



US 20120044111A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0044111 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **ANTENNA APPARATUS RESONATING IN PLURAL FREQUENCY BANDS IN INVERTED F ANTENNA**

Publication Classification

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

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

(57) **ABSTRACT**

(76) Inventors: **Masahiko Nagoshi**, Osaka (JP);
Wataru Noguchi, Hyogo (JP)

(21) Appl. No.: **13/259,380**

(22) PCT Filed: **Dec. 24, 2010**

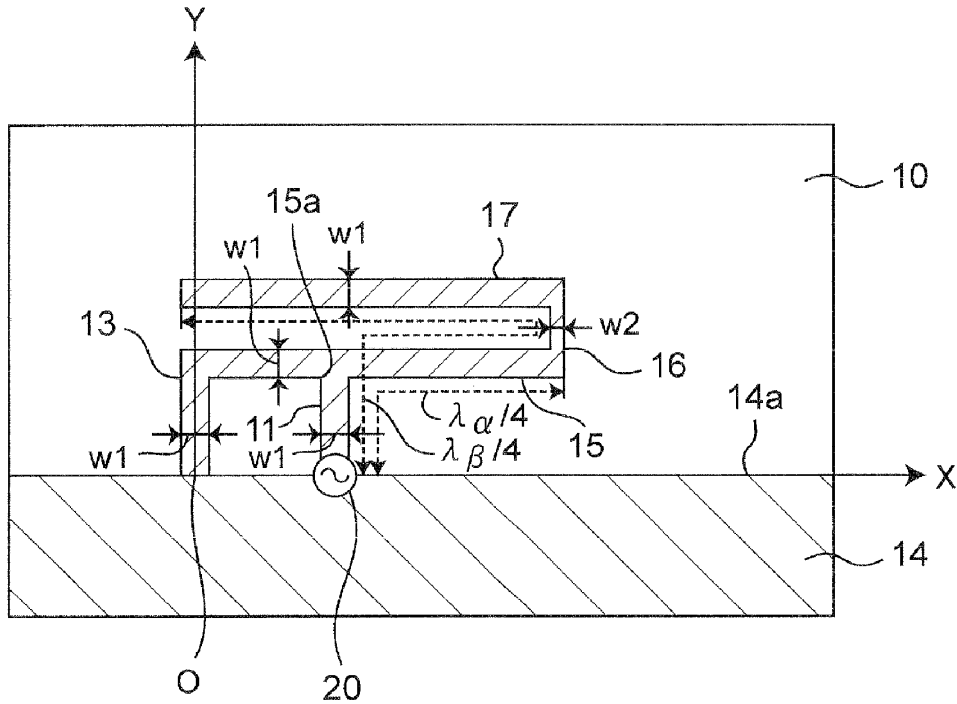
(86) PCT No.: **PCT/JP2010/007489**

§ 371 (c)(1),
(2), (4) Date: **Sep. 23, 2011**

In an inverted F pattern antenna apparatus including a first antenna element and having an electrical length of a quarter wavelength of a first resonance frequency, a folded antenna element and a second antenna element are provided at an end portion of the first antenna element. A length having an electrical length obtained by adding the electrical length of the further provided antenna elements to the electrical length of the inverted F pattern antenna apparatus is set to an electrical length of a quarter wavelength of a second resonance frequency, then resonance is achieved at the second resonance frequency, thereby configuring the antenna apparatus having two resonance frequencies.

(30) **Foreign Application Priority Data**

Dec. 28, 2009 (JP) 2009-297388





US 20120044112A1

(19) **United States**

(12) **Patent Application Publication**
Bellows

(10) **Pub. No.: US 2012/0044112 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **LOCAL AREA NETWORK ANTENNA FOR A MOBILE COMPUTING DEVICE**

Publication Classification

(75) Inventor: **David E. Bellows, Wantagh, NY (US)**

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

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

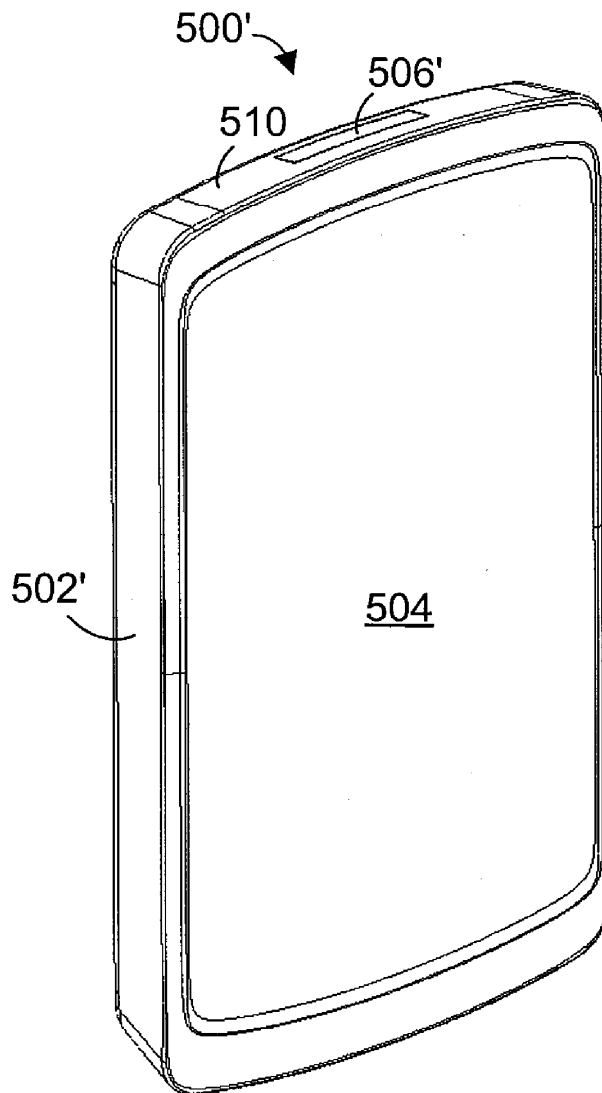
(73) Assignee: **Symbol Technologies, Inc., Schaumburg, IL (US)**

(57) **ABSTRACT**

An antenna for a mobile device is described. The antenna includes a housing formed from a metal material. The housing functions as a ground plane for the antenna and an RF shield for at least one electronic component of the mobile device. An insulating material covers at least a portion of the housing. The antenna also includes a radiating element disposed on the insulating material.

(21) Appl. No.: **12/858,561**

(22) Filed: **Aug. 18, 2010**





US 20120044114A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0044114 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **BUILT-IN ANTENNA AND METHOD FOR IMPROVING ANTENNA EFFICIENCY**

Publication Classification

(75) Inventors: **Sang-Jin EOM**, Suwon-si (KR);
Jin-Kyu BANG, Suwon-si (KR);
Ho-Saeng KIM, Anyang-si (KR);
Yong-Jin KIM, Seoul (KR); **Jin-U KIM**, Seoul (KR)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01P 11/00 (2006.01)
H01Q 9/04 (2006.01)

(52) **U.S. Cl.** **343/702; 343/700 MS; 29/601**

(73) Assignee: **SAMSUNG ELECTRONICS CO. LTD.**, Suwon-si (KR)

(57) **ABSTRACT**

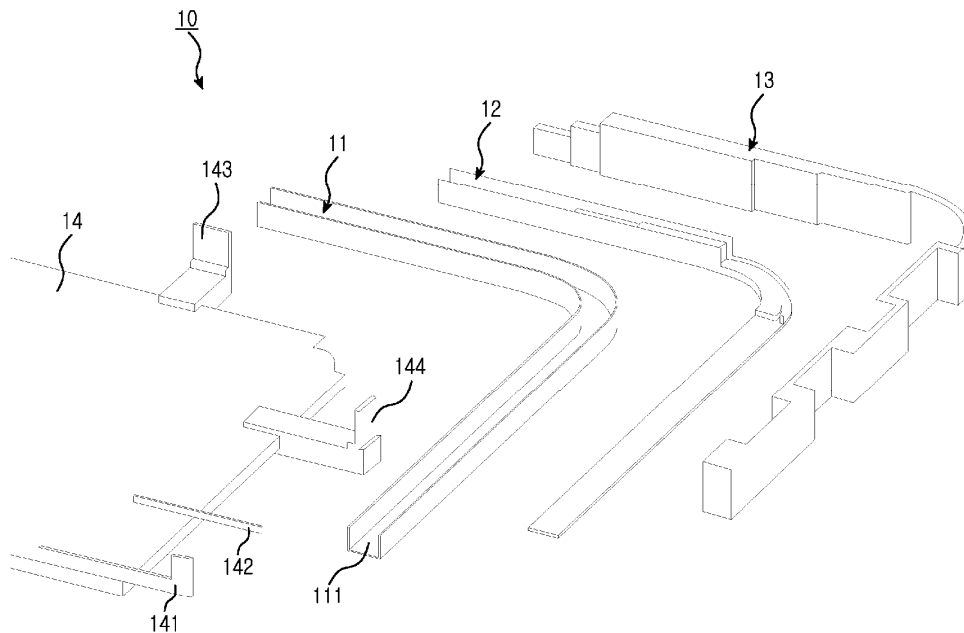
(21) Appl. No.: **13/204,032**

A built-in antenna of a portable terminal and a method of forming the same are provided. The built-in antenna includes a first conductor having a specific length and used for a ground, a second conductor disposed with a specific distance in parallel to the first conductor to couple with the first conductor and used for power feeding, and a separating element disposed between the first conductor and the second conductor to separate the first and second conductors. Accordingly, the built-in antenna may exhibit a smooth radiation property even if a metal construction is used in a device and thus may implement robustness improvement of the device and make the device slim and have an attractive outer appearance. In addition, a method of improving antenna efficiency may prevent deterioration of the radiation property of the antenna radiator of the related art by using simple processing, and the metal construction may be used as a radiator.

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

(30) **Foreign Application Priority Data**

Aug. 17, 2010 (KR) 10-2010-0079223





US 20120044116A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0044116 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **SLOT ANTENNAS FOR ELECTRONIC DEVICES**

Publication Classification

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

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

(57) **ABSTRACT**

(76) Inventors: **Bing Chiang**, Cupertino, CA (US);
Douglas Blake Kough, San Jose, CA (US);
Enrique Ayala Vazquez, Watsonville, CA (US)

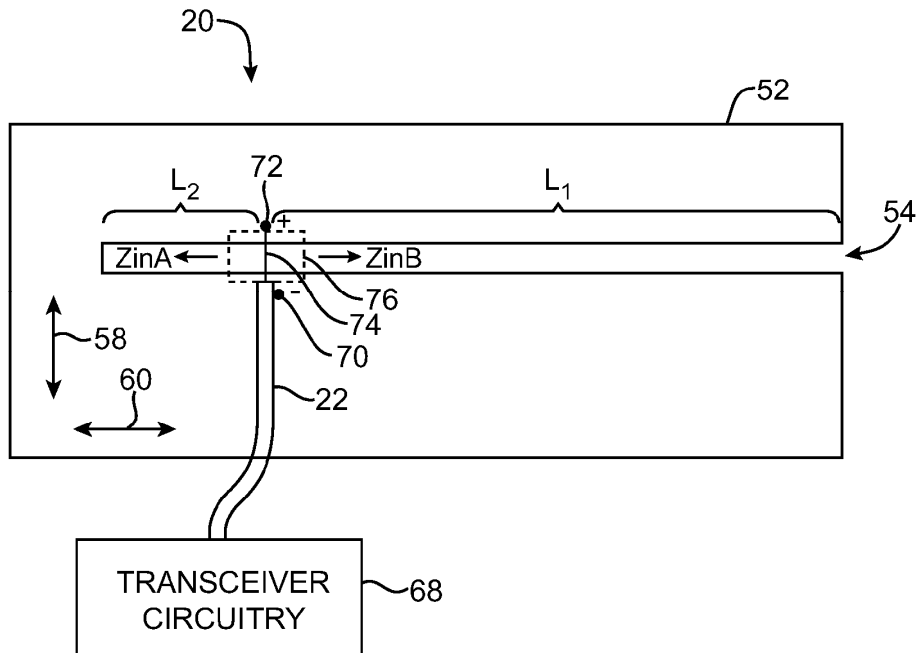
Slot antennas are provided for electronic devices such as portable electronic devices. The slot antennas may have a dielectric-filled slot that is formed in a ground plane element. The ground plane element may be formed from part of a conductive device housing. The slot may have one or more holes at its ends. The holes may affect the impedance characteristics of the slot antennas so that the length of the slot antennas may be reduced. For example, the holes can be used to synthesize the impedance of the slot antennas so that the slot antennas have a resonant frequency that is different from their natural resonant frequency. The holes may affect the impedance of the slot antennas in multiple radio-frequency bands.

(21) Appl. No.: **13/286,845**

(22) Filed: **Nov. 1, 2011**

Related U.S. Application Data

(62) Division of application No. 12/101,121, filed on Apr. 10, 2008, now Pat. No. 8,077,096.





US 20120044117A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0044117 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **PLANAR ANTENNA APPARATUS**

Publication Classification

(75) Inventors: **Hiroshi MATSUKUMA**,
Kanagawa (JP); **Keiji YOSHIDA**,
Fukuoka (JP); **Haruichi KANAYA**,
Fukuoka (JP)

(51) **Int. Cl.**
H01Q 13/10 (2006.01)
H01Q 1/50 (2006.01)
(52) **U.S. Cl.** **343/771; 343/770**

(73) Assignee: **RENESAS ELECTRONICS CORPORATION**, Kanagawa (JP)

(57) **ABSTRACT**

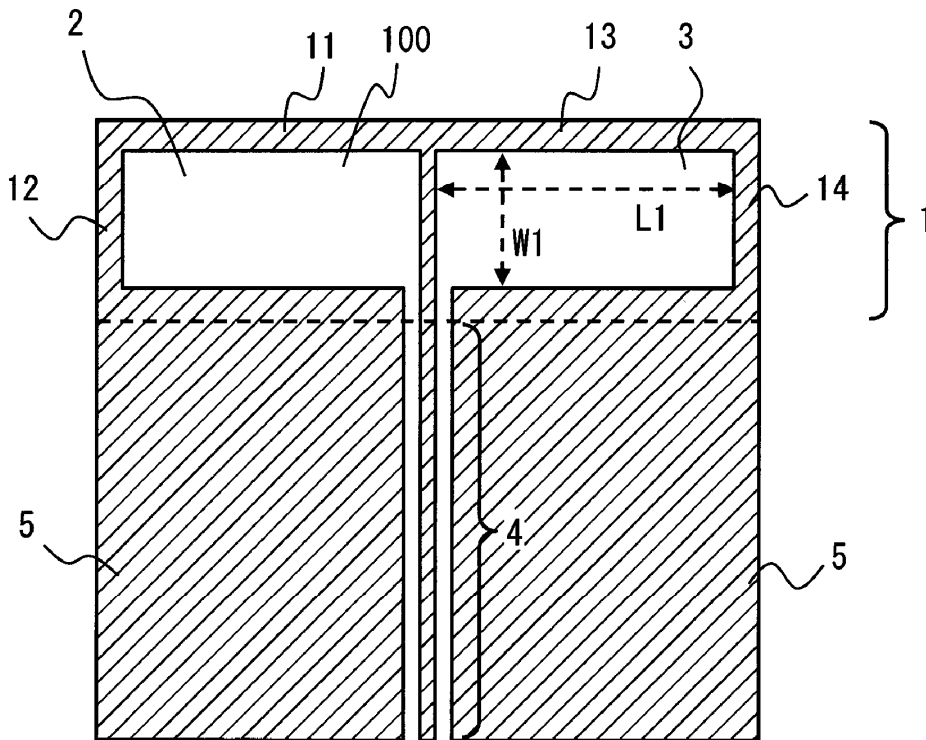
(21) Appl. No.: **13/028,600**

A ground conductor is formed by a conductor pattern placed to a surface of a dielectric substrate, and includes a first and a second opening. A transmission line is formed over the dielectric substrate by the conductor pattern. The transmission line supplies a signal to a first and a second peripheral conductor respectively surrounding the first and the second opening. The first and second opening are arranged axis-symmetrically with respect to the transmission line. Opening areas of the first and the second opening are determined so that, due to loop currents supplied by the transmission line flowing through the first and the second peripheral conductor, a region including the first opening and the first peripheral conductor operates as a magnetic field radiation first loop radiating element, and a region including the second opening and the second peripheral conductor operates as a magnetic field radiation second loop radiating element.

(22) Filed: **Feb. 16, 2011**

(30) **Foreign Application Priority Data**

Feb. 16, 2010 (JP) 2010-031222
Feb. 23, 2010 (JP) 2010-037604
Dec. 24, 2010 (JP) 2010-287159





US 20120044120A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0044120 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **PORTABLE TERMINAL ANTENNA FOR IMPROVING SAR AND HAC CHARACTERISTICS**

Publication Classification

(51) **Int. Cl.**
H01Q 9/06 (2006.01)
H01Q 1/36 (2006.01)

(75) **Inventors:** **Su-Hyun Choi**, Gyeonggi-do (KR);
Jun-Hee Kim, Incheon-si (KR);
Won-Hwi Jin, Seoul (KR);
Byong-Nam Kim, Gyeonggi-do (KR)

(52) **U.S. Cl.** **343/843; 343/700 MS**

(73) **Assignee:** **ACE TECHNOLOGIES CORPORATION**, Incheon-si (KR)

(57) **ABSTRACT**

An antenna for a mobile terminal for improving SAR and HAC characteristics is disclosed. The disclosed antenna may include: a first conductive line electrically connected to a feeding point; a second conductive line separated from the first conductive line at a designated distance and electrically connected to a ground; a third conductive line extending from the second conductive line; and a coupling branch separated from the third conductive line and electrically connected to a ground, where coupling matching and coupling feeding occur between the first conductive line and the second conductive line, and the second conductive line and the third conductive line operate as a radiator. The disclosed antenna can enable impedance matching for a broader band and can improve SAR and HAC characteristics.

(21) **Appl. No.:** **13/266,635**

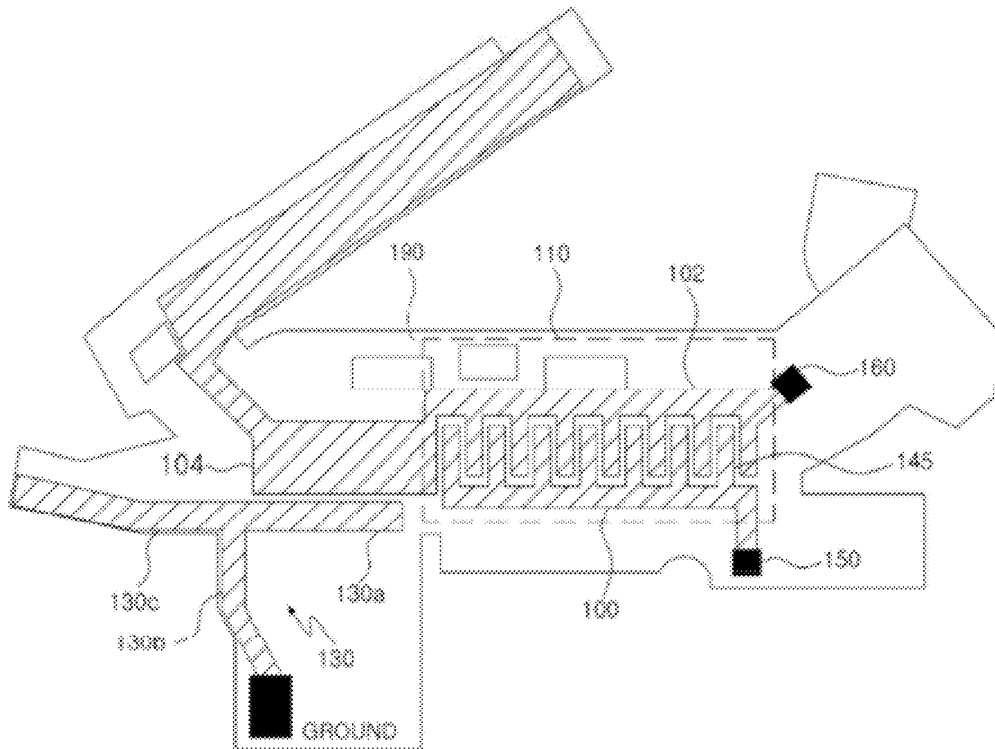
(22) **PCT Filed:** **Apr. 28, 2010**

(86) **PCT No.:** **PCT/KR10/02698**

§ 371 (c)(1),
(2), (4) **Date:** **Oct. 27, 2011**

(30) **Foreign Application Priority Data**

Apr. 28, 2009 (KR) 10-2009-0037324





US 20120044121A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0044121 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **DISTRIBUTED COUPLING ANTENNA**

Related U.S. Application Data

(75) Inventors: **Steve Krupa**, Tiberias (IL); **Snir Azulay**, Tiberias (IL)

(60) Provisional application No. 61/167,247, filed on Apr. 7, 2009.

Publication Classification

(73) Assignee: **GALTRONICS CORPORATION LTD.**, Tiberias (IL)

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

(52) **U.S. Cl.** **343/860; 343/850**

(57) **ABSTRACT**

(21) Appl. No.: **13/203,109**

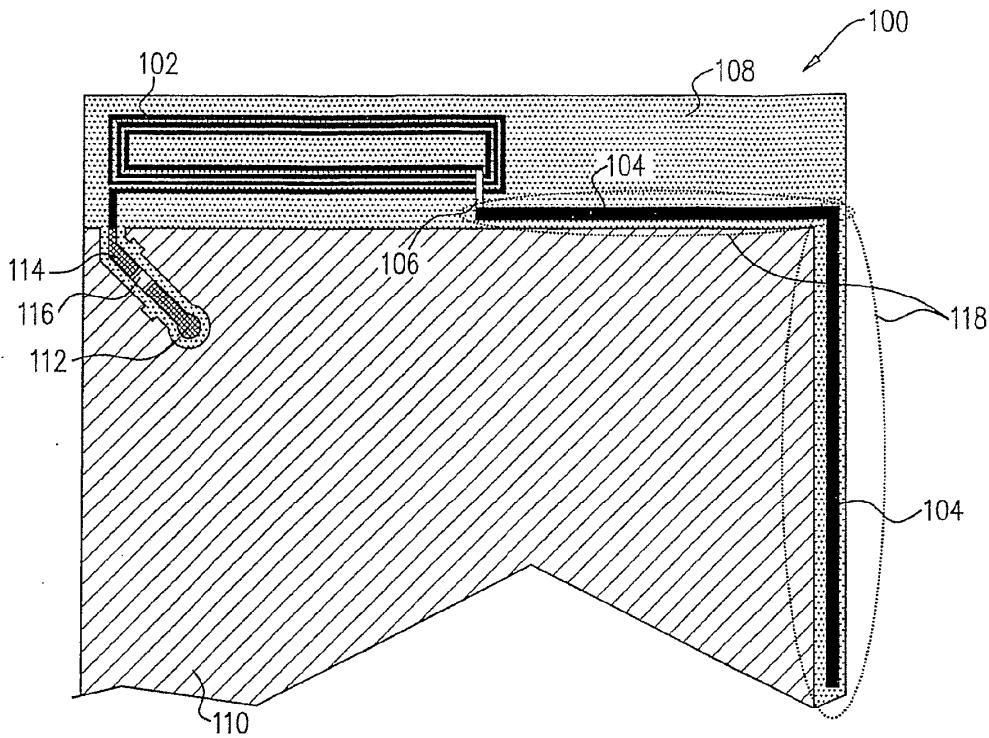
An antenna including a ground plane region, a feed element having associated with it a first reactance and a coupling element having associated with it a second reactance, the second reactance being of opposite sign to the first reactance, the coupling element being coupled to the feed element and to the ground plane region and being located in close proximity to the ground plane region, wherein an impedance and hence a resonant frequency of the antenna depend on the first and second reactances.

(22) PCT Filed: **Apr. 7, 2010**

(86) PCT No.: **PCT/IL2010/000291**

§ 371 (c)(1),

(2), (4) Date: **Nov. 4, 2011**





US 20120044122A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0044122 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **BROADBAND ANTENNA USING AN ELECTRIC LOOP-TYPE SIGNAL LINE**

(30) **Foreign Application Priority Data**

Apr. 27, 2009 (KR) 10-2009-0036502

(75) Inventors: **Sung-Nam An**, Seoul (KR);
Bo-Sung Kwon, Seoul (KR);
Hae-Yeon Kim, Gyeonggi-do (KR);
Jae-Ho Lee, Gyeongsangbuk-do (KR);
Byong-Nam Kim, Gyeonggi-do (KR)

Publication Classification

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

(52) **U.S. Cl.** **343/862**

(73) Assignee: **ACE TECHNOLOGIES CORPORATION**, Incheon-si (KR)

(57) **ABSTRACT**

A broadband antenna is disclosed. The disclosed antenna may include: a substrate; an impedance matching/feeding unit, arranged on the substrate and comprising a first matching member and a second matching member configured to perform impedance matching through a coupling method; a radiating member electrically connected to the impedance matching/feeding unit; and a signal line electrically connected to the second matching member. Here, the signal line is implemented in the form of an electrical loop.

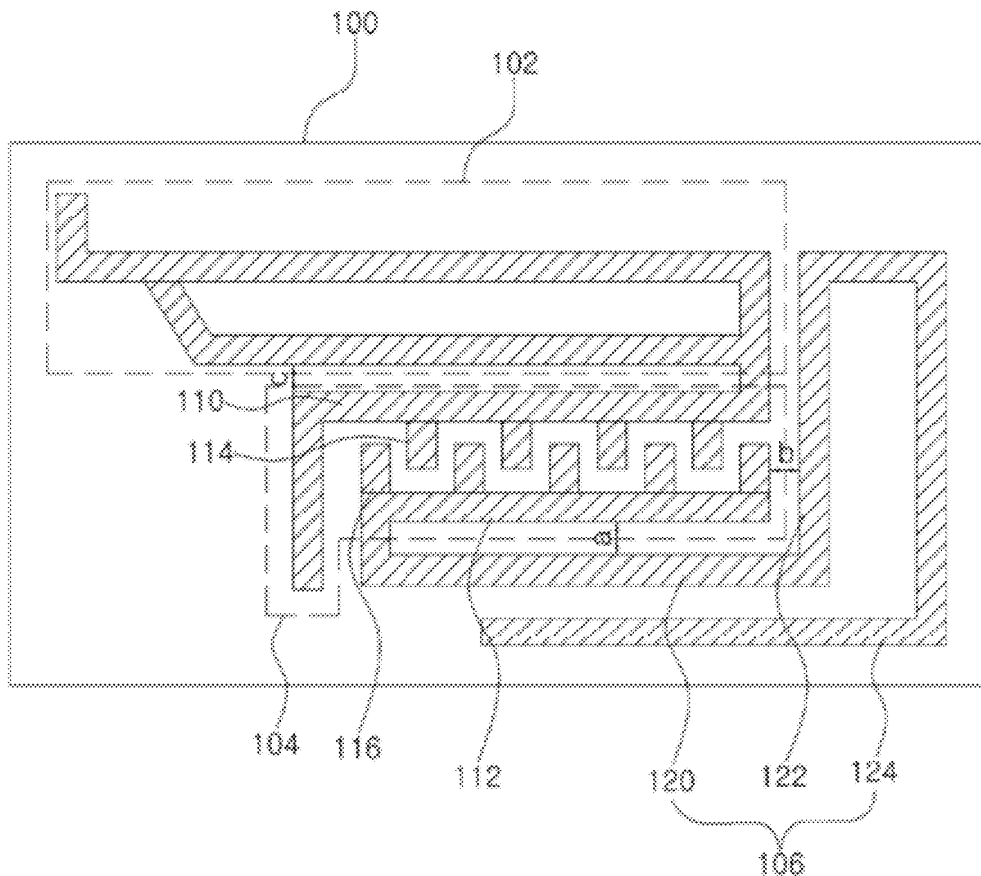
(21) Appl. No.: **13/266,435**

(22) PCT Filed: **Apr. 27, 2010**

(86) PCT No.: **PCT/KR2010/002657**

§ 371 (c)(1),
(2), (4) Date:

Oct. 26, 2011





US 20120044123A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0044123 A1**

(43) **Pub. Date: Feb. 23, 2012**

(54) **MODULAR MATERIAL ANTENNA ASSEMBLY**

Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01P 11/00 (2006.01)

(52) **U.S. Cl.** **343/878; 29/600**

(57) **ABSTRACT**

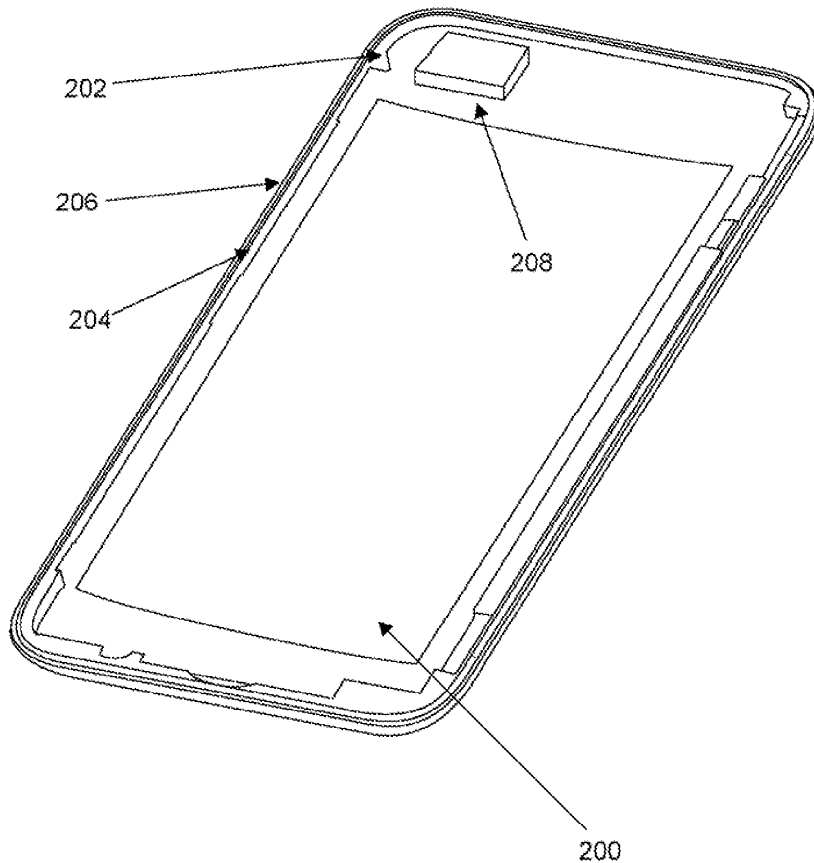
A modular material antenna assembly is provided that includes an antenna block having a portion with a shape that interlocks with a corresponding portion of an electrically non-conductive frame and secures the antenna block to the electrically non-conductive frame. The electrically non-conductive frame is attached to an interior of an electrically conductive housing so that the electrically non-conductive frame and the electrically conductive housing form an integrated structure. An antenna flex is then mechanically secured to the antenna block. The antenna flex may also be electrically connected to a circuit board. The frame is designed to support a cover glass for the portable electronic device and may be affixed to a housing. The dielectric constant of the antenna block is substantially less than the dielectric constant of the frame.

(75) Inventors: **Fletcher R. ROTHKOPF**, Los Altos, CA (US); **Phillip M. HOBSON**, Menlo Park, CA (US); **Adam MITTLEMAN**, San Francisco, CA (US); **Anna-Katrina SHEDLETSKY**, Sunnyvale, CA (US)

(73) Assignee: **APPLE INC.**, Cupertino, CA (US)

(21) Appl. No.: **12/859,701**

(22) Filed: **Aug. 19, 2010**





US 20120050111A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0050111 A1**

(43) **Pub. Date: Mar. 1, 2012**

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

Publication Classification

(75) Inventors: **LUNG-SHENG TAI**, New Taipei (TW); **WEN-FONG SU**, New Taipei (TW); **CHUN-MING CHIU**, New Taipei (TW)

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

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

(57) **ABSTRACT**

(73) Assignee: **HON HAI PRECISION INDUSTRY CO., LTD.**, New Taipei (TW)

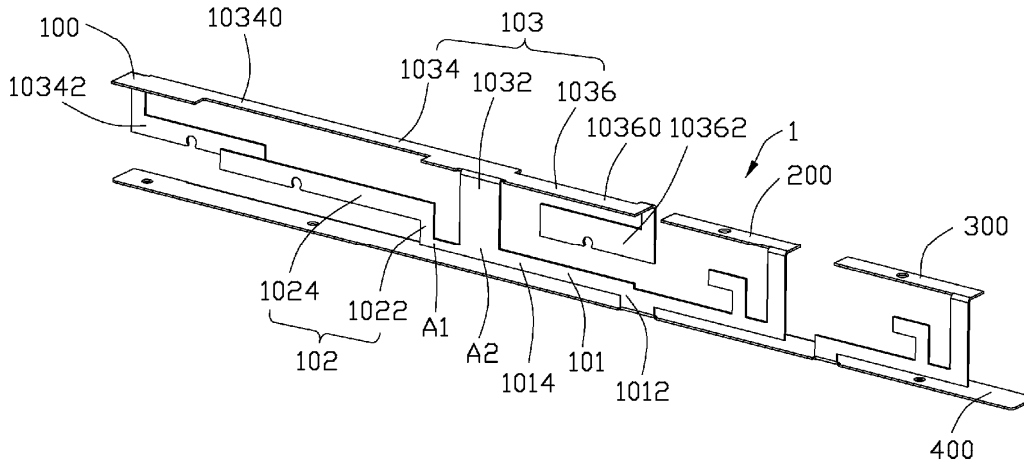
A multi-band antenna includes a grounding element, a first antenna working on a wireless wide area network, a second antenna working on a wireless local area network, and a third antenna operating on a wireless local area network. The first antenna includes a first conductive piece, a first radiating element extending from the first conductive arm, a coupling radiating element and a feeding line. The second antenna includes a second conductive piece, a first resonant element extending from the second conductive piece, a second resonant element and a feeding line. The third antenna includes a third conductive element, a first conductive arm extending from the third conductive element and a second conductive arm and a feeding line. The first conductive piece is connected to the second conductive piece.

(21) Appl. No.: **13/218,455**

(22) Filed: **Aug. 26, 2011**

(30) **Foreign Application Priority Data**

Aug. 26, 2010 (TW) 099128572





US 20120050115A1

(19) **United States**

(12) **Patent Application Publication**
KAO

(10) **Pub. No.: US 2012/0050115 A1**

(43) **Pub. Date: Mar. 1, 2012**

(54) **ANTENNA ASSEMBLY AND ELECTRONIC DEVICE USING THE SAME**

Publication Classification

(75) Inventor: **KUNG-MING KAO**, Tu-Cheng City (TW)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/08 (2006.01)

(73) Assignee: **CHI MEI COMMUNICATION SYSTEMS, INC.**, Tu-Cheng City (TW)

(52) **U.S. Cl.** **343/702; 343/880**

(21) Appl. No.: **12/955,027**

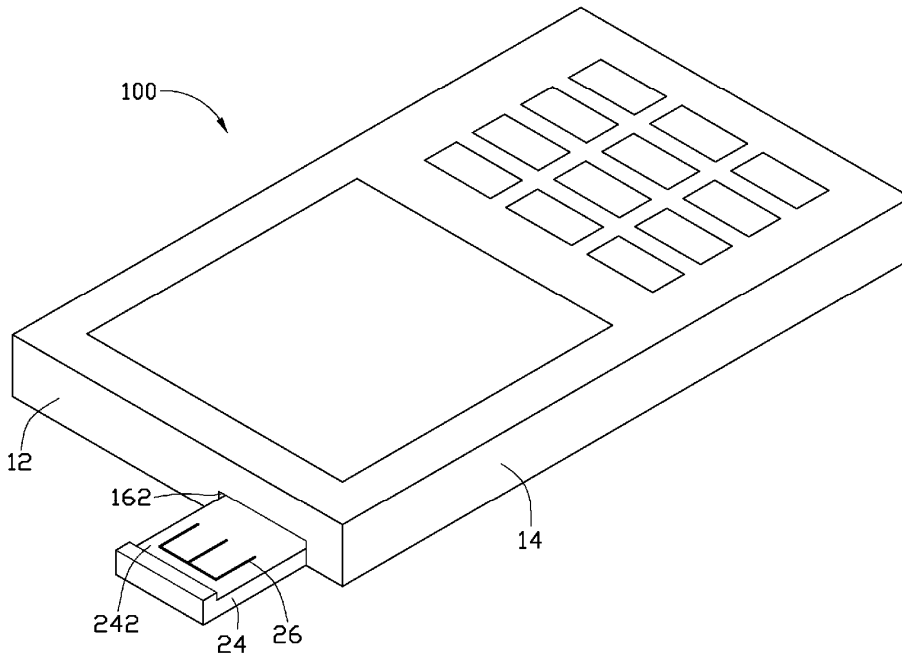
(57) **ABSTRACT**

(22) Filed: **Nov. 29, 2010**

An antenna assembly includes a slide mechanism, a chassis, and an antenna. The slide mechanism includes a fixed plate and a slide plate slidably mounted on the fixed plate. The chassis is mounted on the slide plate. The antenna is mounted on the chassis. The antenna is contained between the fixed plate and the slide plate when the slide mechanism is retracted, and exposed when the slide mechanism is extended.

(30) **Foreign Application Priority Data**

Aug. 25, 2010 (TW) 99128427





US 20120050134A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0050134 A1**

(43) **Pub. Date: Mar. 1, 2012**

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

Publication Classification

(75) Inventors: **Chao-Hsu Wu**, Luzhu Township (TW); **Yuan-Chang Chao**, Dayuan Township (TW)

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

(52) **U.S. Cl.** **343/908**

(73) Assignee: **Quanta Computer Inc.**

(57) **ABSTRACT**

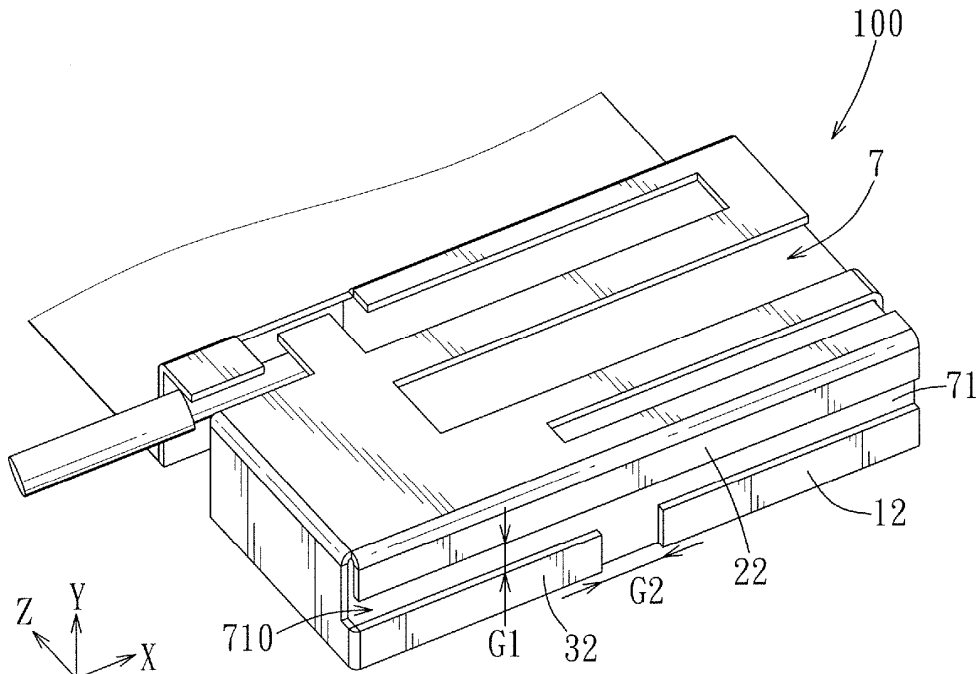
(21) Appl. No.: **13/008,039**

(22) Filed: **Jan. 18, 2011**

A three-dimensional slot antenna includes a loop conductor, a first conductor arm, a second conductor arm, and a third conductor arm. The first radiator section, the second radiator section and the third radiator section are disposed on a same plane. The second radiator section cooperates with the first and third radiator sections to form a first slot segment. The first radiator section further cooperates with the third radiator section to form a second slot segment. The first and second slot segments form a substantially T-shaped slot.

(30) **Foreign Application Priority Data**

Aug. 26, 2010 (TW) 099128634





US 20120052916A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0052916 A1**

(43) **Pub. Date: Mar. 1, 2012**

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE HAVING FREQUENCY SELECTIVE
GROUNDING AND RELATED METHOD**

Publication Classification

(51) **Int. Cl.**
H04W 88/02 (2009.01)
H01Q 1/24 (2006.01)
(52) **U.S. Cl.** **455/566; 343/702; 455/575.1**

(75) **Inventors:** **Joshua Kwan Ho WONG,**
Waterloo (CA); **Adrian M. Cooke,**
Kitchener (CA)

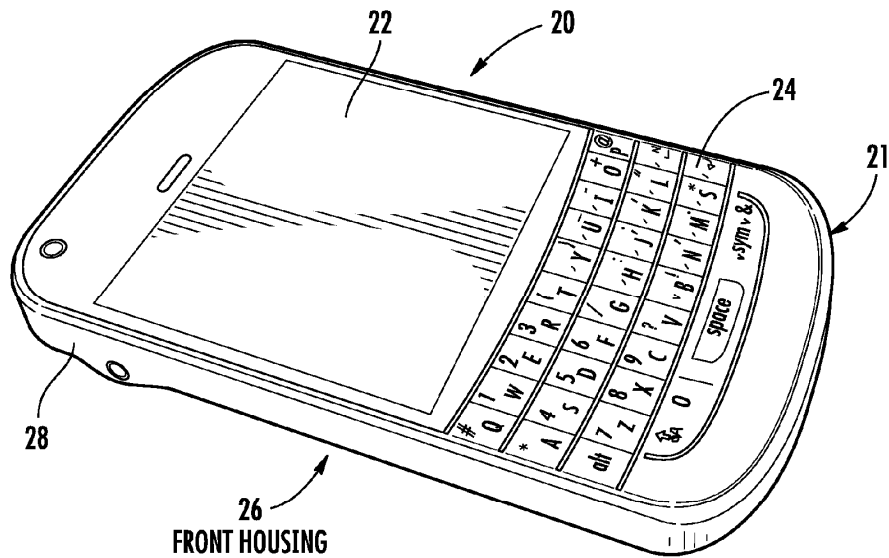
(57) **ABSTRACT**

(73) **Assignee:** **Research In Motion Limited,**
Waterloo (CA)

A mobile wireless communications device includes a portable housing having a metallic front housing forming a peripheral sidewall as a metallic ring. A circuit board is carried by the portable housing and forms a chassis ground plane. A wireless communications circuit is carried by a circuit board. An antenna circuit is carried by a circuit board and connected to the wireless communications circuit. A frequency selective grounding circuit is positioned at a selected grounding location at the chassis ground plane and metallic front housing and forms a harmonic trap that responds to a specific range of frequencies.

(21) **Appl. No.: 12/868,763**

(22) **Filed: Aug. 26, 2010**





US 20120056692A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0056692 A1**

(43) **Pub. Date: Mar. 8, 2012**

(54) **MULTI-LINE PHASE SHIFTER FOR VERTICAL BEAM TILT-CONTROLLED ANTENNA**

Publication Classification

(51) **Int. Cl.**
H01P 1/18 (2006.01)

(75) Inventors: **Young-Chan Moon**, Gyeonggi-do (KR); **Oh-Seog Choi**, Gyeonggi-do (KR); **In-Ho Kim**, Gyeonggi-do (KR); **Kwang-Seok Choi**, Gyeongsangbuk-do (KR)

(52) **U.S. Cl.** 333/136

(57) **ABSTRACT**

(73) Assignee: **KMW INC.**, Gyeonggi-Do (KR)

A Multi-Line Phase Shifter (MLPS) for a vertical beam tilt-controlled antenna is provided, in which a housing is shaped into an elongated rectangular box, a fixed plate is attached on an inner bottom surface of the housing and has transmission lines printed thereon, the transmission lines forming part of a plurality of phase shifting patterns and a plurality of signal division patterns, for dividing an input signal and shifting phases of divided signals, and a mobile plate is installed within the housing, movably along a length direction at a position where the mobile plate contacts a surface of the fixed plate, and has transmission lines printed thereon, the transmission lines forming a remaining part of the plurality of phase shifting patterns for phase shifting by forming variable lines through coupling with the part of the plurality of phase shifting patterns.

(21) Appl. No.: **13/319,389**

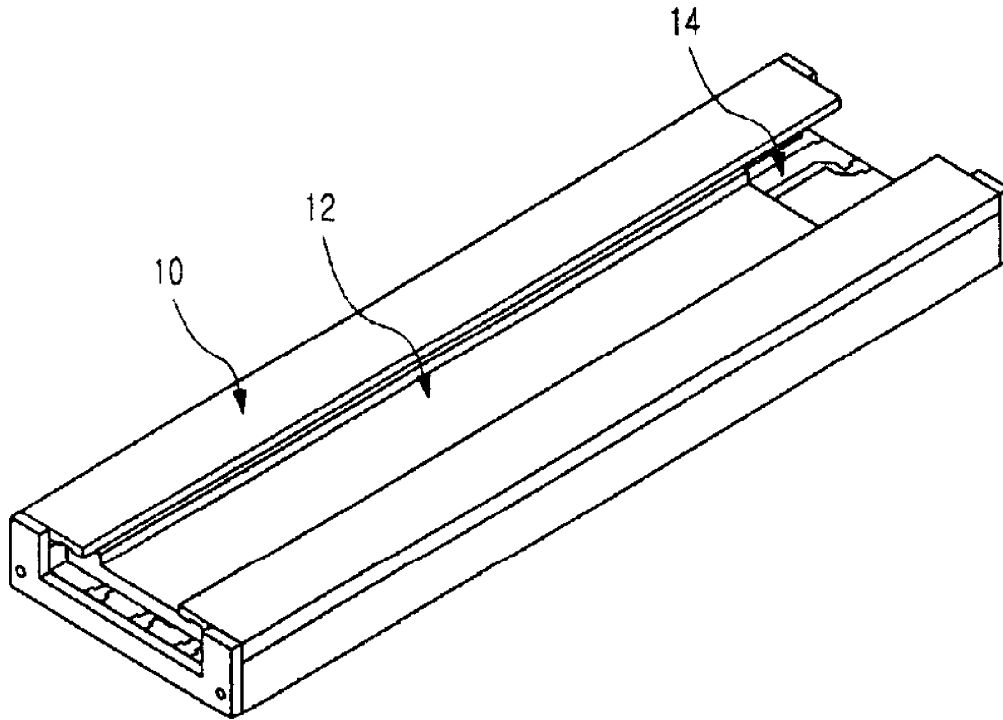
(22) PCT Filed: **May 11, 2010**

(86) PCT No.: **PCT/KR2010/002993**

§ 371 (c)(1),
(2), (4) Date: **Nov. 8, 2011**

(30) **Foreign Application Priority Data**

May 11, 2009 (KR) 10-2009-0040978





US 20120056778A1

(19) **United States**

(12) **Patent Application Publication**
YANO

(10) **Pub. No.: US 2012/0056778 A1**

(43) **Pub. Date: Mar. 8, 2012**

(54) **WAVEGUIDE CONVERTER, ANTENNA AND RADAR DEVICE**

H01Q 1/00 (2006.01)

H01P 3/12 (2006.01)

(76) Inventor: **Koji YANO**, Nishinomiya-City (JP)

(52) **U.S. Cl. 342/175; 333/239; 343/872; 343/905**

(21) Appl. No.: **13/082,134**

(57) **ABSTRACT**

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

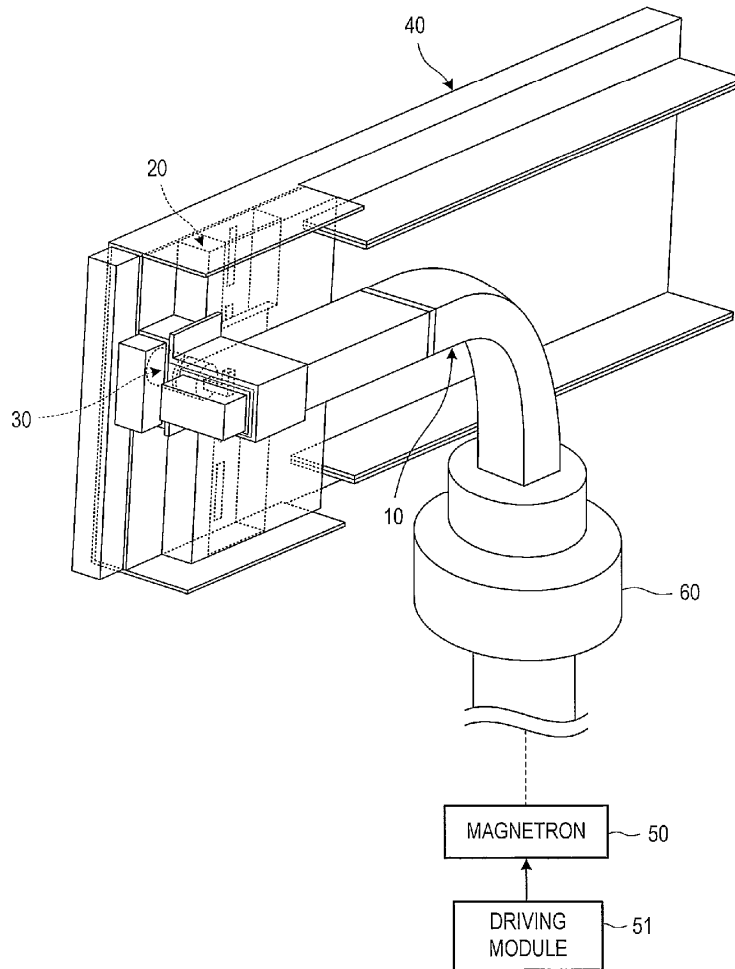
This disclosure provides a waveguide converter, which includes a first waveguide for propagating an electromagnetic wave, a second waveguide for being inputted the electromagnetic wave from the first waveguide and propagating the electromagnetic wave in a direction different from the propagating direction of the electromagnetic wave in the first waveguide, and an elongated-plate-shaped inner conductor arranged between the first waveguide and the second waveguide so that end portions of the inner conductor are exposed to the inside of the first waveguide and the second waveguide, respectively.

(30) **Foreign Application Priority Data**

Apr. 9, 2010 (JP) 2010-090965

Publication Classification

(51) **Int. Cl.**
G01S 13/00 (2006.01)
H01Q 1/42 (2006.01)





US 20120056787A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0056787 A1**

(43) **Pub. Date: Mar. 8, 2012**

(54) **PATCH ANTENNA WITH CAPACITIVE RADIATING PATCH**

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

(75) **Inventors: Dmitry V. Tatarnikov, Moscow (RU); Andrey V. Astakhov, Moscow (RU)**

(57) **ABSTRACT**

(73) **Assignee: TOPCON POSITIONING SYSTEMS, INC., Livermore, CA (US)**

A patch antenna includes a capacitive radiating patch, a ground plane, and vertical coupling elements electrically connected to defined portions of the capacitive radiating patch and the ground plane. The capacitive radiating patch includes an array of conductive segments along the periphery and within the interior of the capacitive radiating patch. Capacitors are electrically connected to specific conductive segments in a defined pattern. Vertical coupling elements electrically connect specific conductive segments along the periphery of the capacitive radiating patch to the ground plane. Vertical coupling elements can be conductors or defined combinations of resistors, inductors, and capacitors. Various embodiments of the patch antenna are configured for linear polarization and circular polarization. Relative to a conventional patch antenna of a similar size, a patch antenna with a capacitive radiating patch has a broader operational bandwidth and a broader radiation pattern in the forward hemisphere.

(21) **Appl. No.: 13/190,620**

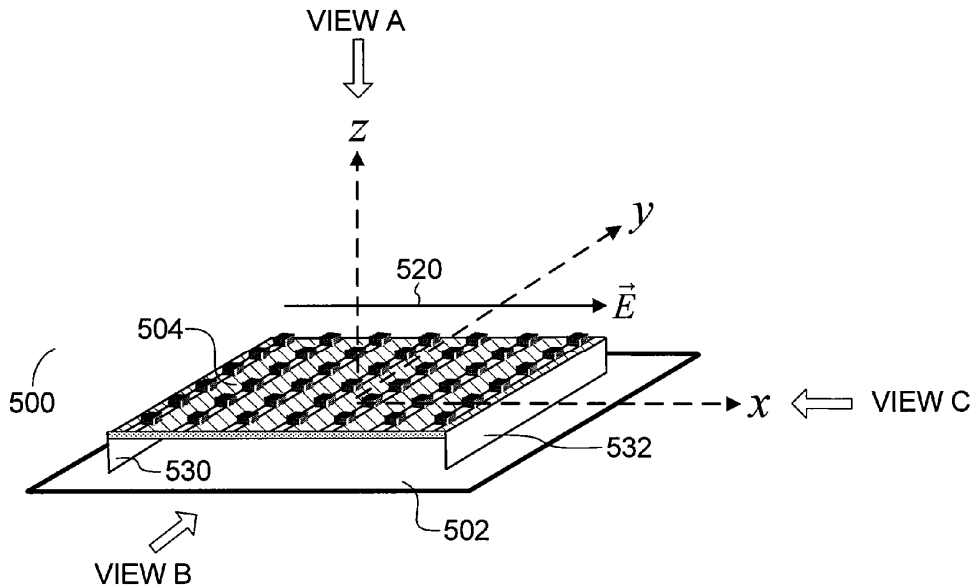
(22) **Filed: Jul. 26, 2011**

Related U.S. Application Data

(60) **Provisional application No. 61/379,450, filed on Sep. 2, 2010.**

Publication Classification

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





US 20120056788A1

(19) **United States**

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

(10) **Pub. No.:** US 2012/0056788 A1

(43) **Pub. Date:** Mar. 8, 2012

(54) **MULTIBAND AND BROADBAND ANTENNA USING METAMATERIALS, AND COMMUNICATION APPARATUS COMPRISING THE SAME**

(30) **Foreign Application Priority Data**

Mar. 2, 2009 (KR) 10-2009-0017608

Publication Classification

(75) **Inventors:** Byung Hoon Ryou, Seoul (KR);
Won Mo Sung, Gyeonggi-do (KR);
Jeong Keun Ji, Seoul (KR)

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

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

(73) **Assignee:** EMW CO., LTD., Incheon (KR)

(57) **ABSTRACT**

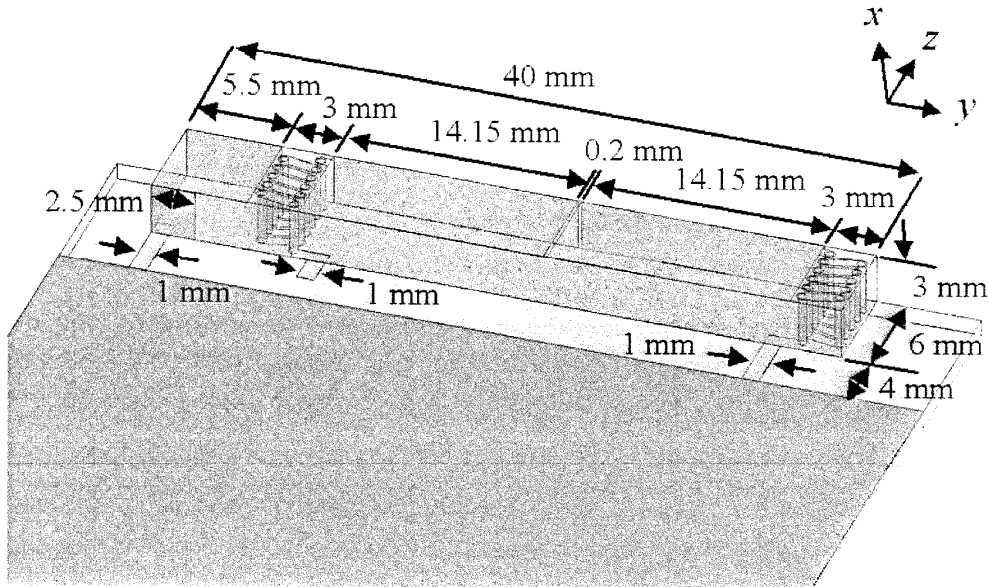
(21) **Appl. No.:** 13/254,828

(22) **PCT Filed:** Mar. 2, 2010

(86) **PCT No.:** PCT/KR2010/001269

§ 371 (c)(1),
(2), (4) **Date:** Nov. 15, 2011

A multiband and broadband antenna using metamaterials and a communication apparatus comprising same are provided. According to one embodiment of the present invention, provided is a multiband and broadband antenna, comprising: a feeder unit formed in at least a portion of a carrier; and at least one double negative (DNG) unit cell which is formed in the carrier, fed by the feeder unit, and serves as a composite right/left handed transmission line (CRLH-TL).





US 20120056789A1

(19) **United States**

(12) **Patent Application Publication**
Sohn

(10) **Pub. No.: US 2012/0056789 A1**

(43) **Pub. Date: Mar. 8, 2012**

(54) **ANTENNA BOOSTER CASE FOR
ENHANCING TRANSMISSION/RECEPTION
SENSIBILITY OF MOBILE DEVICE**

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

(75) **Inventor: Mike Sohn, La Habra, CA (US)**

(57) **ABSTRACT**

(73) **Assignee: XG SOLUTIONS, LLC., Irvine,
CA (US)**

Disclosed is an antenna booster case for mobile devices for preventing death grip in a mobile device with an internal antenna, which has become a significant issue in recent years. More particularly, the present disclosure relates to an antenna booster case for mobile devices, which includes a case antenna provided to a protective case body, enclosing an outer surface of a mobile device, to be connected to an internal antenna of the mobile device through physical contact therewith or without physical contact therewith to enhance transmission/reception sensibility of the mobile device. The antenna booster case includes a protective case body enclosing an outer surface of a mobile device; and a case antenna including a loop member secured to the protective case body and a connection part brought into contact with a conductive frame of the mobile device.

(21) **Appl. No.: 12/882,102**

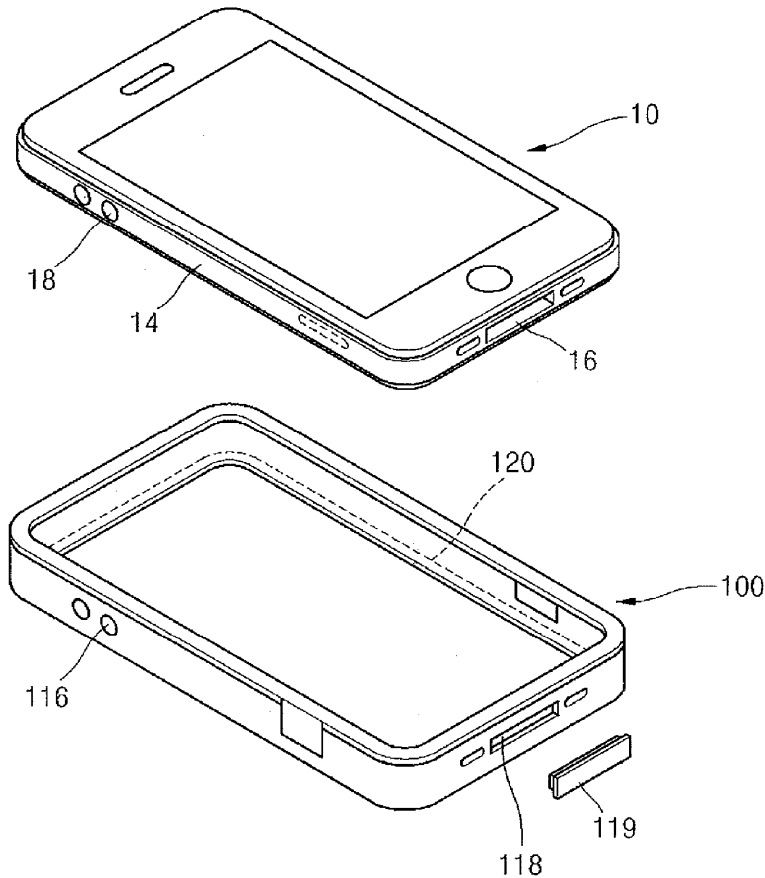
(22) **Filed: Sep. 14, 2010**

Related U.S. Application Data

(60) **Provisional application No. 61/380,118, filed on Sep. 3, 2010.**

Publication Classification

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





US 20120056792A1

(19) **United States**

(12) **Patent Application Publication**
HAN

(10) **Pub. No.: US 2012/0056792 A1**

(43) **Pub. Date: Mar. 8, 2012**

(54) **WEARABLE DEVICE WITH ANTENNA**

Publication Classification

(75) Inventor: **PING HAN**, Shenzhen City (CN)

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

(73) Assignees: **HON HAI PRECISION**
INDUSTRY CO., LTD., Tu-Cheng
(TW); **HONG FU JIN**
PRECISION INDUSTRY
(ShenZhen) CO., LTD., Shenzhen
City (CN)

(52) **U.S. Cl.** **343/718**

(57) **ABSTRACT**

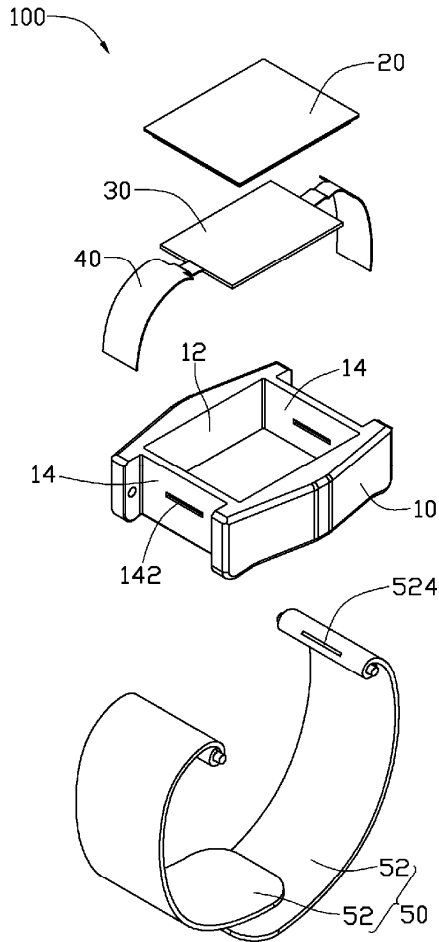
(21) Appl. No.: **12/916,631**

A wearable device includes a housing, a circuit board, a strap, and two antennas. The housing defines a receiving space. The receiving space includes two sidewalls each defining a through hole. The circuit board is received in the receiving space. The strap defines two slots respectively adjacent to the sidewalls. The antennas extend from the circuit board and are electrically connected to the circuit board. Each of the antennas is received in a corresponding slot.

(22) Filed: **Oct. 31, 2010**

(30) **Foreign Application Priority Data**

Sep. 3, 2010 (CN) 201010271810.2





US 20120056795A1

(19) **United States**

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

(10) **Pub. No.:** US 2012/0056795 A1

(43) **Pub. Date:** Mar. 8, 2012

(54) **ANTENNA MATCHING CIRCUIT, ANTENNA DEVICE, AND METHOD OF DESIGNING ANTENNA DEVICE**

Publication Classification

- (51) **Int. Cl.**
H01Q 1/50 (2006.01)
H03H 7/38 (2006.01)
H01P 11/00 (2006.01)
H01Q 1/00 (2006.01)
- (52) **U.S. Cl.** 343/787; 343/860; 333/32; 29/600
- (57) **ABSTRACT**

(75) **Inventors:** **Shoji NAGUMO**, Nagaokakyo-shi (JP); **Hiromasa KOYAMA**, Nagaokakyo-shi (JP); **Noriyuki UEKI**, Nagaokakyo-shi (JP)

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

(21) **Appl. No.:** 13/241,094

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

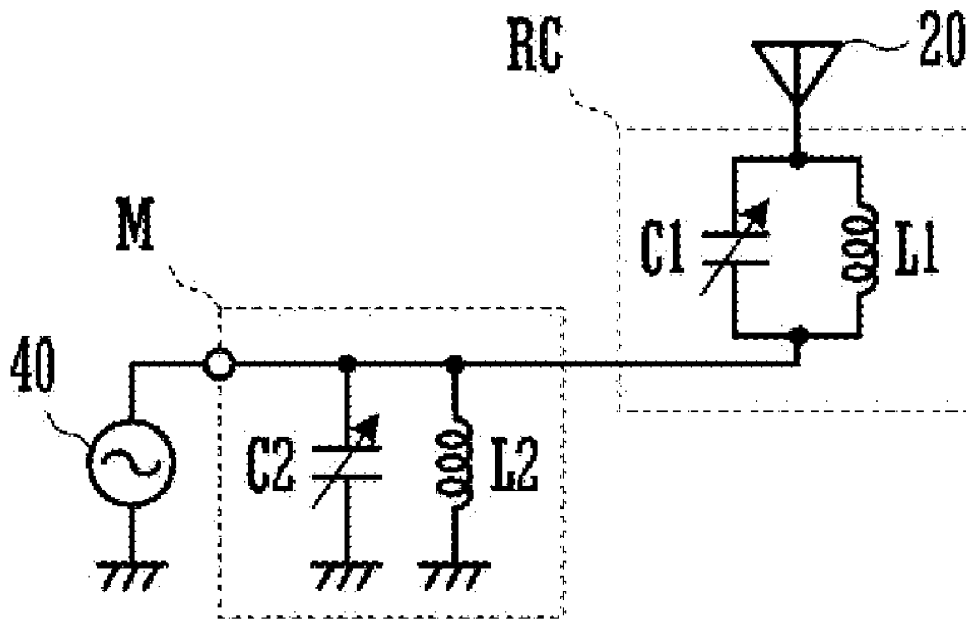
Related U.S. Application Data

(63) Continuation of application No. PCT/JP2009/069903, filed on Nov. 26, 2009.

(30) **Foreign Application Priority Data**

Apr. 1, 2009 (JP) 2009-089186

A switching function and multiband compatibility and a function handling deviation of matching caused by the influence of the human body are configured in a single matching circuit. An antenna matching circuit is formed by a reactance changing section and a matching section. The matching section is formed by a parallel circuit of an inductor and a capacitor, and the LC parallel circuit is shunt-connected between a feed section and the ground. The reactance changing section changes the resonant frequency to be compatible with a plurality of bands, and performs fine adjustment of the resonant frequency changed by the influence of the human body. The parallel inductor causes the locus of input impedance of the antenna matching circuit to draw a small circle locus in the first quadrant of a Smith chart. The parallel capacitor is adjustable to move the small circle locus to the center on the Smith chart.





US 20120056797A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0056797 A1**

(43) **Pub. Date: Mar. 8, 2012**

(54) **FREQUENCY-TUNABLE ANTENNA**

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

(75) **Inventors:** **Huang-Tse Peng**, Jhonghe City (TW); **Kuo-Jen Lai**, Jhonghe City (TW)

(57) **ABSTRACT**

(73) **Assignee:** **ARIMA COMMUNICATIONS CO., LTD.**, Jhonghe City (TW)

A frequency-tunable antenna includes a radiating element, a feeding terminal, a first ground terminal and a second ground terminal. The radiating element includes a first segment, a turning segment and a second segment. The turning segment is interconnected between the first segment and the second segment. The feeding terminal is disposed at the first segment of the radiating element, and electrically connected with the radiating element and the circuit substrate. The first ground terminal is disposed beside the feeding terminal. The second ground terminal is arranged between the first ground terminal and the turning segment of the radiating element. A radio frequency switch mounted on the circuit substrate is selectively connected with either the first ground terminal or the second ground terminal, so that the frequency-tunable antenna transmits and receives a wireless signal in first frequency band or a second frequency band.

(21) **Appl. No.:** **12/952,450**

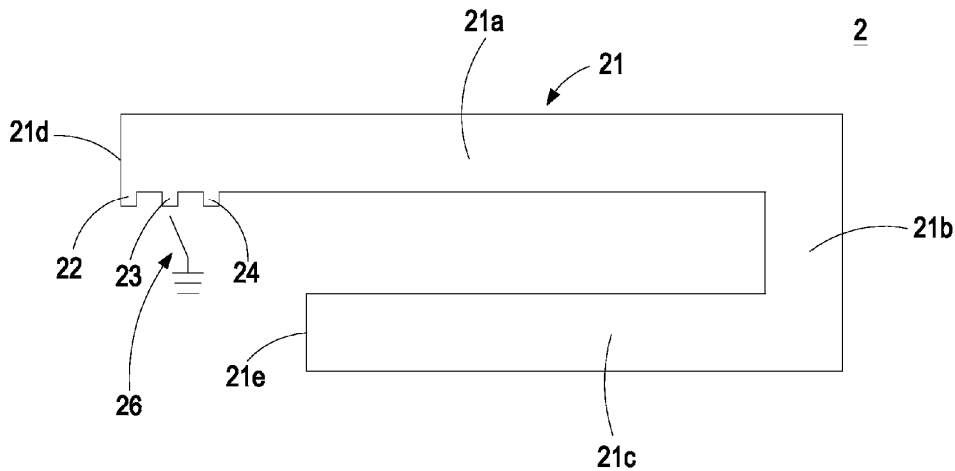
(22) **Filed:** **Nov. 23, 2010**

(30) **Foreign Application Priority Data**

Sep. 3, 2010 (TW) 099129800

Publication Classification

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





US 20120056798A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0056798 A1**

(43) **Pub. Date: Mar. 8, 2012**

(54) **INJECTION MOLDED CASE HAVING
ANTENNA PATTERN AND
MANUFACTURING METHOD THEREOF**

Publication Classification

(51) **Int. Cl.**
H01Q 1/40 (2006.01)
B29C 45/14 (2006.01)

(75) **Inventors:** **Hae-Won AHN,**
Gyeongsangbuk-do (KR); **Jae-Ho
OH,** Gyeongsangbuk-do (KR);
Jeong-Woon KOO,
Gyeongsangbuk-do (KR)

(52) **U.S. Cl.** **343/873; 425/129.1; 264/272.15**

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

(57) **ABSTRACT**

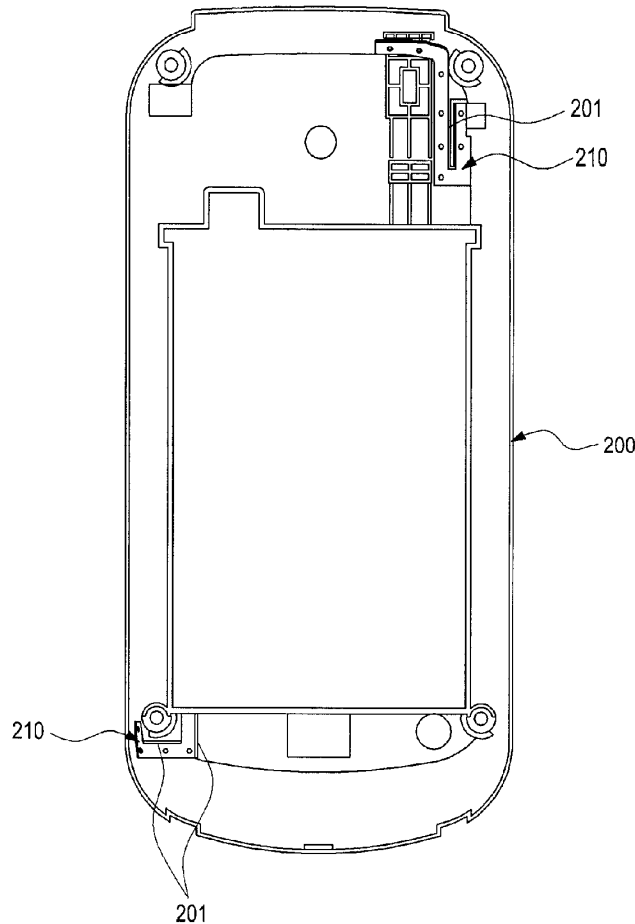
An injection-molded case and a manufacturing method thereof having antenna patterns are formed in the injection-molded case by only one insert injection molding process, without a second insert injection molding process as required in the conventional manufacture. The injection-molded case preferably includes: one or more antenna patterns fabricated by a press process; and an injection-molded case part having the antenna patterns provided therewithin, which is fabricated by fixing the antenna patterns on an injection mold and carrying out only one insert injection molding process.

(21) **Appl. No.:** **13/183,747**

(22) **Filed:** **Jul. 15, 2011**

(30) **Foreign Application Priority Data**

Sep. 7, 2010 (KR) 10-2010-0087421





US 20120062428A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0062428 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **PORTABLE RADIO**

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

(75) **Inventors: Daigo Imano, Miyagi (JP); Jun Sawada, Miyagi (JP); Takeshi Yamaguchi, Kanagawa (JP)**

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

(57) **ABSTRACT**

(21) **Appl. No.: 13/320,894**

There is provided a portable radio that exhibits high water-proof property and dust resistance property without impairing toughness and antenna performance while pursuing a smaller size.

(22) **PCT Filed: Mar. 2, 2010**

(86) **PCT No.: PCT/JP2010/001429**

§ 371 (c)(1),
(2), (4) **Date: Nov. 16, 2011**

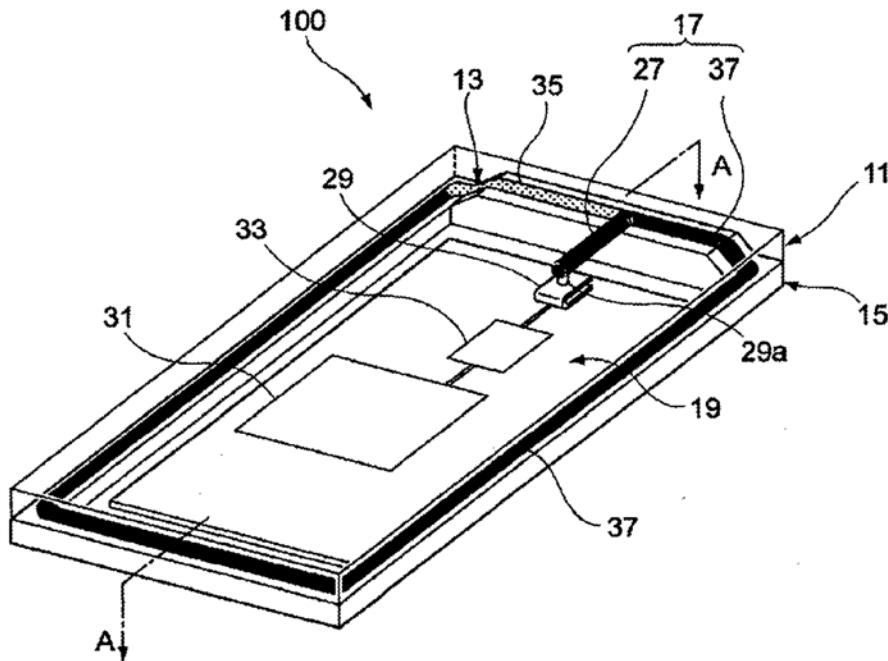
A portable radio **100** has a first case member **11** and a second case member **15** to be joined to a surrounding area of an opening of the first case member **11** by way of a soft seal member **13** and houses a circuit board **19** connected to an antenna element **17** within a case. The seal member **13** has an annular structure including a first extension part **35** made of a nonconductive material and a second extension part **37** to be connected to both ends of the first extension part **35**, in which a conductive material included in at least a portion of the second extension part serves as the antenna element, a passive element, and an earth line. A hardness of the seal member **13** exhibits substantially the same hardness in both the first extension part **35** and the second extension part **37**.

(30) **Foreign Application Priority Data**

May 28, 2009 (JP) 2009-129090

Publication Classification

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





US 20120062429A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0062429 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **PORTABLE RADIO**

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

(75) **Inventors:** **Hiroyuki Uno, Ishikawa (JP);
Yoshio Koyanagi, Kanagawa (JP);
Tomoaki Nishikido, Ishikawa (JP)**

(57) **ABSTRACT**

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

There is provided a foldable portable radio capable of yielding high emission efficiency over a wide band in either a closed or open state.

(21) **Appl. No.:** **13/321,952**

A portable radio **100** is comprised of: a lower housing **101** making up a first housing; an upper housing **102** making up a second housing; a hinge **103** for coupling the lower housing **101** to the upper housing **102** in a turnable manner; a first circuit board **104**; a second circuit board **105**; an antenna element **106**; a radio circuit **107**; an impedance matching circuit **108**; a signal line **109** that connects the first circuit board **104** to the second circuit board **105**; and a conductor element **110**. The conductor element **110** has a length that is a quarter wavelength of an operating frequency and is placed in the hinge **103** of the upper housing **102**. The conductor element **110** is electrically connected to a ground of the second circuit board **105** placed on the upper housing **102**, and the electrical connection is set at any position between a center of the housing along its widthwise direction and an end of the housing located opposite a feed point **111** of the antenna element **106**.

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

(86) **PCT No.:** **PCT/JP2010/001158**

§ 371 (c)(1),

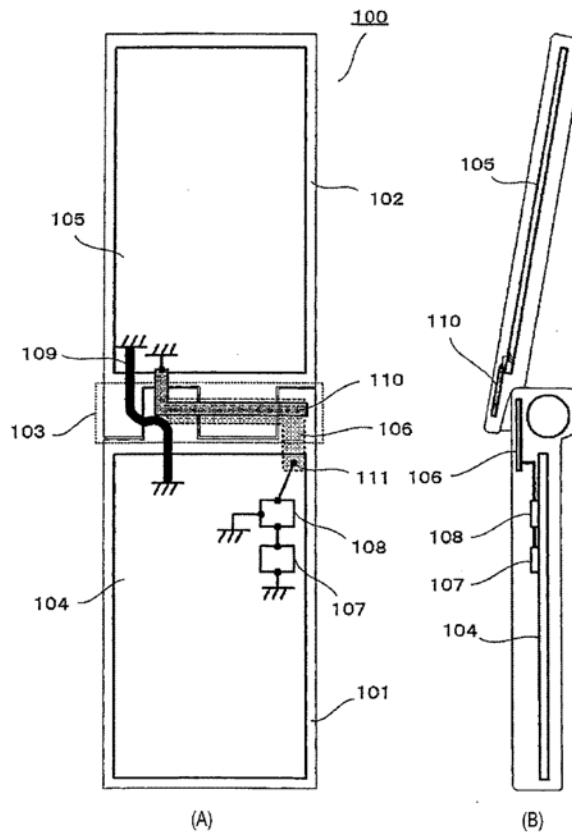
(2), (4) **Date:** **Nov. 22, 2011**

(30) **Foreign Application Priority Data**

May 27, 2009 (JP) 2009-127360

Publication Classification

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





US 20120062433A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0062433 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **FLEXIBLE ANTENNAS AND RELATED APPARATUSES AND METHODS**

(60) Provisional application No. 61/252,105, filed on Oct. 15, 2009, provisional application No. 61/180,592, filed on May 22, 2009.

(75) Inventors: **Constantine A. Balanis**, Mesa, AZ (US); **David R. Allee**, Phoenix, AZ (US)

Publication Classification

(73) Assignees: **Behalf of Arizona State University**, Scottsdale, AZ (US); **Arizona Board of Regents, a Body Corporate of the State of Arizona** Acting for and on

(51) **Int. Cl.**
H01Q 1/44 (2006.01)
H01P 11/00 (2006.01)
H01J 9/20 (2006.01)
H01Q 1/38 (2006.01)
H01Q 9/28 (2006.01)

(21) Appl. No.: **13/298,504**

(52) **U.S. CL.** **343/720; 343/700 MS; 343/795; 445/24; 29/600**

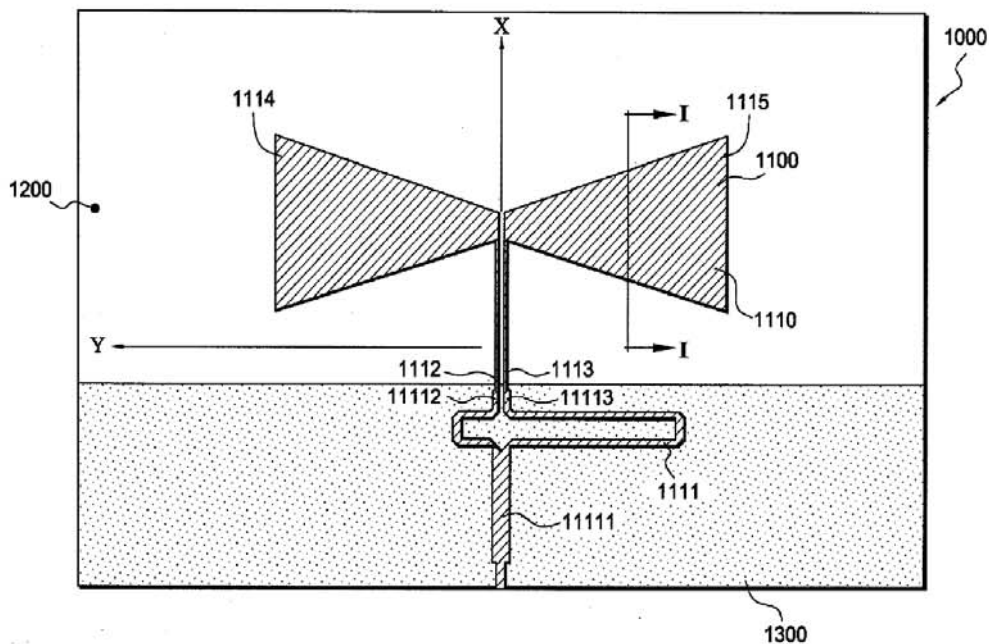
(22) Filed: **Nov. 17, 2011**

(57) **ABSTRACT**

Related U.S. Application Data

Embodiments of antennas over flexible substrates are described herein. Other embodiments and related methods are also disclosed herein.

(63) Continuation of application No. PCT/US10/34984, filed on May 14, 2010.





US 20120062434A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0062434 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **ANTENNA USING A REACTIVE ELEMENT**

(30) **Foreign Application Priority Data**

(75) Inventors: **Hyeong-Dong Kim**, Seoul (KR);
Hyung-Cheul Choi, Seoul (KR);
Shin-Hyung Jeon, Seoul (KR);
Jung-Hwan Yeom, Seoul (KR);
Oul Cho, Seoul (KR); **Seung-Woo Kim**, Gunpo (KR)

Mar. 23, 2009 (KR) 10-2009-0024654
May 15, 2009 (KR) 10-2009-0042460

Publication Classification

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
(52) **U.S. Cl.** **343/749**

(73) Assignee: **Industry-University Cooperation Foundation Hanyang University**, Seoul (KR)

(57) **ABSTRACT**

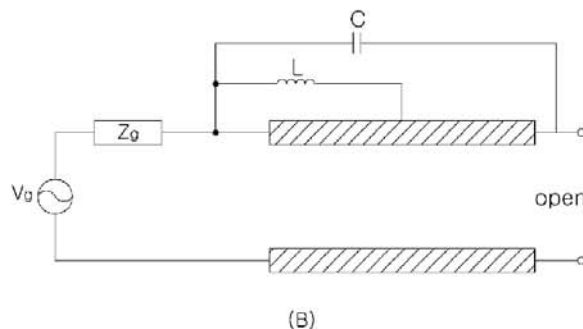
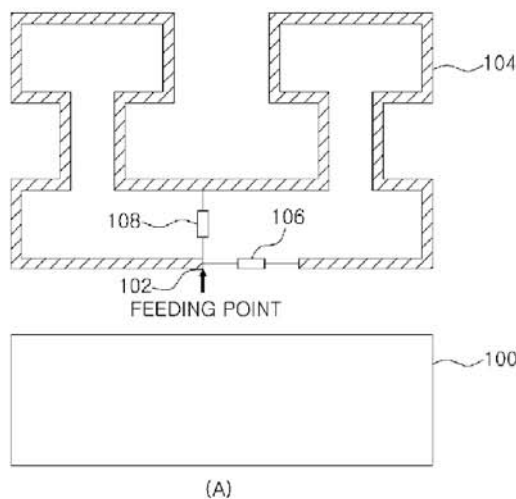
(21) Appl. No.: **13/240,653**

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

Disclosed is an antenna using a reactive element that is capable of individually controlling the respective resonance frequencies and resonance bandwidths. The antenna includes a radiator electrically coupled with a feeding point, a first reactive element electrically coupling a first point and a second point of the radiator, and a second reactive element electrically coupling a third point and a fourth point of the radiator. Here, the reactive elements are each coupled to the radiator in parallel, and because of the reactive elements, the antenna is made to have higher-order resonance frequencies that are not integer multiple in relation to a fundamental resonance frequency.

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2009/006308, filed on Oct. 29, 2009.





US 20120062435A1

(19) **United States**

(12) **Patent Application Publication**

Kato et al.

(10) **Pub. No.: US 2012/0062435 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **MAGNETIC SHEET, ANTENNA MODULE, ELECTRONIC APPARATUS, AND MAGNETIC SHEET MANUFACTURING METHOD**

(30) **Foreign Application Priority Data**

Mar. 29, 2010 (JP) P2010-074956

(75) Inventors: **Yoshihiro Kato**, Kanagawa (JP);
Shinichi Fukuda, Kanagawa (JP);
Kenichi Kabasawa, Saitama (JP);
Yoshito Ikeda, Tochigi (JP);
Keisuke Matsunami, Tokyo (JP)

Publication Classification

(51) **Int. Cl.**
H01Q 1/00 (2006.01)
B05D 5/00 (2006.01)

(73) Assignee: **SONY CORPORATION**, Tokyo (JP)

(52) **U.S. Cl.** **343/787; 427/127**

(21) Appl. No.: **13/321,615**

(57) **ABSTRACT**

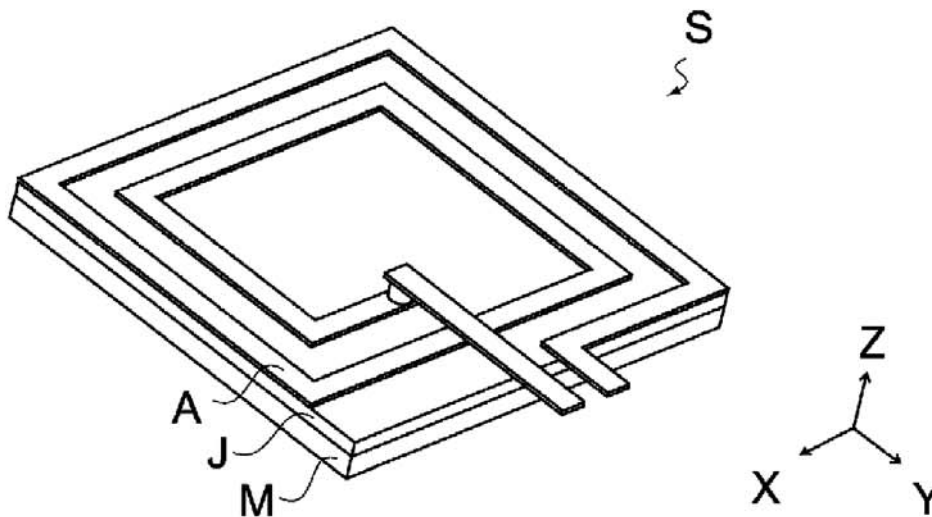
(22) PCT Filed: **Mar. 22, 2011**

A magnetic sheet for use with an antenna module is provided. The magnetic sheet may have a magnetically permeable layer having a plurality of randomly shaped pieces such that the magnetic sheet is configured to affect a resonance frequency of the antenna module. At least one of the randomly shaped pieces of the magnetic sheet does not have a rectangular or triangular shape.

(86) PCT No.: **PCT/JP2011/001667**

§ 371 (c)(1),
(2), (4) Date:

Nov. 21, 2011





US 20120062438A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0062438 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **ANTENNA APPARATUS**

Publication Classification

(76) Inventors: **Masahiro TANABE**, Kawasaki-shi (JP); **Yasuharu Masuda**, Kawasaki-shi (JP)

(51) **Int. Cl.**
H01Q 19/10 (2006.01)

(52) **U.S. Cl.** **343/834**

(21) Appl. No.: **13/192,720**

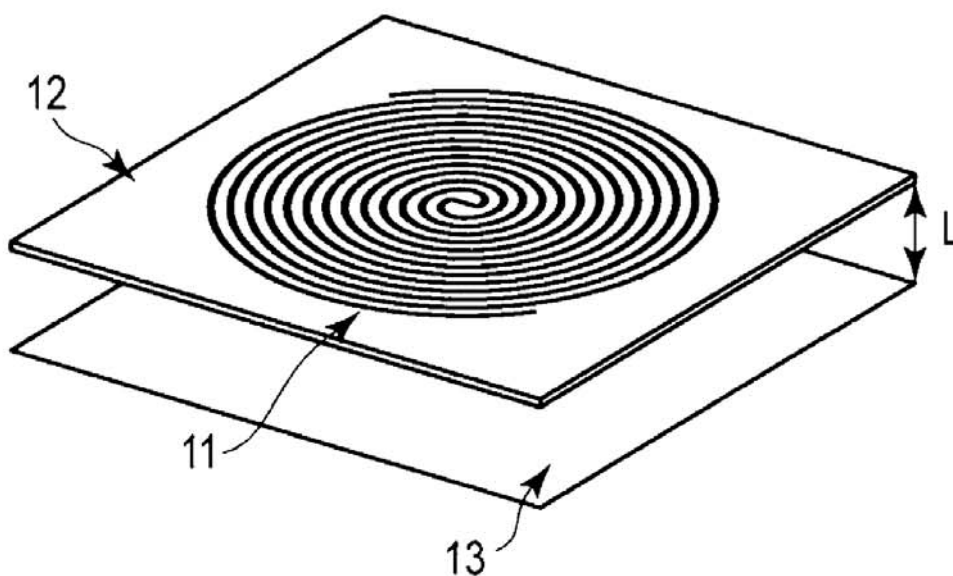
(57) **ABSTRACT**

(22) Filed: **Jul. 28, 2011**

According to one embodiment, an antenna apparatus includes an antenna element formed into a spiral shape, a sheet-shaped magnetic material arranged in tight contact with a back surface of the antenna element, and a reflector arranged with an air gap to the magnetic material.

(30) **Foreign Application Priority Data**

Sep. 9, 2010 (JP) 2010-202091





US 20120062441A1

(19) **United States**

(12) **Patent Application Publication**
PEIKER

(10) **Pub. No.: US 2012/0062441 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **ARRANGEMENT FOR COUPLING A MOBILE PHONE TO AN EXTERNAL ANTENNA**

(30) **Foreign Application Priority Data**

Feb. 13, 2010 (DE) 10 2010 008 030.6

(75) Inventor: **Andreas PEIKER**, Friedrichsdorf (DE)

Publication Classification

(51) **Int. Cl.**
H01Q 15/00 (2006.01)

(73) Assignee: **Peiker Acustic GmbH & Co. KG**, Friedrichsdorf (DE)

(52) **U.S. Cl.** **343/912**

(21) Appl. No.: **13/270,610**

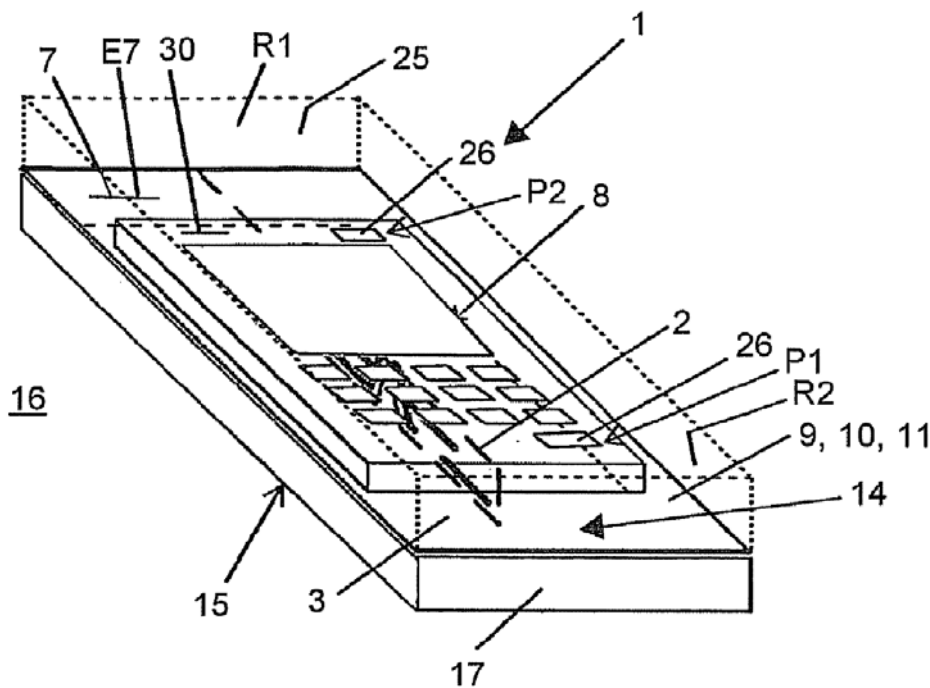
(57) **ABSTRACT**

(22) Filed: **Oct. 11, 2011**

The invention relates to an arrangement for coupling an antenna, which is in the form of a transmitting and/or receiving antenna, of a mobile telephone to an external antenna or an arrangement for accommodating a mobile telephone from amongst a large number of different mobile telephones in a vehicle with low levels of loss and interference radiation, and for coupling the respective mobile telephone to devices of the vehicle.

Related U.S. Application Data

(63) Continuation of application No. PCT/EP2011/000656, filed on Feb. 11, 2011.





US 20120063077A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0063077 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **HANDHELD TERMINAL DEVICE AND ELECTRONIC EQUIPMENT**

Publication Classification

(75) Inventors: **Shinji Tomobe**, Kanagawa (JP);
Yasutoki Manda, Kanagawa (JP);
Hidehiko Amaki, Kanagawa (JP);
Takeshi Sekne, Kanagawa (JP);
Takefumi Ishida, Kanagawa (JP)

(51) **Int. Cl.**
H05K 5/06 (2006.01)

(52) **U.S. Cl.** **361/679.01**

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

(57) **ABSTRACT**

Provided is a handheld terminal device in which an excellent seal can be obtained without causing twisting, air bubbles, or gaps in double-sided tape. The handheld terminal device (100) has a water-resistant construction for a camera unit (113), a speaker unit (114), a charging terminal unit (116), a keypad (117), an antenna unit (118), a main display (121), and a sub-display (122). Said water-resistant construction comprises convex ribs having edge-shaped protrusions that press on water-resistant double-sided tape. For example, the sub-display (122) is provided with: a display unit (151) having a display opening (151a); a water-resistant wall (152) that is formed on the surface of the display unit (151) and has a convex rib (153); and water-resistant double-sided tape (154) that attaches the upper face of the water-resistant wall (152) having a convex rib (153) to the inner face of a sub-display exterior case (155).

(21) Appl. No.: **13/320,843**

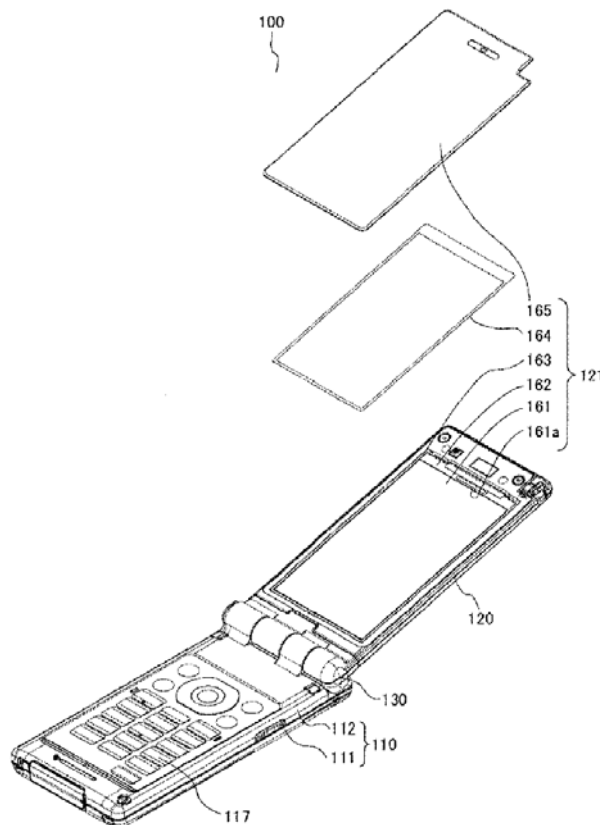
(22) PCT Filed: **Apr. 15, 2010**

(86) PCT No.: **PCT/JP2010/002741**

§ 371 (c)(1),
(2), (4) Date: **Nov. 16, 2011**

(30) **Foreign Application Priority Data**

May 22, 2009 (JP) 2009-124598





US 20120064843A1

(19) **United States**

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

(10) **Pub. No.:** US 2012/0064843 A1

(43) **Pub. Date:** Mar. 15, 2012

(54) **DATA COMMUNICATION DEVICE**

(52) **U.S. CL.** 455/83

(76) **Inventors:** **Changil KIM**, Gyeonggi-Do (KR);
Soyeon LEE, Gyeonggi-Do (KR);
Yeomin YOUN, Gyeonggi-Do (KR);
Kyunghack YI, Seoul (KR);
Jin LEE, Seoul (KR)

(57) **ABSTRACT**

A communication device as disclosed herein may include a body, an antenna assembly provided in the body, and configured to transmit or receive wireless signals, and a circuit board connected to the antenna assembly and configured to process the wireless signals. The antenna assembly may include a carrier having at least one region that is dimensioned to be farther away from the body than other portions thereof, and a radiator provided on the at least one dimensioned region of the carrier and configured to receive or radiate electromagnetic waves corresponding to the wireless signals. The radiator may be positioned on the dimensioned region of the carrier such that a specific absorption rate (SAR) due to the antenna assembly is reduced.

(21) **Appl. No.:** 13/086,764

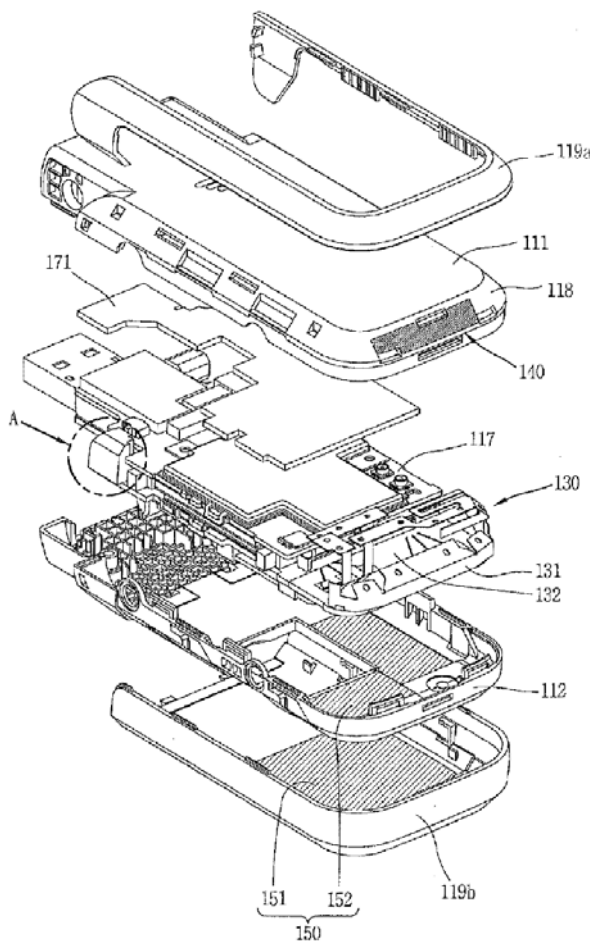
(22) **Filed:** Apr. 14, 2011

(30) **Foreign Application Priority Data**

Sep. 10, 2010 (KR) 10-2010-0089087

Publication Classification

(51) **Int. Cl.**
H04B 1/44 (2006.01)





US 20120064954A1

(19) **United States**

(12) **Patent Application Publication**
Kato

(10) **Pub. No.: US 2012/0064954 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **COMPOSITE ANTENNA AND PORTABLE TELEPHONE**

Publication Classification

(75) Inventor: **Hisatomo Kato, Osaka (JP)**

(51) **Int. Cl.**
H04W 88/02 (2009.01)
H01Q 9/00 (2006.01)

(73) Assignee: **KYOCERA CORPORATION,**
Kyoto (JP)

(52) **U.S. Cl.** **455/575.7; 343/751**

(57) **ABSTRACT**

(21) Appl. No.: **13/321,782**

(22) PCT Filed: **May 24, 2010**

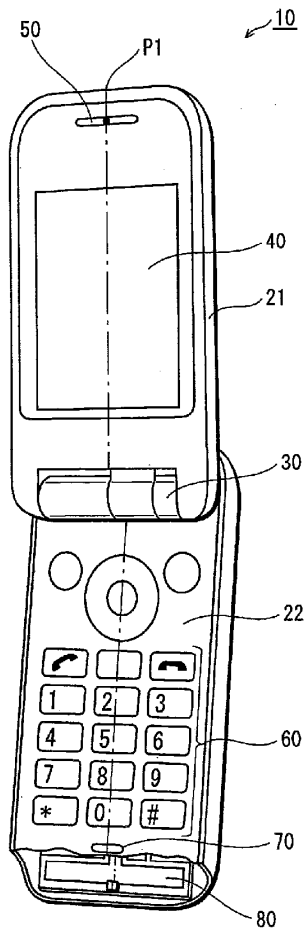
(86) PCT No.: **PCT/JP2010/003464**

§ 371 (c)(1),
(2), (4) Date: **Nov. 21, 2011**

A complex antenna has a first antenna element and a second antenna element each connected at one end to a different feed point and connected to each other at the other end through a parallel resonant circuit. Each antenna element has the same resonant frequency as the parallel resonant circuit. A mobile phone has an antenna switch with a first port connected to the first antenna element, a second port connected to the second antenna element, and a third port that can be connected to one of the first port and the second port and switched therebetween. A signal processing unit causes the antenna switch to connect the third port to the first port or to the second port and detects a signal captured by one of the antenna elements from the output of the third port.

(30) **Foreign Application Priority Data**

May 27, 2009 (JP) 2009-127769





US 20120065945A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0065945 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **AUTOMATED ANTENNA BUILDER**

(52) **U.S. CL.** 703/1

(75) **Inventors:** **Kenneth Joseph Brown**, Carson City, NV (US); **Ryan James Orsi**, San Diego, CA (US)

(57) **ABSTRACT**

(73) **Assignee:** **DockOn AG**, Zurich (CH)

(21) **Appl. No.:** **13/234,053**

(22) **Filed:** **Sep. 15, 2011**

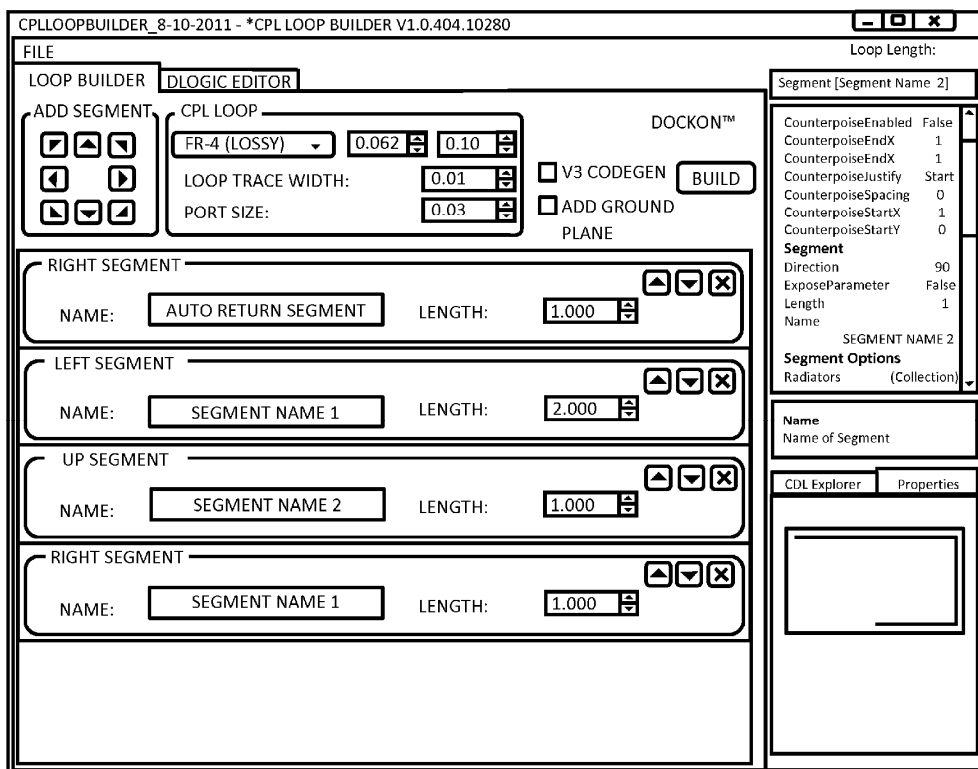
Embodiments are directed to an antenna builder and a method of building and maintaining an antenna design repository. A first embodiment consists of an antenna builder that enables the creation of an antenna representation that can subsequently be output into a plurality of formats to be used by other tools, such as electromagnetic simulation software. An alternative embodiment is directed to a method of building and maintaining a repository of antenna designs. The repository of antenna designs can be queried, enabling a plurality of users to search for specific antenna designs. Alternative embodiments can enable a user to search the repository antenna designs by visually browsing over the antenna designs in the repository. The repository of antenna designs is created by saving solutions generated by an optimizer during an optimization run to the repository. Solutions from the repository can also be used to seed and bootstrap other optimization runs.

Related U.S. Application Data

(60) Provisional application No. 61/383,308, filed on Sep. 15, 2010.

Publication Classification

(51) **Int. Cl.**
G06F 17/50 (2006.01)





US 20120065946A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0065946 A1**

(43) **Pub. Date: Mar. 15, 2012**

(54) **AUTOMATED ANTENNA BUILDER AND ANTENNA REPOSITORY**

(52) **U.S. CL. 703/1; 703/13**

(75) **Inventors:** **Kenneth Joseph Brown**, Carson City, NV (US); **Ryan James Orsi**, San Diego, CA (US)

(57) **ABSTRACT**

(73) **Assignee:** **DockOn AG**, Zurich (CH)

(21) **Appl. No.:** **13/234,063**

(22) **Filed:** **Sep. 15, 2011**

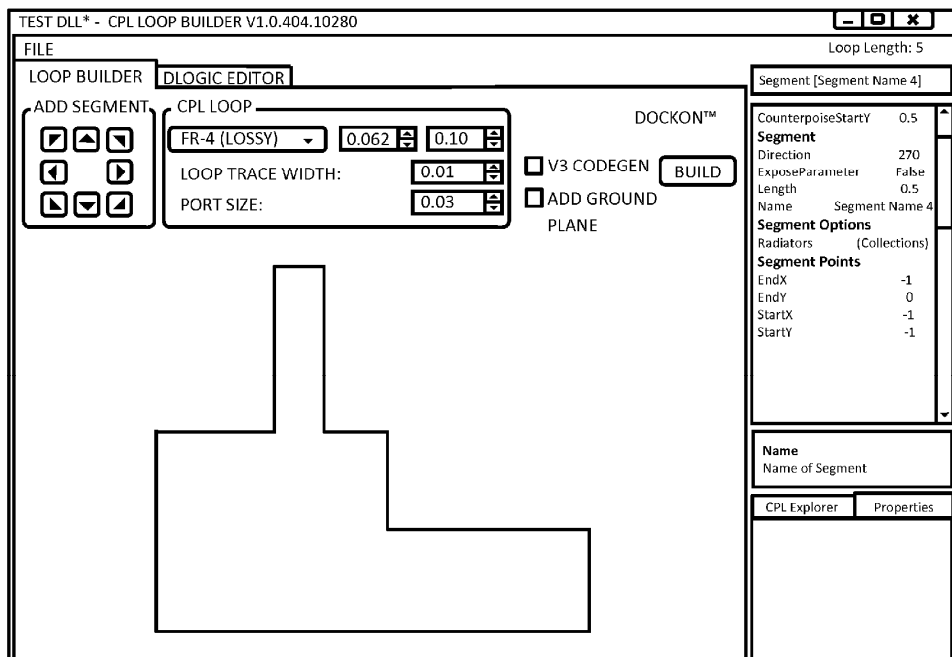
Embodiments are directed to an antenna builder and a method of building and maintaining an antenna design repository. A first embodiment consists of an antenna builder that enables the creation of an antenna representation that can subsequently be output into a plurality of formats to be used by other tools, such as electromagnetic simulation software. An alternative embodiment is directed to a method of building and maintaining a repository of antenna designs. The repository of antenna designs can be queried, enabling a plurality of users to search for specific antenna designs. Alternative embodiments can enable a user to search the repository antenna designs by visually browsing over the antenna designs in the repository. The repository of antenna designs is created by saving solutions generated by an optimizer during an optimization run to the repository. Solutions from the repository can also be used to seed and bootstrap other optimization runs.

Related U.S. Application Data

(63) Continuation of application No. 61/383,308, filed on Sep. 15, 2010.

Publication Classification

(51) **Int. Cl.**
G06G 7/62 (2006.01)
G06F 17/50 (2006.01)





US 20120068783A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0068783 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **TUNING CIRCUIT FOR PIVOTAL ANTENNA**

(52) **U.S. CL.** 333/33

(75) **Inventors:** **Tsung-Wen Chiu**, Taipei County (TW); **Fu-Ren Hsiao**, Taipei County (TW)

(57) **ABSTRACT**

(73) **Assignee:** **ADVANCED CONNECTEK, INC.**, Taipei County (TW)

A tuning circuit for a pivotal antenna comprises a feeder transmission cable, a microwave medium, an impedance-matching tuning circuit, a grounding plane, a pivotal shaft, a radiation conductor, and a carrier member. The feeder transmission cable has a central wire and an outer conductor. The microwave medium has a first plane and a second plane. The impedance-matching tuning circuit is arranged on the first plane and connected with the central wire. The grounding plane is arranged on the second plane and connected with the outer conductor. The pivotal shaft has a first end connected with the impedance-matching tuning circuit and a second end connected with the radiation conductor. The carrier member accommodates the microwave medium therein. The tuning circuit for a pivotal antenna of the present invention can provide superior impedance and bandwidth for a radiation conductor of an antenna.

(21) **Appl. No.:** **12/973,436**

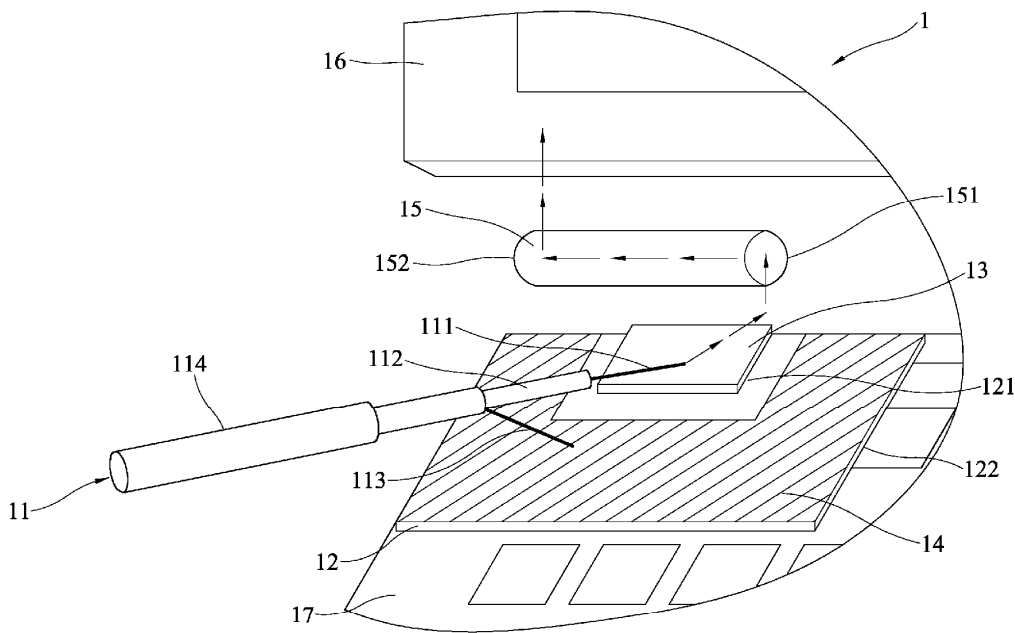
(22) **Filed:** **Dec. 20, 2010**

(30) **Foreign Application Priority Data**

Sep. 17, 2010 (TW) 099131558

Publication Classification

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





US 20120068887A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0068887 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **MULTI-FREQUENCY ANTENNA**

Publication Classification

(75) Inventors: **Tsung-Wen Chiu**, Taipei County (TW); **Fu-Ren Hsiao**, Taipei County (TW); **Yao-Yuan Chang**, Taipei County (TW); **Kuo-Chan Fu**, Taipei County (TW)

(51) **Int. Cl.**
H01G 5/01 (2006.01)
H01Q 1/36 (2006.01)
(52) **U.S. Cl.** **343/700 MS**

(73) Assignee: **ADVANCED CONNECTEK INC.**, Taipei County (TW)

(57) **ABSTRACT**

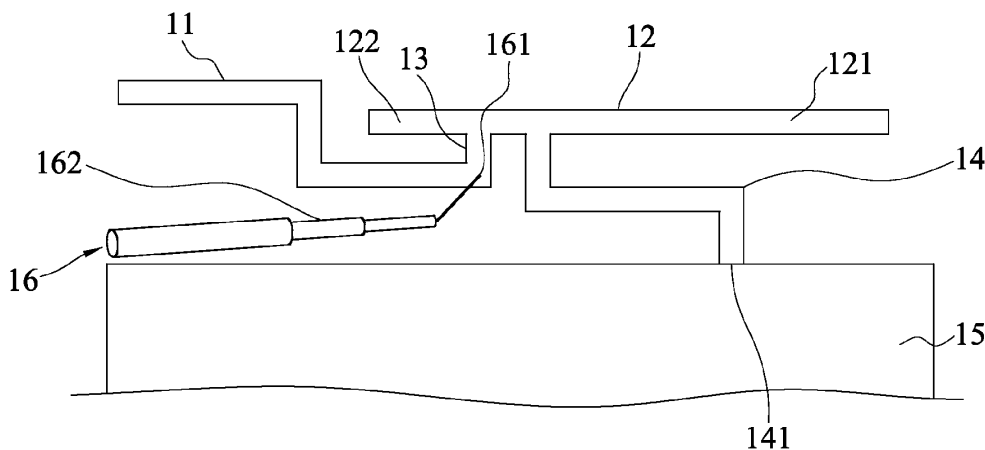
(21) Appl. No.: **13/025,000**

A multi-frequency antenna comprises a first conductor, a second conductor, a feeder conductor, a short-circuit member, a grounding plane and a feeder cable. The first conductor has a serpentine form. The second conductor is parallel to the first conductor and extends in one side of the first conductor. The feeder conductor connects the first conductor and the second conductor. The short-circuit member connects with the second conductor and extends serpentinely with an end thereof connecting with the grounding plane. The short-circuit member is arranged in one side of the second conductor and connects with the second conductor at a near-central point of the second conductor, which divides the second conductor into a first extension and a second extension. The feeder cable includes a central wire connecting with the feeder conductor and an external wire connecting with the grounding plane.

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

(30) **Foreign Application Priority Data**

Sep. 17, 2010 (TW) 099131559





US 2012006888A1

(19) **United States**

(12) **Patent Application Publication**
Tsung-Wen et al.

(10) **Pub. No.: US 2012/0068888 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **FLEXIBLE ANTENNA**

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

(75) **Inventors:** **Chiu Tsung-Wen**, Xin-Dian Cty (TW); **Hsiao Fu-Ren**, Taipei County (TW); **Chen Chih-Fan**, Taipei County (TW); **Chen Po-Sheng**, Taipei County (TW)

(57) **ABSTRACT**

A flexible antenna comprises a filmed layer, a flexible radiation conductor and a support member. The flexible radiation conductor has a crooked form and a feeder terminal. The filmed layer covers the upper surface of the flexible radiation conductor. The support member has a through-hole. The lower surface of the flexible radiation conductor is stuck to the upper surface of the support member. The feeder terminal is inserted through the through-hole to protrude from the lower surface of the support member. The flexible radiation conductor and the crooked feeder terminal thereof replace the conventional radiation conductor circuit layer and metallic contact terminal to overcome the problem that the conventional contact terminal damages the radiation conductor layer and protrudes the filmed layer. Further, the present invention integrates FPC and LDS technologies to enable the flexible radiation conductor to be arbitrarily stuck to complicated planes or complicated curved surfaces.

(73) **Assignee:** **ADVANCED CONNECTEK INC.**, Taipei County (TW)

(21) **Appl. No.:** **13/070,364**

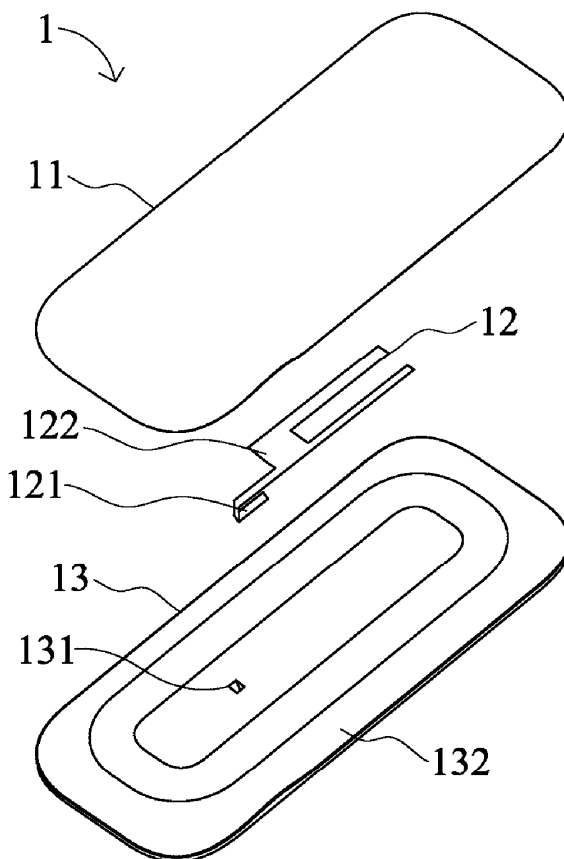
(22) **Filed:** **Mar. 23, 2011**

(30) **Foreign Application Priority Data**

Sep. 17, 2010 (TW) 099131558

Publication Classification

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





US 20120068889A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0068889 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **ANTENNA, COMPONENT AND METHODS**

Publication Classification

(76) Inventors: **Juha Sorvala**, Oulu (FI); **Petteri Annamaa**, Oulunsalo (FI); **Kimmo Koskiniemi**, Oulu (FI)

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

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

(21) Appl. No.: **13/215,021**

(57) **ABSTRACT**

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

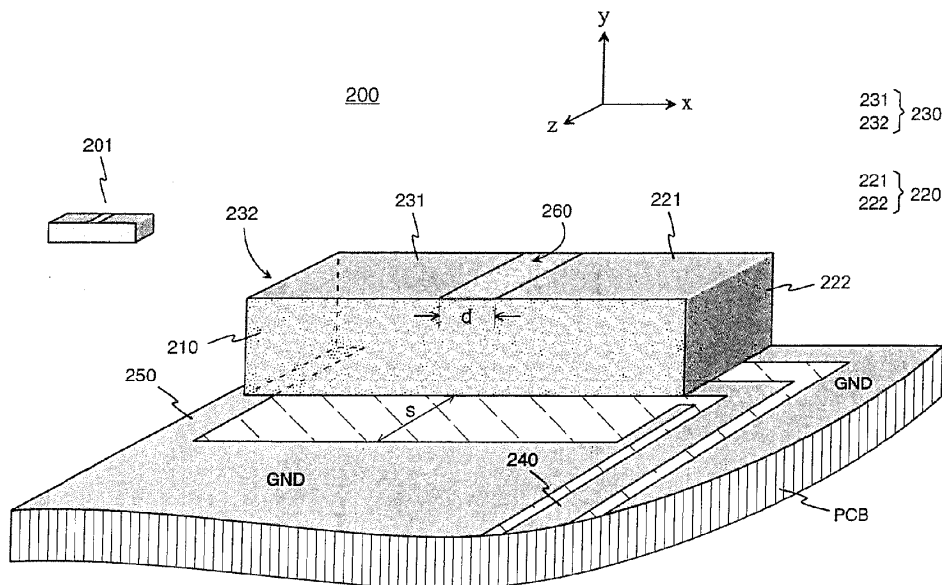
An antenna component (and antenna) with a dielectric substrate and a plurality of radiating antenna elements on the surface of the substrate. In one embodiment, the plurality comprises two (2) elements, each of them covering one of the opposite heads and part of the upper surface of the device. The upper surface between the elements comprises a slot. The lower edge of one of the antenna elements is galvanically coupled to the antenna feed conductor on a circuit board, and at another point to the ground plane, while the lower edge of the opposite antenna element, or the parasitic element, is galvanically coupled only to the ground plane. The parasitic element obtains its feed through the electromagnetic coupling over the slot, and both elements resonate at the operating frequency. Omni-directionality is also achieved. Losses associated with the substrate are low due to the simple field image in the substrate.

Related U.S. Application Data

(63) Continuation of application No. 12/871,481, filed on Aug. 30, 2010, which is a continuation of application No. 11/648,429, filed on Dec. 28, 2006, now Pat. No. 7,786,938.

(30) **Foreign Application Priority Data**

Jun. 28, 2004 (FI) 20040892
Aug. 18, 2004 (FI) 20041088
Mar. 16, 2005 (FI) PCT/FI2005/050089
Jun. 28, 2005 (FI) PCT/FI2005/050247





US 20120068893A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0068893 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **ANTENNA STRUCTURES HAVING
RESONATING ELEMENTS AND PARASITIC
ELEMENTS WITHIN SLOTS IN
CONDUCTIVE ELEMENTS**

Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 9/04 (2006.01)
H01Q 21/00 (2006.01)
(52) **U.S. Cl.** **343/702; 343/893; 343/700 MS**

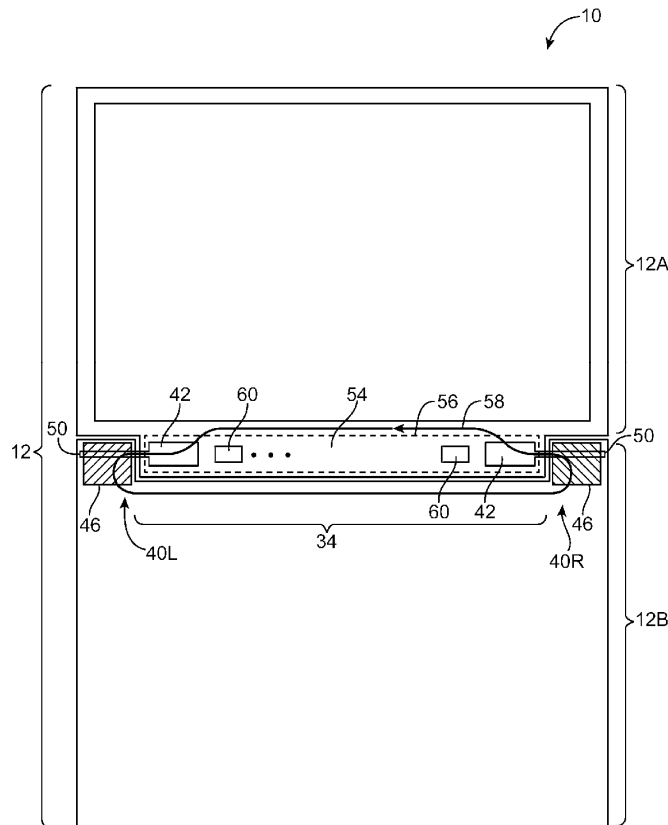
(76) Inventors: **Jerzy Guterman**, Mountain View, CA (US); **Hao Xu**, Cupertino, CA (US); **Douglas Blake Kough**, San Jose, CA (US); **Eduardo Lopez Camacho**, Watsonville, CA (US); **Mattia Pascolini**, Campbell, CA (US); **Robert W. Schlub**, Cupertino, CA (US); **Ruben Caballero**, San Jose, CA (US)

(57) **ABSTRACT**

Electronic devices may include radio-frequency transceiver circuitry and antenna structures. The antenna structures may include antenna resonating elements such as dual-band antenna resonating elements that resonate in first and second communications bands. The antenna structures may also contain parasitic antenna elements such as elements that are operative in only the first or second communications band and elements that are operative in both the first and second communications bands. The antenna resonating elements and parasitic elements may be mounted on a common dielectric carrier. The dielectric carrier may be mounted within a slot or other opening in a conductive element. The conductive element may be formed from conductive housing structures in an electronic device such as a portable computer. The portable computer may have a clutch barrel with a dielectric cover. The dielectric cover may overlap and cover the slot and the dielectric carrier.

(21) Appl. No.: **12/888,350**

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





US 20120068895A1

(19) **United States**

(12) **Patent Application Publication**
Yamaguchi

(10) **Pub. No.: US 2012/0068895 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **PORTABLE WIRELESS DEVICE**

Publication Classification

(75) Inventor: **Takeshi Yamaguchi**, Kanagawa (JP)

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

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

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

(57) **ABSTRACT**

(21) Appl. No.: **13/320,159**

(22) PCT Filed: **Mar. 3, 2010**

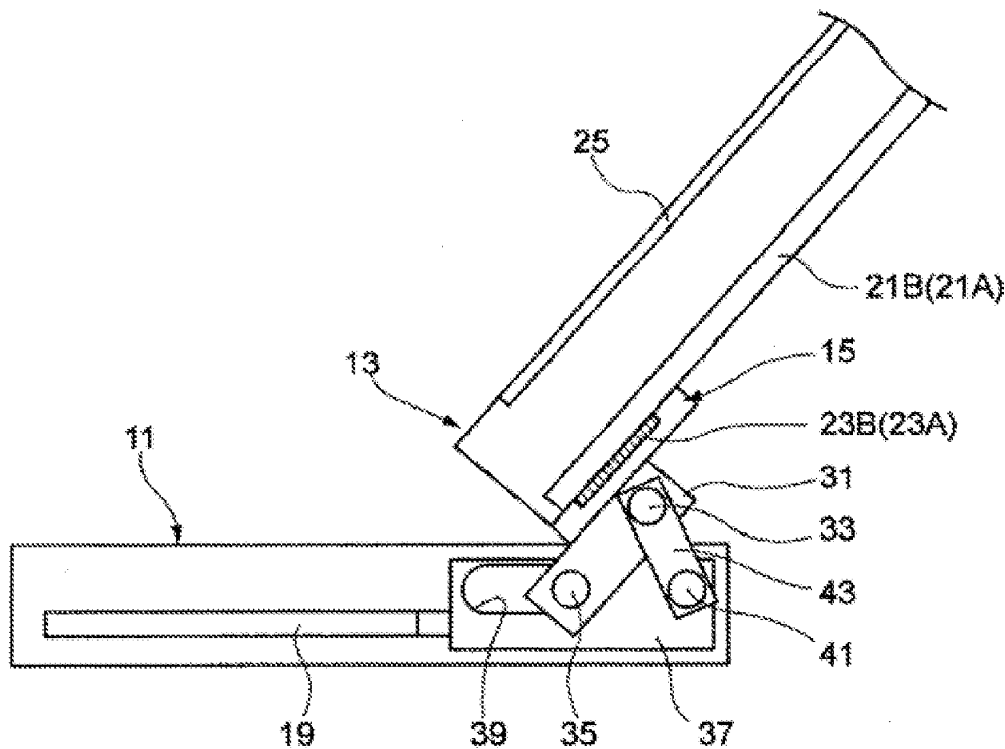
(86) PCT No.: **PCT/JP2010/001478**

§ 371 (c)(1),
(2), (4) Date: **Nov. 11, 2011**

A portable wireless device includes: a first housing including therein an antenna element and a circuit board disposed in parallel therewith; a second housing disposed to overlap with the first housing; and a tilt holding member including a hinge part which rotatably connects one end side of the first housing and one end side of the second housing to each other and which is configured to hold the second housing in a state in which the second housing is tilted with respect to the first housing. The tilt holding member includes a cored bar made of a metal material disposed along an arrangement direction of the circuit board and the antenna element. The cored bar is divided outside an arrangement range of the circuit board at the antenna element side in the arrangement direction.

(30) **Foreign Application Priority Data**

May 13, 2009 (JP) 2009-116623





US 20120068898A1

(19) **United States**

(12) **Patent Application Publication**

Clow et al.

(10) **Pub. No.: US 2012/0068898 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **COMPACT ULTRA WIDE BAND ANTENNA FOR TRANSMISSION AND RECEPTION OF RADIO WAVES**

(30) **Foreign Application Priority Data**

Jun. 9, 2009 (GB) 0909878.1

Oct. 9, 2009 (GB) 0917690.0

(75) Inventors: **Nathan Clow**, Salisbury (GB); **Ivor Leslie Morrow**, Swindon (DE)

Publication Classification

(73) Assignee: **THE SECRETARY OF STATE FOR DEFENCE**, SALISBURY WILTSHIRE (GB)

(51) **Int. Cl.**
H01Q 9/36 (2006.01)
H01Q 21/00 (2006.01)

(52) **U.S. Cl.** **343/731; 343/893**

(57) **ABSTRACT**

(21) Appl. No.: **13/375,234**

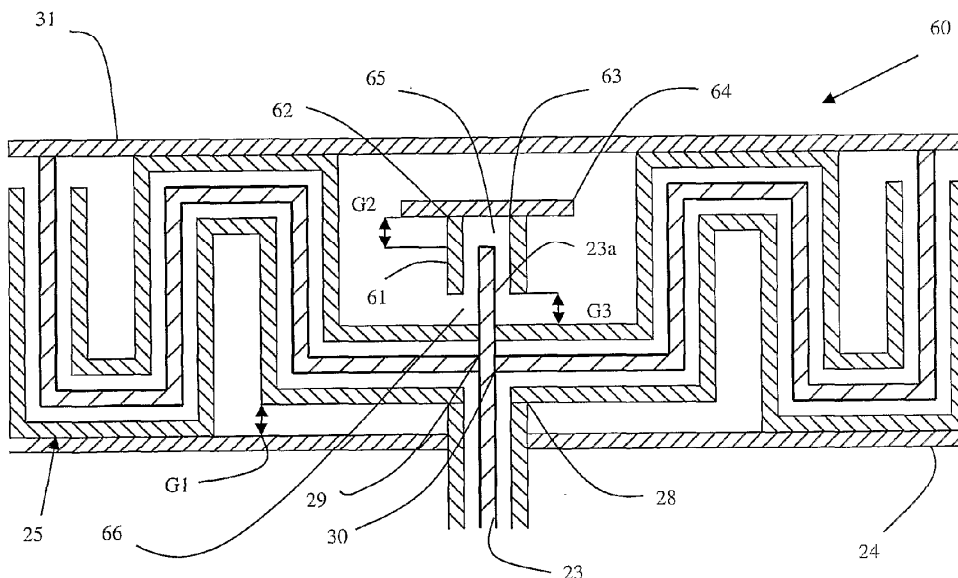
A stacked disk loaded antenna (80) that uses a dual double tuned impedance matching networks to broadband match the radiation resistance to a 50Ω port. Using two antenna elements (31, 64) in a stacked construction results in the antenna effectively combining the bandwidth ranges of both the antenna elements and removes the requirement for external tuning, which will add weight to an antenna structure. The stacked antenna system can be employed within communication systems operating within the HF and UHF bands.

(22) PCT Filed: **Jun. 8, 2010**

(86) PCT No.: **PCT/GB10/01129**

§ 371 (c)(1),
(2), (4) Date:

Nov. 30, 2011





US 20120068901A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0068901 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **MULTIBAND AND BROADBAND ANTENNA USING METAMATERIALS, AND COMMUNICATION APPARATUS COMPRISING THE SAME**

(30) **Foreign Application Priority Data**

Mar. 2, 2009 (KR) 10-2009-0017610

Publication Classification

(76) **Inventors:** **Byung Hoon Ryou**, Seoul (KR);
Won Mo Sung, Gyeonggi-do (KR);
Jeong Keun Ji, Seoul (KR)

(51) **Int. Cl.**
H01Q 13/28 (2006.01)

(52) **U.S. Cl.** 343/772

(57) **ABSTRACT**

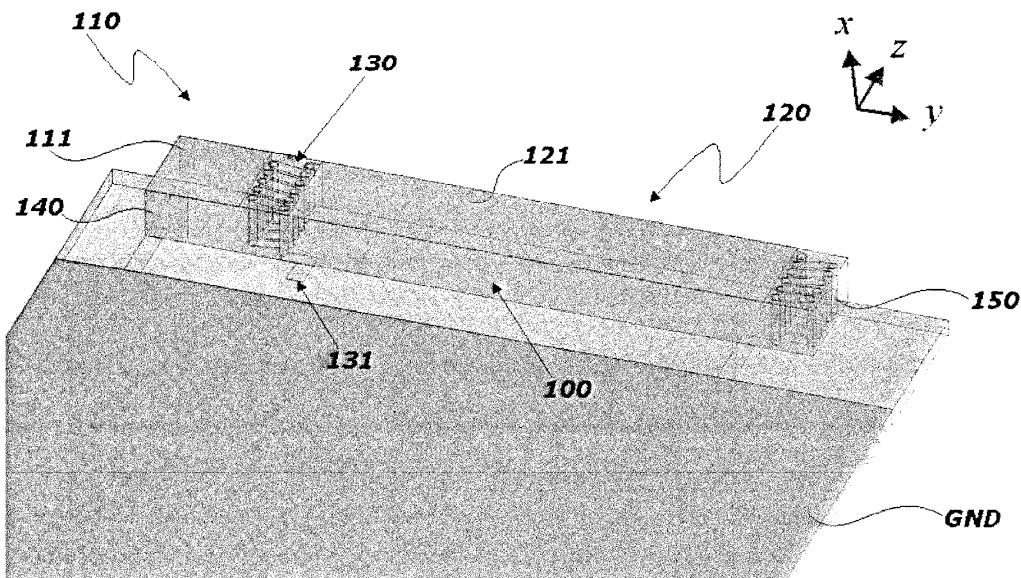
(21) **Appl. No.:** 13/254,832

A multiband and broadband antenna using metamaterials and a communication apparatus comprising same are provided. According to one embodiment of the present invention, provided is a multiband and broadband antenna comprising: a feeder unit formed in at least a portion of a carrier; and at least one double negative (DNG) unit cell and at least one epsilon negative (ENG) unit cell which are formed in the carrier, fed by the feeder unit, and serve as a composite right/left handed transmission line (CRLH-TL).

(22) **PCT Filed:** Mar. 2, 2010

(86) **PCT No.:** PCT/KR10/01270

§ 371 (c)(1),
(2), (4) **Date:** Nov. 21, 2011





US 20120068902A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0068902 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **ELECTRICALLY SMALL ULTRA-WIDEBAND ANTENNA FOR MOBILE HANDSETS AND COMPUTER NETWORKS**

(30) **Foreign Application Priority Data**

Jun. 9, 2009 (GB) 0909877.3

Oct. 9, 2009 (GB) 0917682.7

(75) Inventors: **Nathan Clow**, Salisbury (GB); **Ivor Leslie Morrow**, Swindon (GB)

Publication Classification

(73) Assignee: **THE SECRETARY OF STATE FOR DEFENCE**, Salisbury, Wiltshire (GB)

(51) **Int. Cl.**
H01Q 9/36 (2006.01)

(52) **U.S. Cl.** **343/791**

(21) Appl. No.: **13/375,492**

(57) **ABSTRACT**

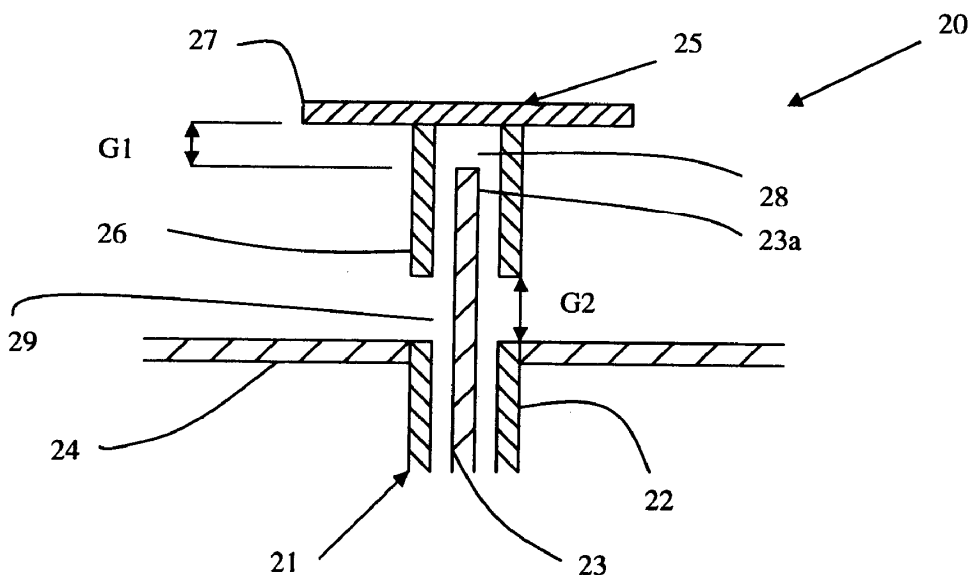
(22) PCT Filed: **Jun. 8, 2010**

An antenna arrangement (1020) for use in instantaneous ultra-wideband applications, the arrangement using a coaxial to coaxial aperture connection which increases matching bandwidth with reduced lossy effect. Beneficially the antenna arrangement uses a top loaded disk (27) to increase its capacitive effect. The arrangement is physically small making it useful for use within mobile handsets and computer networks.

(86) PCT No.: **PCT/GB2010/001116**

§ 371 (c)(1), (2), (4) Date:

Dec. 1, 2011





US 20120068905A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0068905 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **WIDEBAND, HIGH ISOLATION TWO PORT ANTENNA ARRAY FOR MULTIPLE INPUT, MULTIPLE OUTPUT HANDHELD DEVICES**

Publication Classification

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

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

(57) **ABSTRACT**

A multiple input-multiple output antenna assembly with high isolation between the antennas is disclosed. The antenna assembly includes a substrate with a ground layer at its surface. Two antennas are disposed opposing each other on the substrate. An isolation element in a form of a patterned slot is interposed between the first and second antennas on the ground plane. A first signal port is provided for applying a first signal to excite the first antenna and a second signal port is provided for applying a second signal to excite the second antenna. The isolation element provides isolation that inhibits electromagnetic propagation between the two antennas.

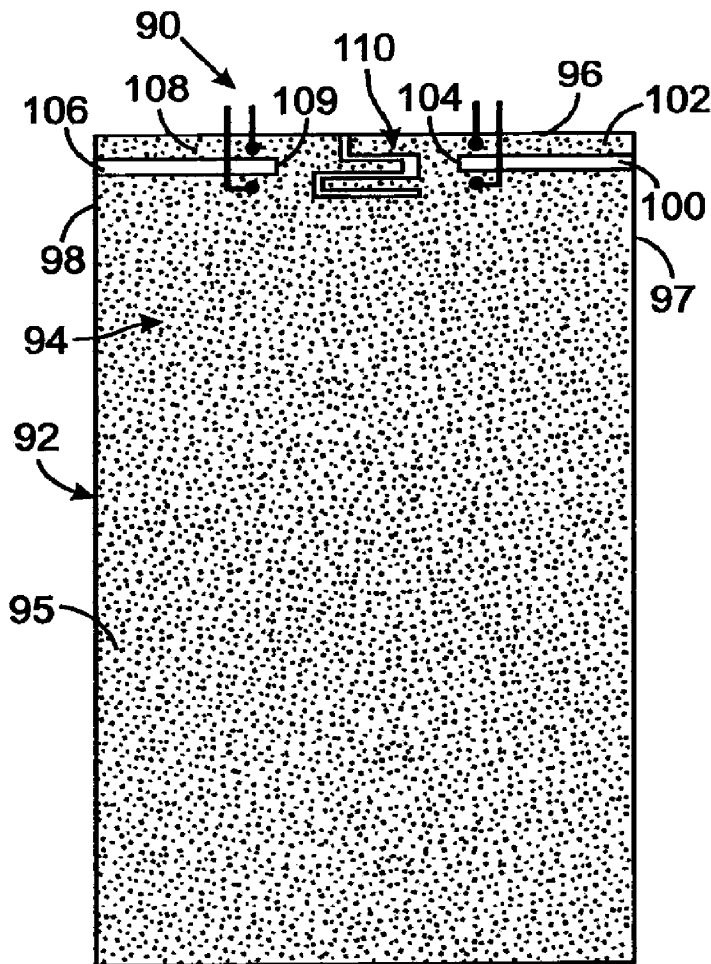
(76) **Inventors:** Mina Ayatollahi, Waterloo (CA);
Qinjiang Rao, Waterloo (CA);
Dong Wang, Waterloo (CA)

(21) **Appl. No.:** 13/301,259

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

Related U.S. Application Data

(63) Continuation of application No. 12/405,955, filed on Mar. 17, 2009, now Pat. No. 8,085,202.





US 20120068908A1

(19) **United States**

(12) **Patent Application Publication**
LEE

(10) **Pub. No.: US 2012/0068908 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **MOBILE COMMUNICATION TERMINAL CASING EQUIPPED WITH INTERNAL ANTENNA**

Publication Classification

(51) **Int. Cl.**
H01Q 1/40 (2006.01)

(52) **U.S. Cl.** **343/873**

(57) **ABSTRACT**

(75) Inventor: **SANG HOON LEE, SEOUL (KR)**

(73) Assignee: **AQ CO., LTD., Seoul (KR)**

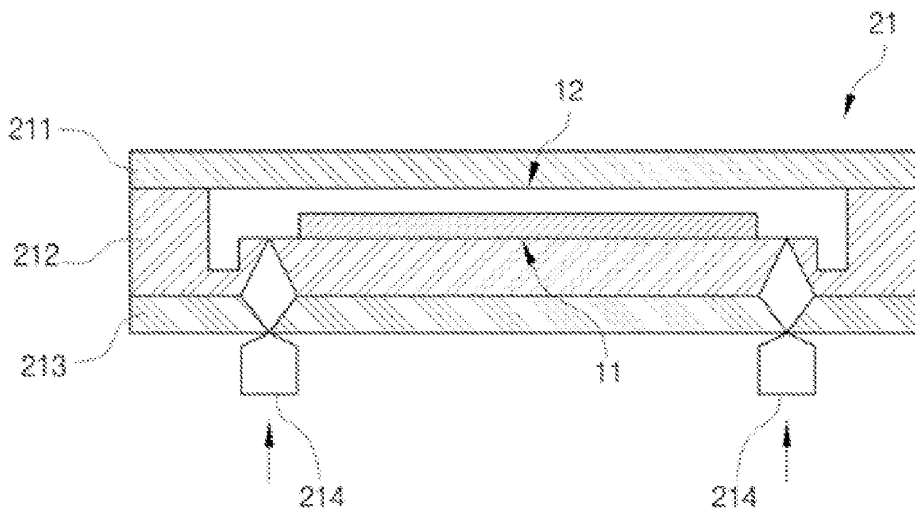
(21) Appl. No.: **13/113,400**

(22) Filed: **May 23, 2011**

(30) **Foreign Application Priority Data**

Sep. 16, 2010 (KR) 10-2010-0091269

Disclosed herein is a mobile communication terminal casing equipped with an internal antenna. The mobile communication terminal casing includes an antenna sheet having contact terminals, and an injection-molded casing product including an inner surface having an internal groove that is coupled to the antenna sheet and an outer surface opposite to the inner surface. A second surface opposite to a first surface of the antenna sheet on which the contact terminals are located comes into contact with the internal groove of the injection-molded casing product, and the first surface is injection-molded to be exposed outside of the injection-molded casing product.





US 20120068911A1

(19) **United States**

(12) **Patent Application Publication**
CHANG

(10) **Pub. No.: US 2012/0068911 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **ANTENNA MODULE WITH ANTENNA
SIGNAL INDICATING FUNCTION**

(52) **U.S. CL. 343/894**

(57) **ABSTRACT**

(75) **Inventor: CHUN-CHUAN CHANG,**
Keelung City (TW)

(73) **Assignee: AUDEN TECHNO CORP.**

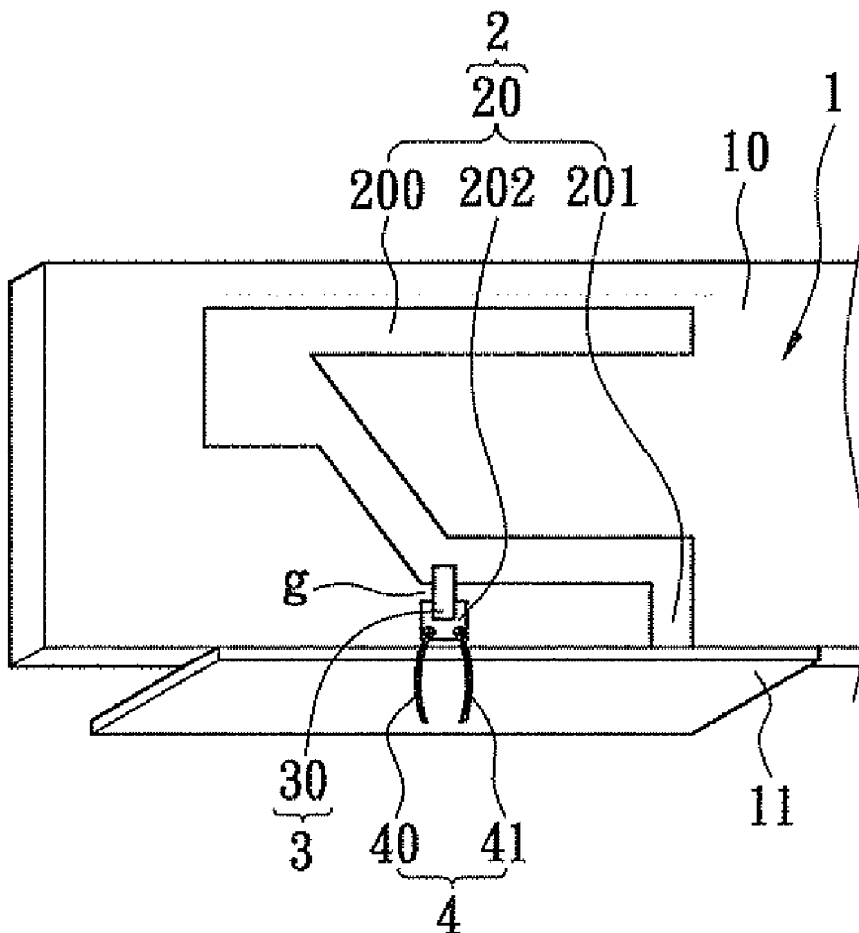
(21) **Appl. No.: 12/885,667**

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

Publication Classification

(51) **Int. Cl.**
H01Q 1/00 (2006.01)
G01R 29/08 (2006.01)

An antenna module with antenna signal indicating function includes a substrate unit, an antenna unit and a light-emitting unit. The antenna unit has an antenna trace fanned on the substrate unit, and the antenna trace has an antenna body having a grounding portion electrically connect with the antenna body and a feeding portion electrically connect with the antenna body for simultaneously receiving RF signals and DC. The light-emitting unit has a light-emitting element electrically connected between the antenna body and the feeding portion, thus the antenna body and the light-emitting element share the grounding portion. When the user turns on the antenna function of the laptop to receive RF signals, the antenna unit and the light-emitting unit can respectively receive RF signals and DC. Hence, users or bystander could easily judge whether the antenna unit is in use according to light or dark of the light-emitting unit.





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(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE INCLUDING AN ELECTRICALLY
CONDUCTIVE, ELECTRICALLY FLOATING
ELEMENT AND RELATED METHODS**

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(75) Inventors: **Yihong Qi**, St. Agatha (CA); **Ying
Tong Man**, Waterloo (CA);
Krystyna Bandurska, Waterloo
(CA)

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(73) Assignee: **Research In Motion Limited**,
Waterloo (CA)

(57) **ABSTRACT**

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A mobile wireless communications device may include a portable housing having a surface, a printed circuit board (PCB) carried by the portable housing, and wireless transceiver circuitry carried by the PCB. The device may further include an antenna connected to the transceiver, and at least one electrically floating, electrically conductive, antenna beam shaping element secured to the surface of the portable housing for directing a beam pattern of the antenna.

Related U.S. Application Data

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