected to the shorted radiating portion, and its other end is left open. The first radiating branch is extended toward the shorting end of the shorted radiating portion and located on the opposite side of the monopole. The second radiating branch has an end electrically connected to the shorted radiating portion, and its other end is left open. The second radiating branch is extended along the first radiating branch, with the first radiating branch located between the second radiating branch and the shorted radiating portion.



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(19) **United States**

(12) **Patent Application Publication**

LAI et al.

(10) **Pub. No.: US 2011/0095952 A1**

(43) **Pub. Date: Apr. 28, 2011**

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

(76) Inventors: **Ming-Iu LAI**, Taipei (TW); **Chun-Hsiung Wang**, Taipei (TW)

(21) Appl. No.: **12/908,491**

(22) Filed: **Oct. 20, 2010**

(30) **Foreign Application Priority Data**

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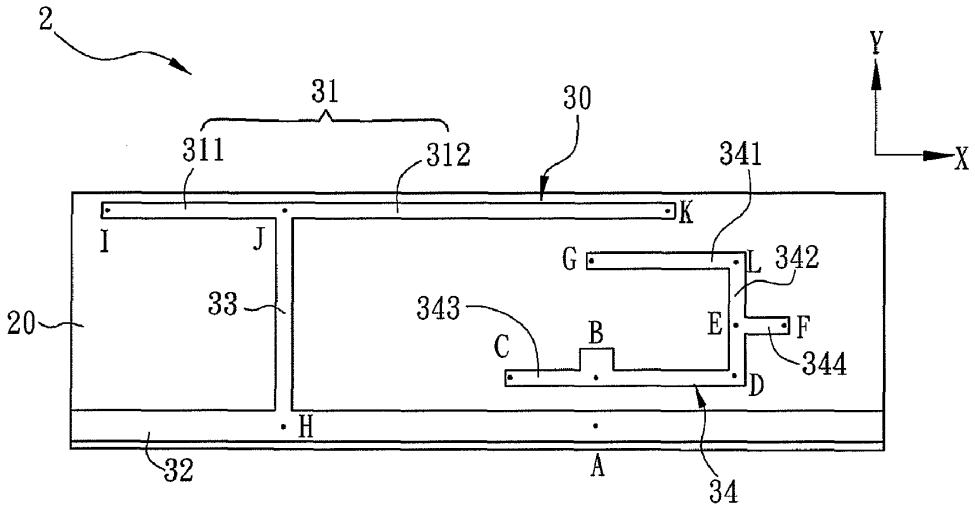
Publication Classification

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

(52) **U.S. Cl.** **343/749**

(57) **ABSTRACT**

A planar multi-band antenna includes a substrate and a metal pattern. The metal pattern includes a first metal wire, a second metal wire, a third metal wire and a fourth metal wire. The second metal wire is disposed opposite to the first metal wire and has a grounding point. Two ends of the third metal wire are connected to the first metal wire and second metal wire, respectively, and the first metal wire is divided into a first radiation portion and a second radiation portion. The fourth metal wire is partially located between the second radiation portion and the second metal wire and forms multiple bends, and has a first impedance matching portion and a feed point, and part of the fourth metal wire coincides with the second radiation portion in a projection direction. By the activation of the feeding point and the grounding point associates with the impedance matching portion, the antenna has plural bands.



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(19) United States

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(43) Pub. Date: Apr. 28, 2011

MURAYAMA et al.

(54) **ANTENNA AND RADIO COMMUNICATION APPARATUS**

(75) Inventors: **Takuya MURAYAMA**, Ishikawa-ken (JP); **Kengo ONAKA**, Kanagawa-ken (JP); **Takashi ISHIHARA**, Tokyo-to (JP)

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

(21) Appl. No.: **12/960,958**

(22) Filed: **Dec. 6, 2010**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2009/055099, filed on Mar. 17, 2009.

(30) **Foreign Application Priority Data**

Jun. 6, 2008 (JP) 2008-149650

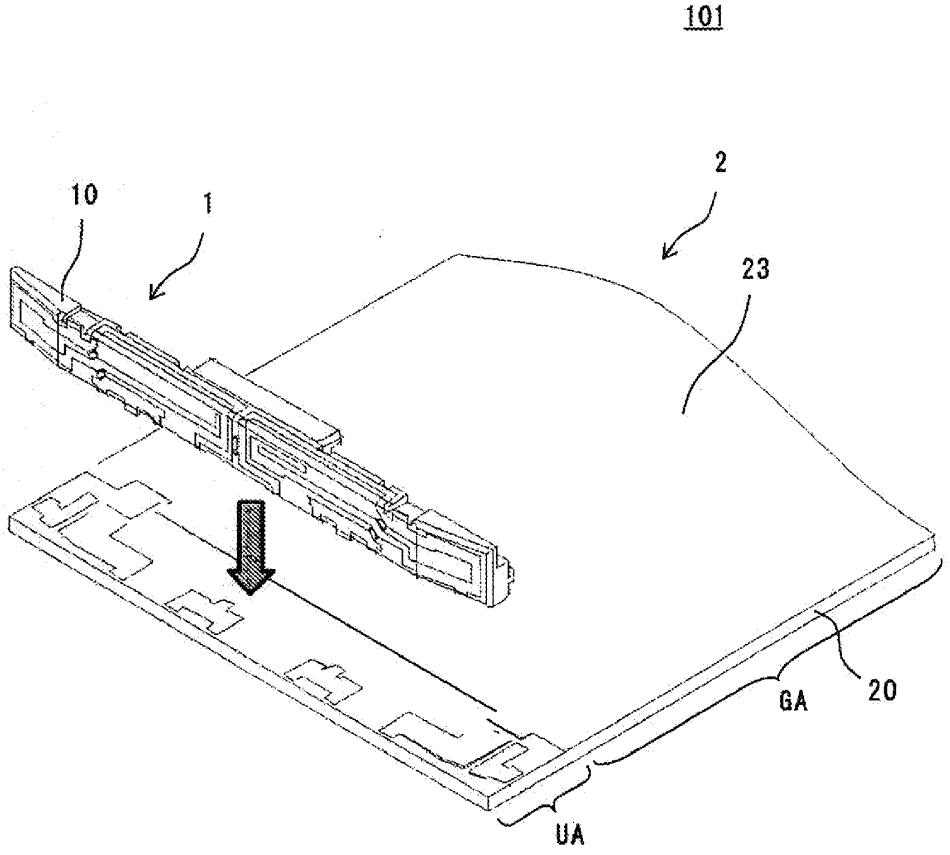
Publication Classification

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

(52) **U.S. Cl.** **343/857**

(57) **ABSTRACT**

An antenna includes an antenna element in which predetermined electrodes are formed on a dielectric base; and a substrate in which predetermined electrodes are formed on a base. On a top surface of a non-ground area of the substrate, a power supply terminal connection electrode is formed so as to be connected to a power supply terminal formed on a bottom surface of the antenna element, and a ground terminal connection electrode is formed so as to be connected to a ground terminal formed on the bottom surface of the antenna element. On a bottom surface of the non-ground area of the substrate, capacitance-forming electrodes are formed at positions opposed to the power supply terminal connection electrode and the ground terminal connection electrode, respectively. By capacitances caused by the capacitance-forming electrodes, being loaded to radiation electrodes, respectively, a resonant frequency in a fundamental mode can be set independently of a resonant frequency in a harmonic mode.



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(19) **United States**

(12) **Patent Application Publication**

Wu et al.

(10) **Pub. No.: US 2011/0095963 A1**

(43) **Pub. Date: Apr. 28, 2011**

(54) **COMMUNICATION DEVICE WITH EMBEDDED ANTENNA**

(76) Inventors: **Min-Chung Wu**, Taoyuan County (TW); **Shao-Chin Lo**, Miaoli City (TW)

(21) Appl. No.: **12/895,795**

(22) Filed: **Sep. 30, 2010**

(30) **Foreign Application Priority Data**

Oct. 22, 2009 (TW) 098135751

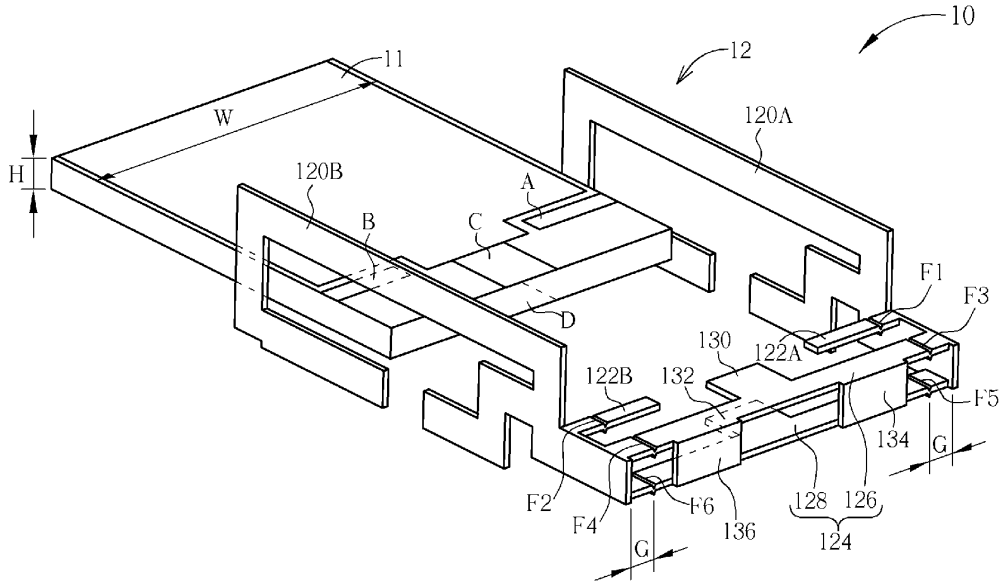
Publication Classification

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H01Q 1/50 (2006.01)

(52) **U.S. Cl.** **343/906**

(57) **ABSTRACT**

A communication device with an embedded antenna includes a printed circuit board and an embedded antenna including at least one radiating unit, at least one feeding unit, where each feeding unit is coupled to a corresponding one of the at least one radiating unit and the printed circuit board, and a connecting unit coupled to the at least one radiating unit including a first connecting portion and a second connecting portion. The connecting unit and the at least one radiating unit form a loop structure such that the embedded antenna is capable of covering one side of the printed circuit board.



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(19) **United States**

(12) **Patent Application Publication**

Pathak et al.

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(43) **Pub. Date: Apr. 28, 2011**

(54) **METAMATERIAL ANTENNA WITH MECHANICAL CONNECTION**

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(73) Assignee: **RAYSPAN CORPORATION**, San Diego, CA (US)

(21) Appl. No.: **12/604,306**

(22) Filed: **Oct. 22, 2009**

Publication Classification

(51) **Int. Cl.**

H01Q 15/02	(2006.01)
H01Q 1/38	(2006.01)
H01Q 19/06	(2006.01)

(52) **U.S. Cl.** ..... **343/909**; 343/700 MS; 343/753

(57) **ABSTRACT**

Metamaterial antenna devices having one or more mechanical connection units made of electrically conductive materials to provide both mechanical engagement and electrical conduction for the antenna devices.