



US 20110156958A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0156958 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **MOBILE COMMUNICATION DEVICE**

(57) **ABSTRACT**

(76) Inventors: **Kin-Lu Wong**, Hsichih (TW);
Shu-Chuan Chen, Hsichih (TW)

(21) Appl. No.: **12/761,443**

(22) Filed: **Apr. 16, 2010**

(30) **Foreign Application Priority Data**

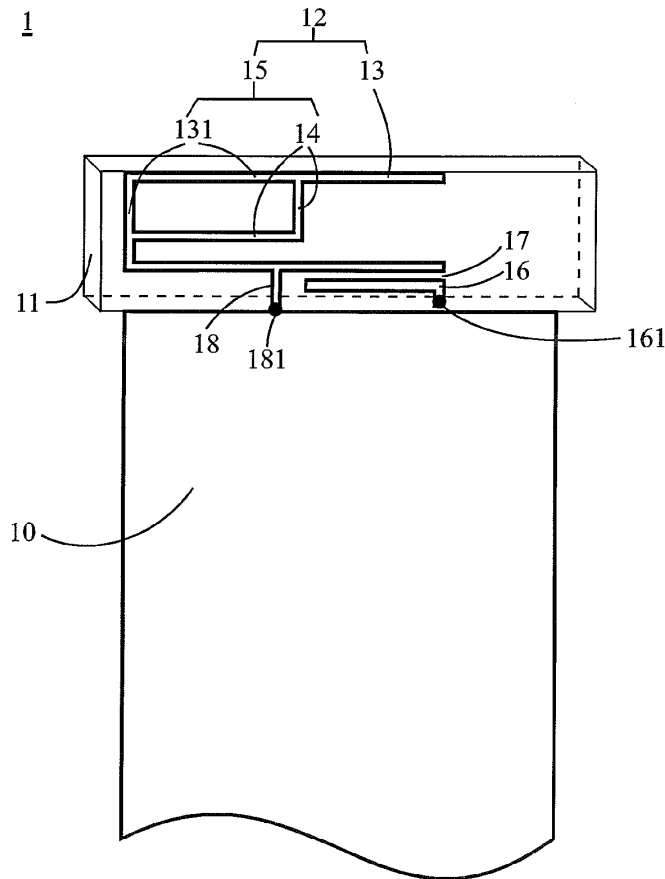
Dec. 31, 2009 (TW) 098146591

Publication Classification

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 5/00 (2006.01)

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

The present invention relates to a mobile communication device comprising a ground plane, a dielectric substrate, and an antenna. The antenna is disposed on one surface of the dielectric substrate and comprises a radiating portion, a feeding portion, and a shorting portion. The radiating portion comprises a first radiating portion and a second radiating portion. The first radiating portion has at least one bending. One end of the first radiating portion is left open. The second radiating portion is a shunt metal strip. Both ends of the second radiating portion are electrically connected to the first radiating portion such that the second radiating portion forms a closed loop with a segment of the first radiating portion. The feeding portion couples the electromagnetic energy to the radiating portion through a coupling gap, and one end of the feeding portion is the antenna's feeding point. One end of the shorting portion is electrically connected to the radiating portion, and the other end of the shorting portion is electrically connected to the ground plane.





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156959 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **FLEXIBLE PRINTED ANTENNA**

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

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

(57) **ABSTRACT**

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

A flexible printed antenna comprises a flexible substrate, a radiation conductor, a flexible feeder cable and a grounding member. The radiation conductor includes a primary conductor and at least one secondary conductor. The flexible substrate is interposed between the primary conductor and the secondary conductor. One end of the feeder cable connects with the primary conductor, and another end extends far away from the primary conductor and connects with the signal source. The present invention is characterized in adopting a flexible substrate made of a FPCB material and forming a radiation conductor and a flexible feeder cable on different surface of the flexible substrate. Thereby, the antenna module of the present invention has better flexibility and applies to various non-planar structures of various communication products. Further, the present invention can be fabricated into a multi-layer antenna structure to greatly reduce the thickness of the antenna.

(21) **Appl. No.:** **12/773,600**

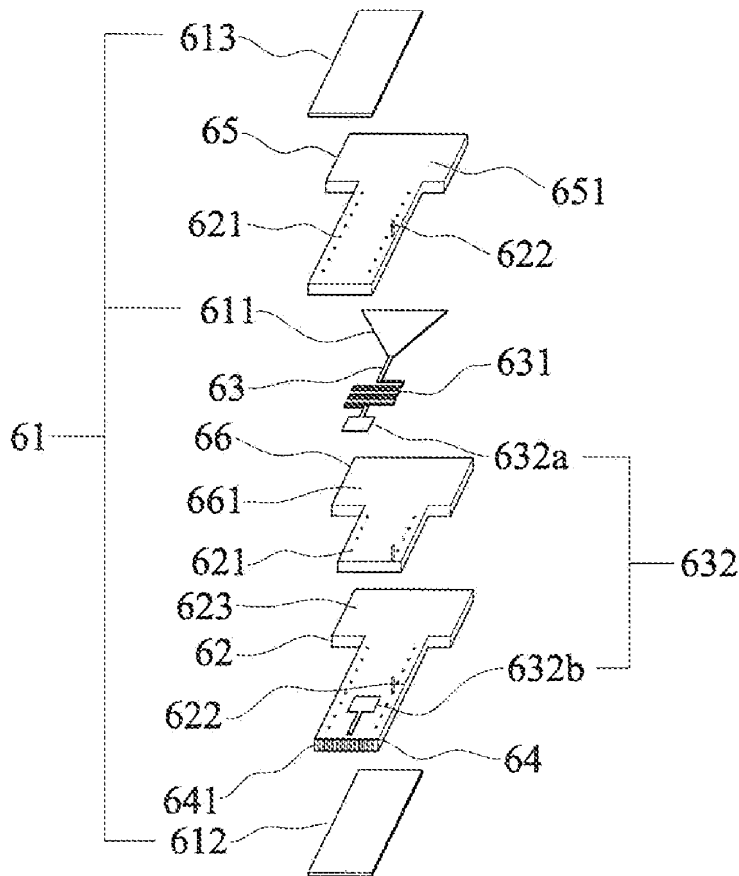
(22) **Filed:** **May 4, 2010**

(30) **Foreign Application Priority Data**

Dec. 25, 2009 (TW) 098144904

Publication Classification

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





US 20110156961A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0156961 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **WIDE BAND ANTENNA**

Publication Classification

(75) Inventors: **CHIH-YUAN YANG**, Tu-Cheng (TW); **SHIH-YEN PENG**, Tu-Cheng (TW); **CHIEN-TANG LIN**, Tu-Cheng (TW); **HUNG-CHANG KO**, Tu-Cheng (TW)

(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 9/04 (2006.01)

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

(57) **ABSTRACT**

(73) Assignee: **HON HAI PRECISION INDUSTRY CO., LTD.**, Tu-Cheng (TW)

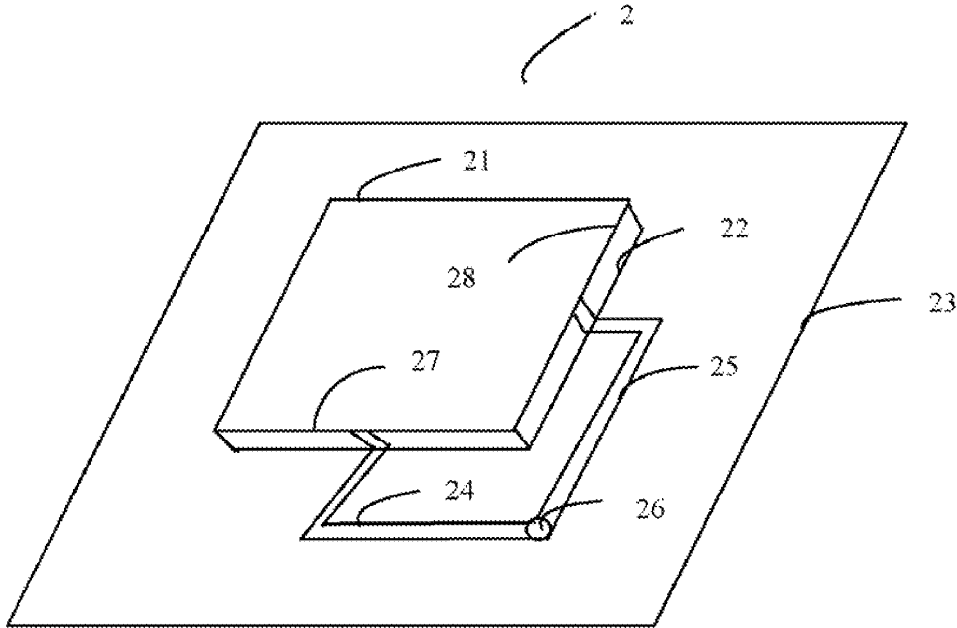
A wide band antenna includes a radiation element, a ground surface, a dielectric element, a connector; a first microstrip feeder and a second microstrip feeder. The radiation element is a rectangle shaped and includes a first side and a second side. The lengths of the first side and the second side are not equal. The dielectric element is positioned between the radiation element and the ground surface. One end of the first microstrip feeder is connected to the first side of the radiation element. One end of the second microstrip feeder is connected to the second side of the radiation element, the other ends of the first and second microstrip feeder are connected to the connector.

(21) Appl. No.: **12/841,185**

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

(30) **Foreign Application Priority Data**

Dec. 25, 2009 (CN) 200910312285.1





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156962 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **MOBILE TERMINAL**

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

(76) **Inventors:** **Younsuk JEONG**, Suwon (KR);
Wooyoung Choi, Gwangmyeong (KR)

(57) **ABSTRACT**

(21) **Appl. No.:** **12/939,907**

According to an embodiment of the present invention, the mobile terminal includes, a terminal body, a printed circuit board (PCB) mounted in the interior of the terminal body, and an internal antenna connected to the PCB, and configured to transmit and receive signals, wherein the internal antenna includes a ground formed on the PCB, a radiator connected to the ground and configured to be operable at a first band, and to feed the signals to the PCB, and a ground extension part extending in at least one direction from the ground, and configured to expand a ground surface of the ground in order for the internal antenna to include a second band, which is lower than a first band, as an operation band.

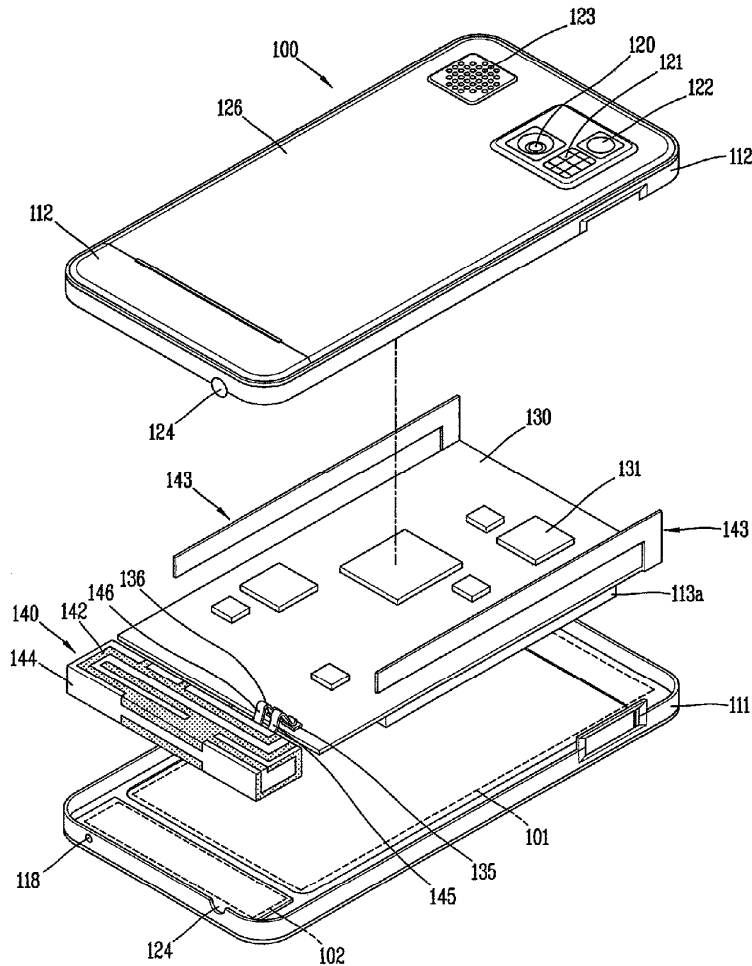
(22) **Filed:** **Nov. 4, 2010**

(30) **Foreign Application Priority Data**

Dec. 30, 2009 (KR) 10-2009-0134762

Publication Classification

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





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156964 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **ANTENNA MODULE, WIRELESS COMMUNICATION DEVICE USING THE ANTENNA MODULE AND METHOD FOR ADJUSTING A PERFORMANCE FACTOR OF THE ANTENNA MODULE**

(75) Inventors: **SHIH-CHIEH LIN**, Taoyuan (TW); **CHIN-HUNG MA**, Taoyuan (TW)

(73) Assignee: **FOXCONN COMMUNICATION TECHNOLOGY CORP.**, Taoyuan County (TW)

(21) Appl. No.: **12/788,436**

(22) Filed: **May 27, 2010**

(30) **Foreign Application Priority Data**

Dec. 30, 2009 (TW) 98146032

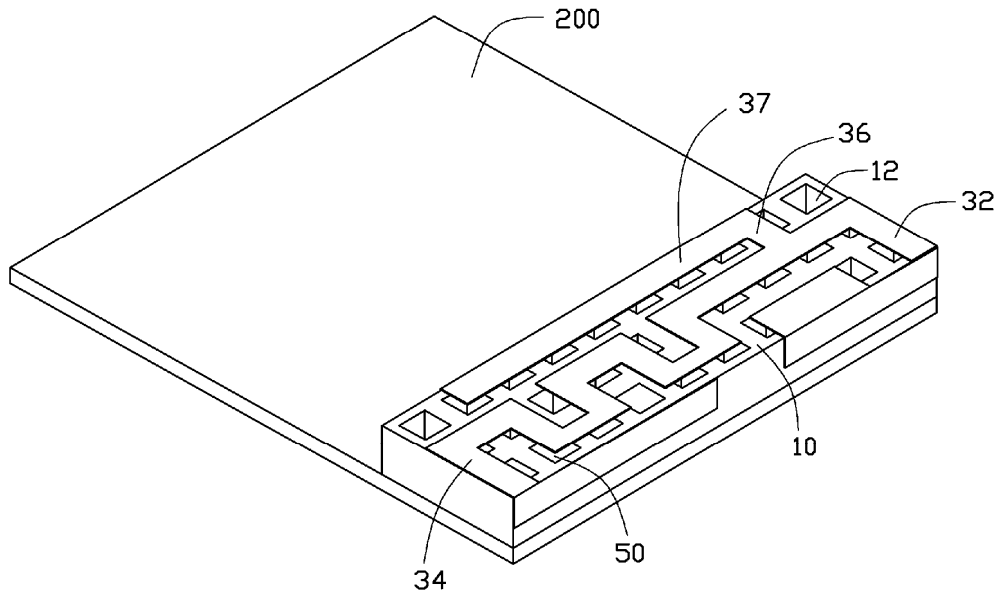
Publication Classification

(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 9/04 (2006.01)
H01Q 1/52 (2006.01)
H01Q 1/24 (2006.01)
H01Q 1/50 (2006.01)

(52) **U.S. Cl.** **343/702; 343/700 MS; 343/841; 343/860**

(57) **ABSTRACT**

An antenna module includes an antenna, a substrate defining a plurality of notches, and a plurality of filling blocks. The antenna is attached to the substrate. The filling blocks have a permittivity higher than the substrate and are received in a portion of the notches covered by the antenna to raise the permittivity of the substrate.





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156965 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **WIRELESS COMMUNICATION DEVICE**

Publication Classification

(75) Inventors: **CHIN-HUNG MA**, Taoyuan (TW);
CHI-SHENG LIU, Taoyuan (TW)

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

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

(73) Assignee: **FOXCONN COMMUNICATION TECHNOLOGY CORP.**, Taoyuan County (TW)

(57) **ABSTRACT**

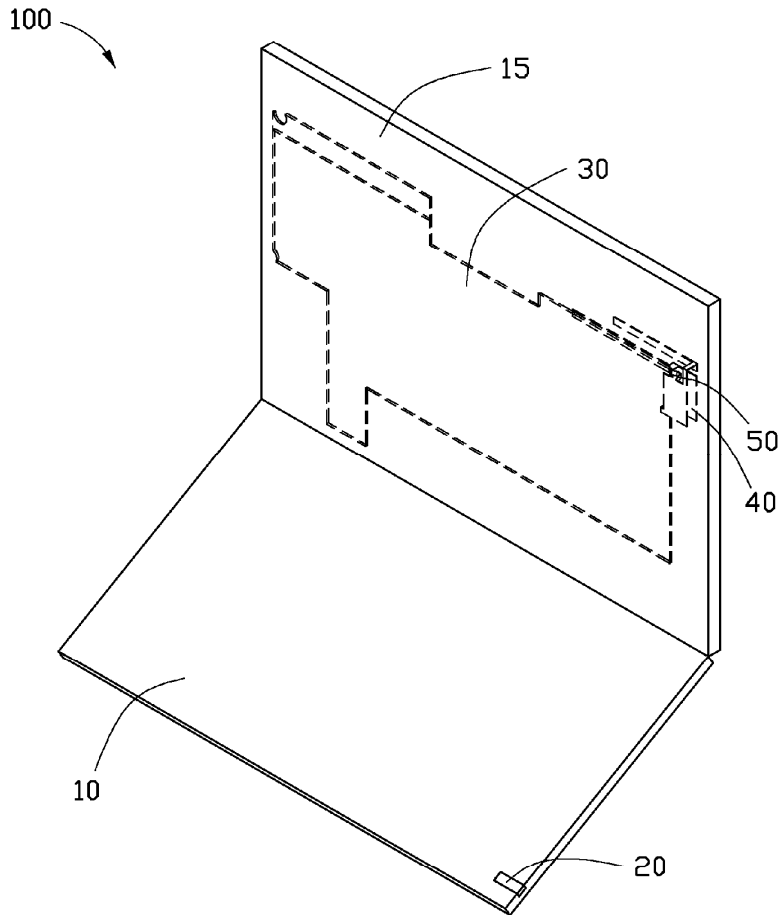
A wireless communication device includes a main body, a cover, a base board, an elastic member, and an antenna module. The cover is attached to the main body. The base board includes a feeding point and a grounding point. The elastic member is connected to one of the feeding point and the grounding point. The antenna module includes a first antenna and a second antenna connected to the other feeding point and the grounding point of the base board. The base board, the elastic and the antenna module are mounted in the cover. The elastic member selectively causes the first antenna or the second antenna to contact to the one of the feeding points and the grounding point of the base board when in an open or closed state.

(21) Appl. No.: **12/819,291**

(22) Filed: **Jun. 21, 2010**

(30) **Foreign Application Priority Data**

Dec. 25, 2009 (TW) 98144871





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156966 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **INFORMATION PROCESSING APPARATUS**

Publication Classification

(75) Inventors: **Kazuki Taniguchi**, Nagano (JP);
Koichi Yamaguchi, Kanagawa (JP);
Nobuhiro Kumae, Nagano (JP)

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

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

(57) **ABSTRACT**

(73) Assignee: **Sony Corporation**, Tokyo (JP)

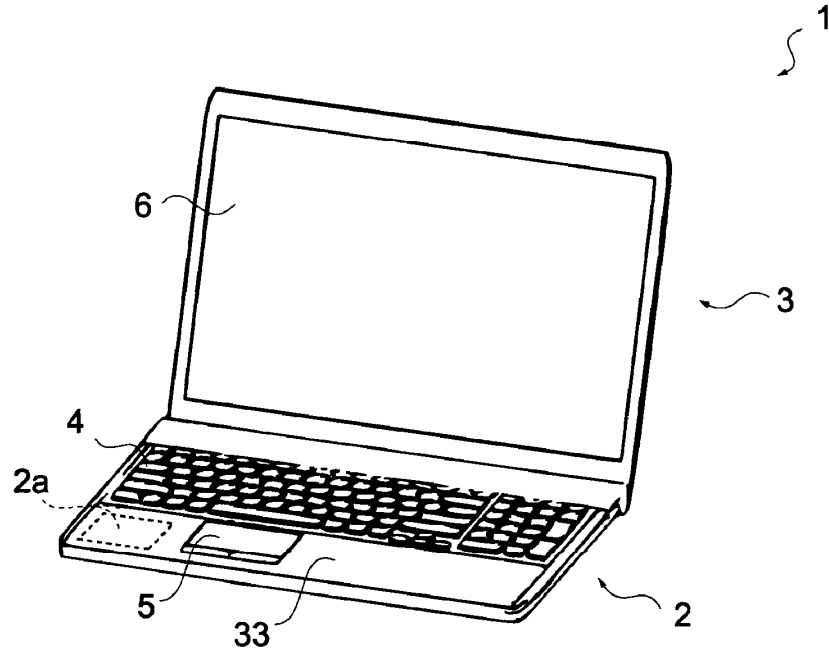
Provided is an information processing apparatus including a keyboard portion, a first antenna module, and a connection portion. The keyboard portion includes a base plate to support a plurality of key portions, and a reinforcing member having an electric conductivity to be stacked on and reinforce the base plate. The first antenna module includes an antenna electrode to generate an induced electric field, and a ground portion to electrically connect to the antenna electrode. The connection portion is electrically connected to the ground portion and the reinforcing member.

(21) Appl. No.: **12/945,316**

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

(30) **Foreign Application Priority Data**

Dec. 28, 2009 (JP) 2009-298873





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156967 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **TOUCH SCREEN PANEL ANTENNA OF MOBILE TERMINAL**

Publication Classification

(75) Inventors: **Kyung Jin OH**, Hwaseong-si (KR);
Oh Hyuck KWON, Suwon-si (KR)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/38 (2006.01)

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

(52) **U.S. Cl.** **343/702; 343/700 MS; 315/505**

(21) Appl. No.: **12/977,620**

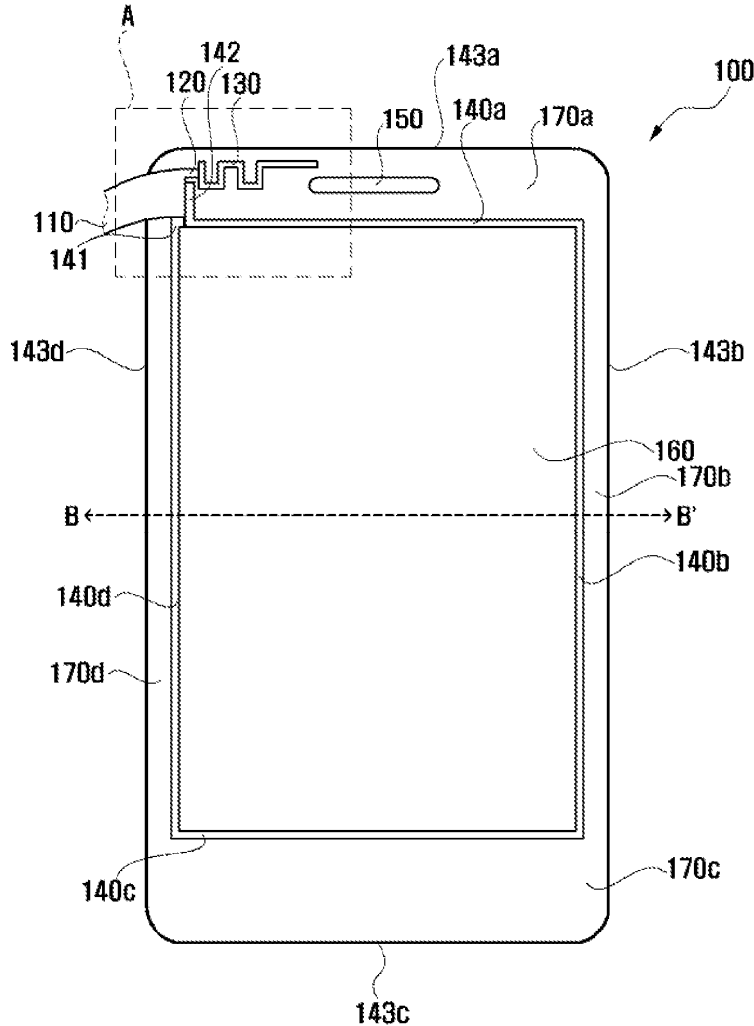
(57) **ABSTRACT**

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

A touch screen panel (TSP) antenna of a mobile terminal is provided. The TSP antenna includes an ITO film stacked in a TSP, an upper electrode line, a lower electrode line, a left electrode line, and a right electrode line formed at an upper or lower surface of the ITO film, an external surface, and an antenna pattern formed in at least one of an upper surface, a lower surface, a left surface, and a right surface of the external surface.

(30) **Foreign Application Priority Data**

Dec. 28, 2009 (KR) 10-2009-0131636





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156968 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **LOW PROFILE FULL WAVELENGTH MEANDERING ANTENNA**

Publication Classification

(75) Inventors: **Yihong Qi**, Waterloo (CA); **Perry Jarmuszewski**, Waterloo (CA); **Ying Tong Man**, Kitchener (CA)

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

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

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

(57) **ABSTRACT**

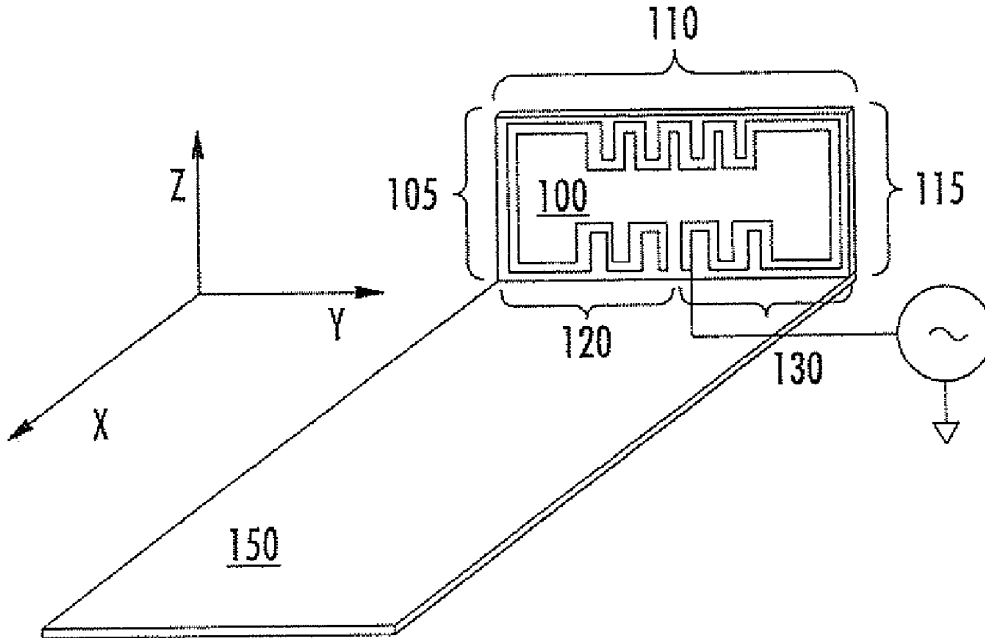
(21) Appl. No.: **13/042,489**

(22) Filed: **Mar. 8, 2011**

A low profile antenna has a meander length based on the full electrical wavelength of the signal being transmitted or received. The antenna can have either an open-loop structure or a closed-loop structure with a matching network. The low profile enables the antenna to be used in a card for a device such as a personal computer, personal digital assistant, wireless telephone and so on with minimal risk of the antenna breaking off, as compared with a prior art antenna having a higher height and thus more likelihood of being broken from its card.

Related U.S. Application Data

(63) Continuation of application No. 12/337,690, filed on Dec. 18, 2008, now Pat. No. 7,936,308, which is a continuation of application No. 11/014,287, filed on Dec. 16, 2004, now Pat. No. 7,486,241.





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156969 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **PRINTED ANTENNA**

Publication Classification

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

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

(52) **U.S. Cl.** **343/720; 343/700 MS**

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

(57) **ABSTRACT**

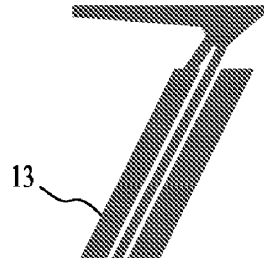
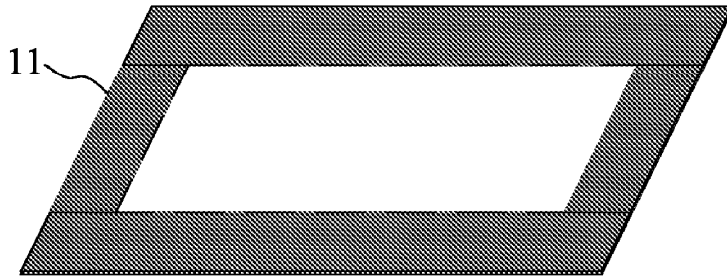
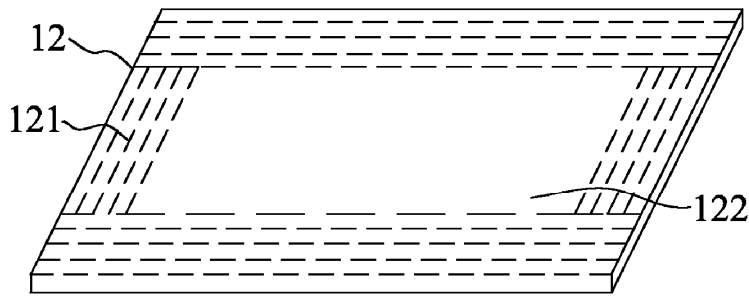
(21) Appl. No.: **12/773,697**

A printed antenna comprises an ink-printed layer, a hard substrate and a radiation conductor layer. The hard substrate has a surface, and the ink-printed layer is coated on the surface to form a non-transparent area. The uncoated region of the surface is a transparent area. The radiation conductor layer is formed on the ink-printed layer and does not exceed the non-transparent area of the hard substrate. In the present invention, a conductive ink is coated on the surface of a non-metallic plate, such as a glass plate, an acrylic plate or an LCD panel, to form the radiation conductor layer. Therefore, the printed antenna of the present invention is exempt from the complicated processes of fabricating the conventional metallic radiation conductors with the application field thereof expanded.

(22) Filed: **May 4, 2010**

(30) **Foreign Application Priority Data**

Dec. 25, 2009 (TW) 098144905





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156970 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **FOLDER-TYPE MOBILE COMMUNICATION DEVICE**

(52) **U.S. CL. 343/722**

(57) **ABSTRACT**

(76) **Inventors:** Kin-Lu Wong, Hsichih (TW);
Chao-An Lyu, Hsichih (TW);
Cheng-Tse Lee, Hsichih (TW)

The present invention is related to a folder-type mobile communication device. The device comprises a first dielectric substrate, a first ground plane disposed on the first dielectric substrate, a second dielectric substrate, a second ground plane disposed on the second dielectric substrate, an antenna element, a metal line, and a band-stop circuit. The antenna element is located near the first ground plane and is electrically connected to a source on the first dielectric substrate. The second ground plane is electrically connected to the first ground plane through the metal line. The band-stop circuit is located either on the first ground plane or on the second ground plane. The band-stop circuit includes a slit, a capacitive element, and an inductive element. The slit is near the metal line. The capacitive element is electrically connected to the two sides of the slit, and the inductive element is electrically connected to the two sides of the slit such that the inductive element and the capacitive element form a parallel LC resonant circuit. Therefore, the band-stop circuit generates a parallel resonance at a specified frequency.

(21) **Appl. No.: 12/726,388**

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

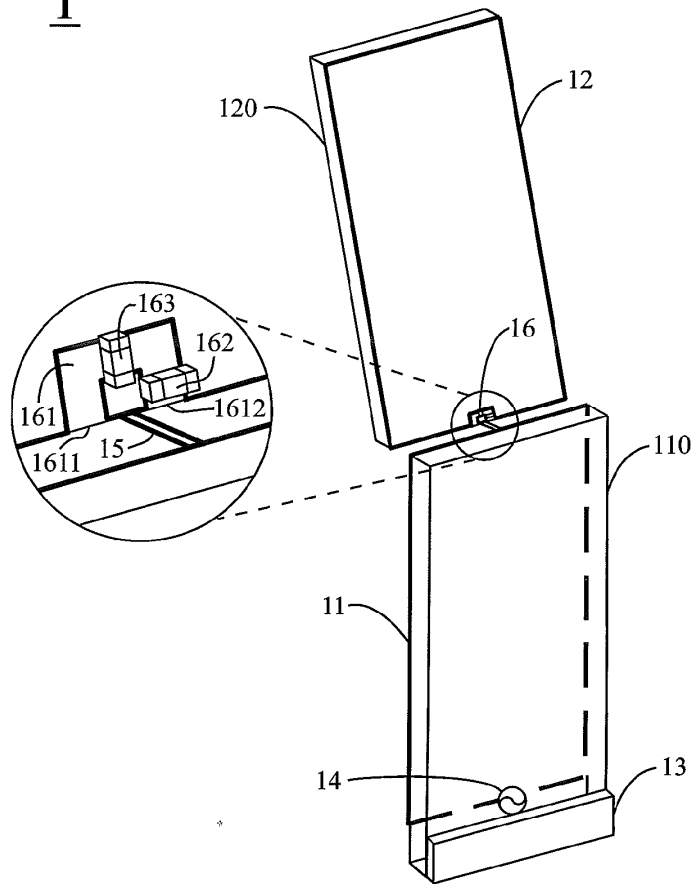
(30) **Foreign Application Priority Data**

Dec. 24, 2009 (TW) 098144822

Publication Classification

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

1





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156971 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **WIDE BAND ANTENNA**

Publication Classification

(75) Inventors: **CHIH-YUAN YANG**, Tu-Cheng (TW); **MING-LIANG YANG**, Tu-Cheng (TW); **WEN-CHIN OU**, Tu-Cheng (TW)

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

(52) **U.S. Cl.** **343/729**

(73) Assignee: **HON HAI PRECISION INDUSTRY CO., LTD.**, Tu-Cheng (TW)

(57) **ABSTRACT**

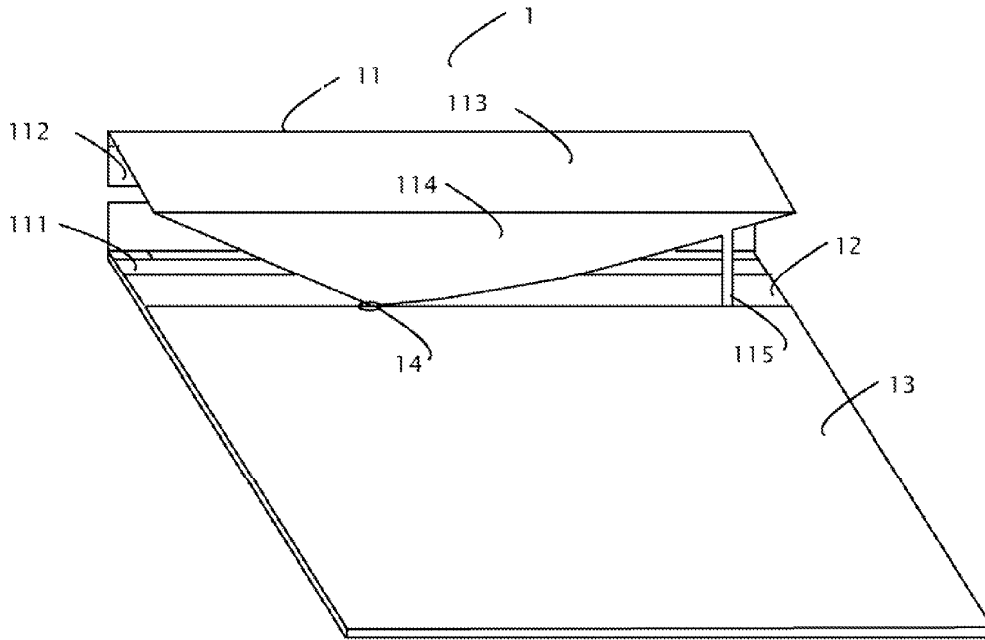
A wide band antenna includes a radiation element, a ground surface, a dielectric element, and a RF connector. The radiation element is connected to the ground element and includes a first radiation part and a second radiation part. The first radiation part includes at least one slit for obtaining low frequency-bands. The second radiation part is for obtaining high frequency-bands. The dielectric element supports and spaces the radiation element and the ground element. The RF connector is connected to the second part of the antenna and the ground element.

(21) Appl. No.: **12/873,204**

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

(30) **Foreign Application Priority Data**

Dec. 25, 2009 (CN) 200910312288.5





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(19) **United States**

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

(10) **Pub. No.: US 2011/0156975 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **SHAPED GROUND PLANE FOR RADIO APPARATUS**

Publication Classification

(76) Inventors: **Jaume Anguera Pros**, Castellon (ES); **Carles Puente Baliarda**, Barcelona (ES)

(51) **Int. Cl.**
H01Q 13/10 (2006.01)
H01Q 1/48 (2006.01)

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

(21) Appl. No.: **13/044,689**

(57) **ABSTRACT**

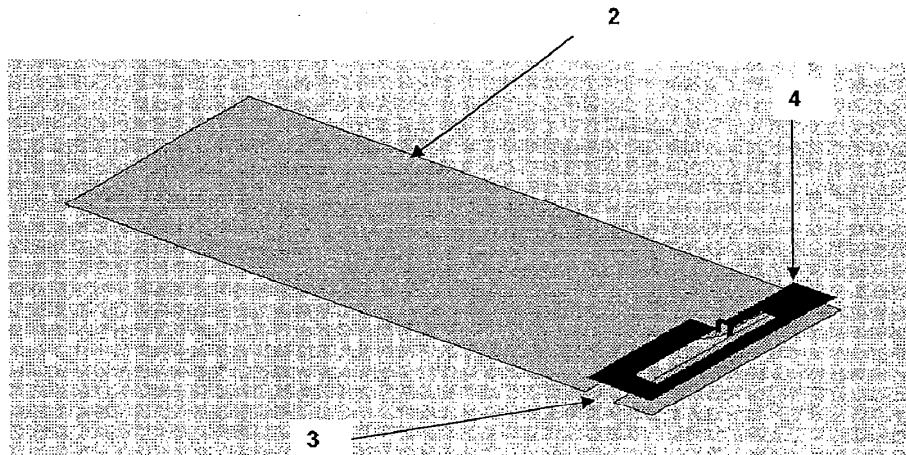
(22) Filed: **Mar. 10, 2011**

An antenna structure for a wireless device comprising a ground plane and an antenna element, wherein the ground plane has a slot with at least a short end, an open end and a length substantially close to a quarter wavelength. The feeding and ground connections of the antenna structure are placed at the two different sides of the slot and the distance of at least one of them to the short end of the slot is equal or smaller than an eighth of the wavelength. An antenna structure for a wireless device comprising a ground plane and an antenna element, wherein the ground plane has a slot with at least two short ends, and a length substantially close to half wavelength. The feeding and ground connections of the antenna structure are placed at the two different sides of said slot and the distance of at least one of them to a short end of the slot is equal or smaller than a quarter of the wavelength.

Related U.S. Application Data

(63) Continuation of application No. 11/793,406, filed on Jul. 19, 2007, now Pat. No. 7,932,863, filed as application No. PCT/EP2005/057215 on Dec. 29, 2005.

(60) Provisional application No. 60/640,645, filed on Dec. 30, 2004.





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(19) **United States**

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

(10) **Pub. No.: US 2011/0159815 A1**

(43) **Pub. Date: Jun. 30, 2011**

(54) **WIRELESS DEVICE**

H05K 7/20 (2006.01)

H05K 7/00 (2006.01)

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

(52) **U.S. Cl.** **455/41.2**; 343/700 MS; 361/714; 361/783; 361/717

(21) Appl. No.: **12/959,373**

(22) Filed: **Dec. 3, 2010**

Related U.S. Application Data

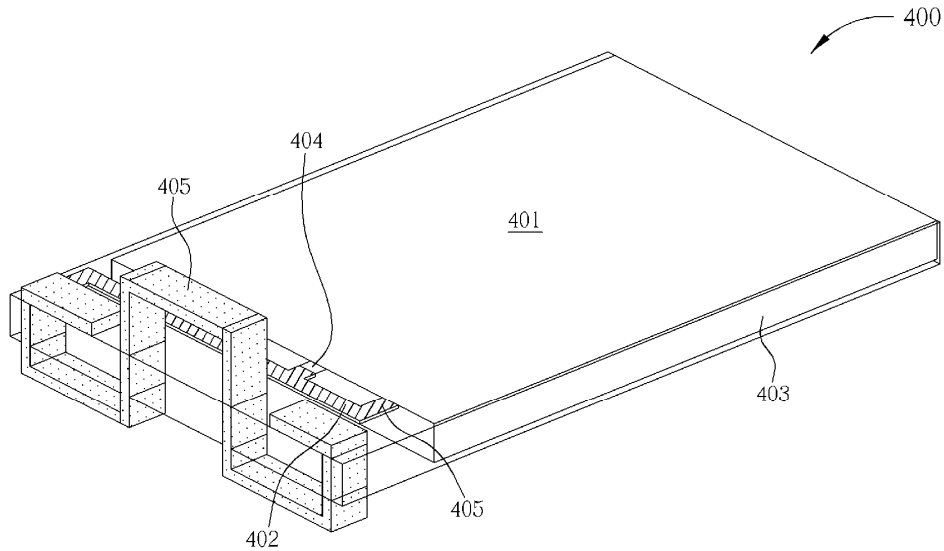
(60) Provisional application No. 61/290,177, filed on Dec. 25, 2009.

Publication Classification

(51) **Int. Cl.**
H04B 7/00 (2006.01)
H01Q 1/38 (2006.01)

(57) **ABSTRACT**

The present invention discloses a wireless device, which includes a substrate and an antenna. The antenna includes a printed antenna element and a 3-dimensional antenna element. The printed antenna element is printed on the substrate, while the 3-dimensional antenna element is disposed on the substrate and coupled to the printed antenna element. The printed antenna element and the 3-dimensional antenna element jointly have a physical length of a desired frequency





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(19) **United States**

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

(10) **Pub. No.: US 2011/0163918 A1**

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

(54) **ANTENNA DEVICE FOR REDUCING SPECIFIC ABSORPTION RATE**

(57) **ABSTRACT**

(76) Inventors: **Yu-Yuan Wu, Taipei (TW); Hung-Jen Chen, Taipei (TW); Chung-Wen Yang, Taipei (TW)**

(21) Appl. No.: **12/683,434**

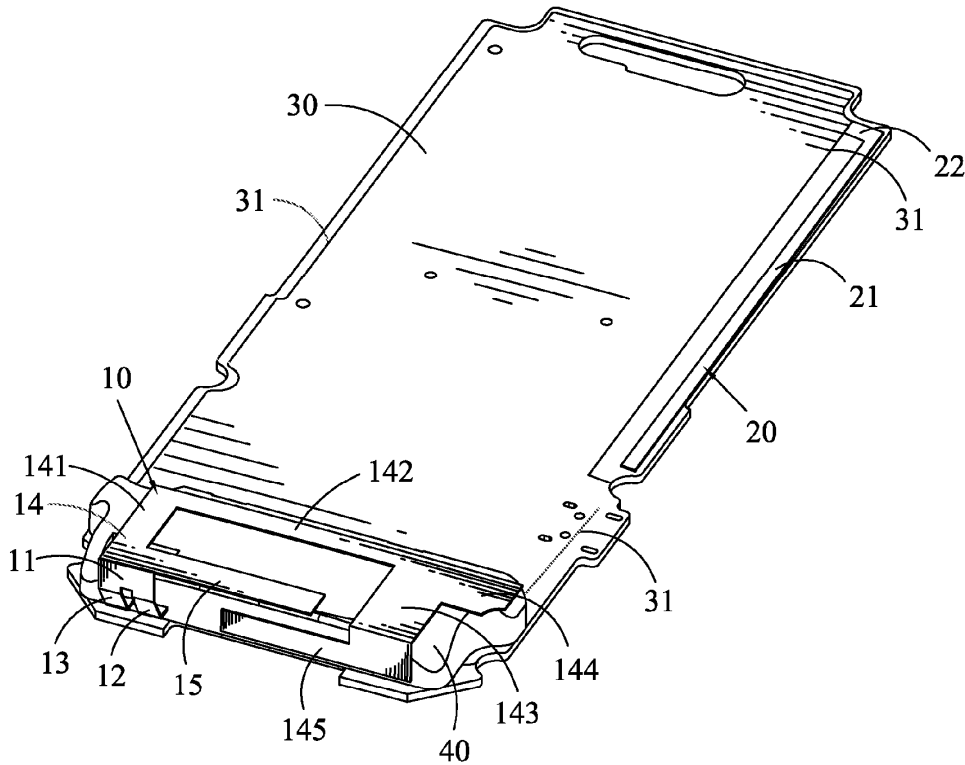
(22) Filed: **Jan. 7, 2010**

Publication Classification

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/38 (2006.01)

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

An antenna device includes a main body. The main body has a first radiator which has a first radiating portion, a third radiating portion, a second radiating portion connected with the first radiating portion and the third radiating portion to show a door shape, a fourth radiating portion extended outwards from the third radiating portion, and a fifth radiating portion extended downwardly from the third radiating portion, and stretched towards the same side of the third radiating portion as the second radiating portion, and a second radiator extended toward the third radiating portion from the first radiating portion. A feeding portion and a grounding portion are extended downwards from the second radiator side by side. A resonance element has an elongated first resonating portion spaced from the main body, and a second resonating portion extended perpendicularly from an end of the first resonating portion away from the main body.





US 20110163922A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0163922 A1**

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

(54) **DUAL-FEED DUAL BAND ANTENNA ASSEMBLY AND ASSOCIATED METHOD**

H01P 11/00 (2006.01)
H01Q 1/24 (2006.01)

(75) Inventors: **Dong Wang, Waterloo (CA);
Qinjiang Rao, Waterloo (CA)**

(52) **U.S. Cl.** **343/702; 343/700 MS; 29/600**

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

(57) **ABSTRACT**

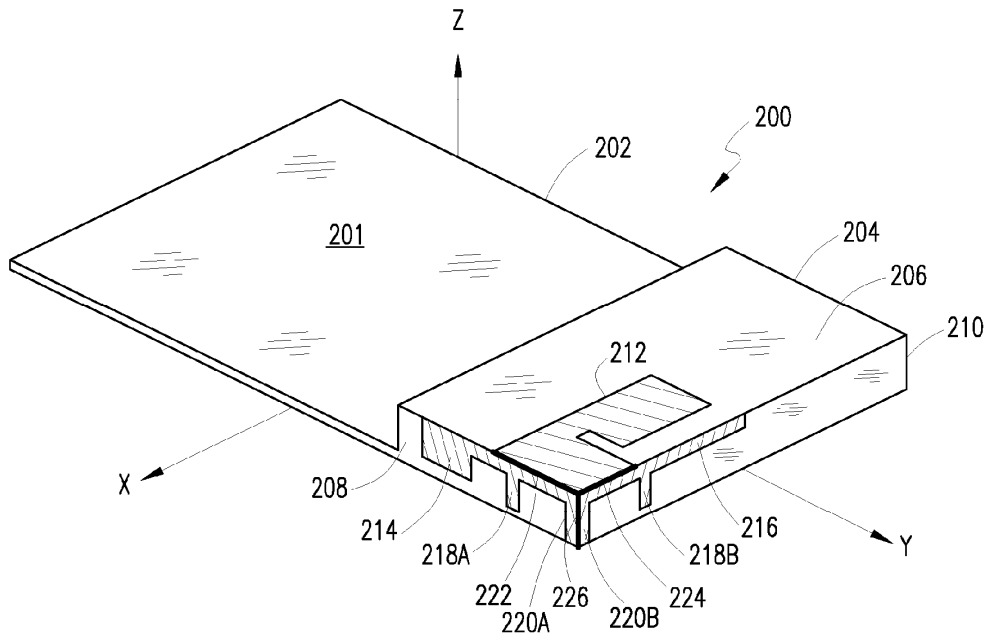
(21) Appl. No.: **12/683,965**

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

A dual-feed dual band (DFDB) antenna module comprising a first antenna element disposed on a first planar surface, a second antenna element disposed on a second planar surface, and a third antenna element disposed on a third planar surface, wherein the first, second and third planar surfaces are substantially orthogonal with respect to one another such that two feed ports formed are substantially orthogonal to each other.

Publication Classification

(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 9/04 (2006.01)





US 20110163923A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0163923 A1**

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

(54) **MULTILEVEL ANTENNAE**

(75) Inventors: **CARLES PUENTE BALIARDA**,
BARCELONA (ES); **CARMEN**
BORJA BORAU, BARCELONA
(ES); **JAUME ANGUERA PROS**,
BARCELONA (ES); **JORDI**
SOLER CASTANY, MATARO
(ES)

(73) Assignee: **FRACTUS, S.A.**, BARCELONA
(ES)

(21) Appl. No.: **13/044,189**

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

Related U.S. Application Data

(63) Continuation of application No. 12/400,888, filed on Mar. 10, 2009, which is a continuation of application No. 11/780,932, filed on Jul. 20, 2007, now Pat. No. 7,528,782, which is a continuation of application No. 11/179,257, filed on Jul. 12, 2005, now Pat. No. 7,397,431, which is a continuation of application No. 11/102,390, filed on Apr. 8, 2005, now Pat. No. 7,123,208, which is a continuation of application No. 10/963,080, filed on Oct. 12, 2004, now Pat. No. 7,015,868, which

is a continuation of application No. 10/102,568, filed on Mar. 18, 2002, now abandoned, which is a continuation of application No. PCT/ES99/00296, filed on Sep. 20, 1999.

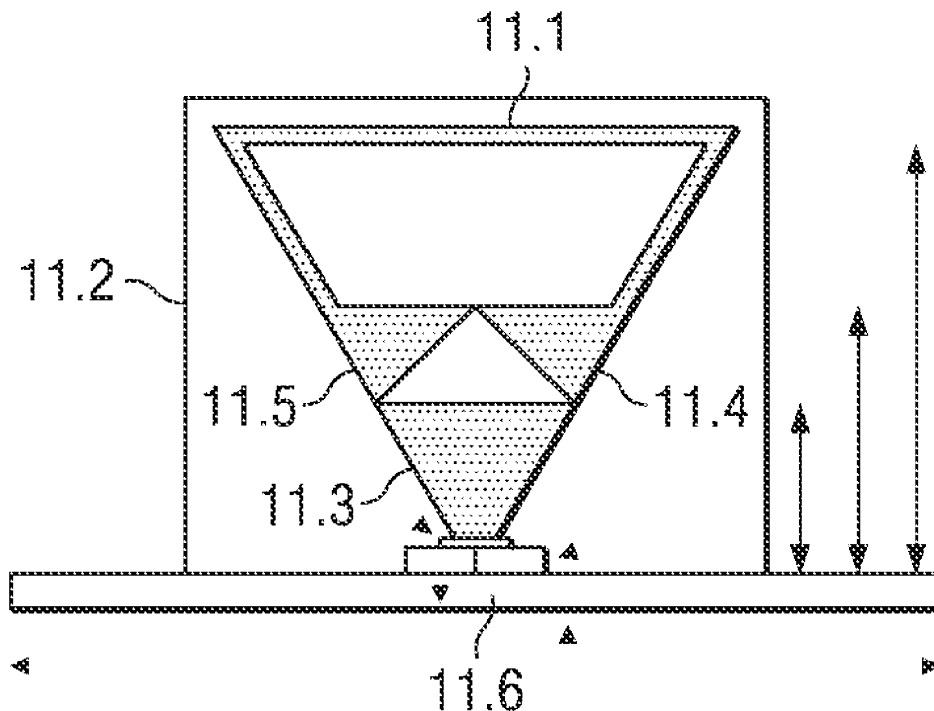
Publication Classification

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

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

(57) **ABSTRACT**

An apparatus including a wireless communications device has an internal antenna system located within the wireless communications device. The internal antenna system includes a passive antenna set comprising at least one antenna element having at least one multilevel structure, a feeding point to the at least one antenna element and a ground plane. The feeding point and a point on the ground plane define an input/output port for said passive antenna set. The passive antenna set provides a similar impedance level and radiation pattern at two or more frequency bands such that the passive antenna set is capable of both transmitting and receiving wireless signals on selected channels. The selected channels are selectable from a plurality of channels throughout an entire frequency range within each of said two or more frequency bands.





US 20110163924A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0163924 A1**

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

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE WITH ANTENNA CONTACT
HAVING REDUCED RF INDUCTANCE**

Publication Classification

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

(75) **Inventors:** **Lizhong ZHU**, Waterloo (CA);
George Mankaruse, Kitchener
(CA); **Michael Corrigan**, Waterloo
(CA); **Perry Jarmuszewski**,
Waterloo (CA); **Jun Jun Xu**,
Waterloo (CA)

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

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

(57) **ABSTRACT**

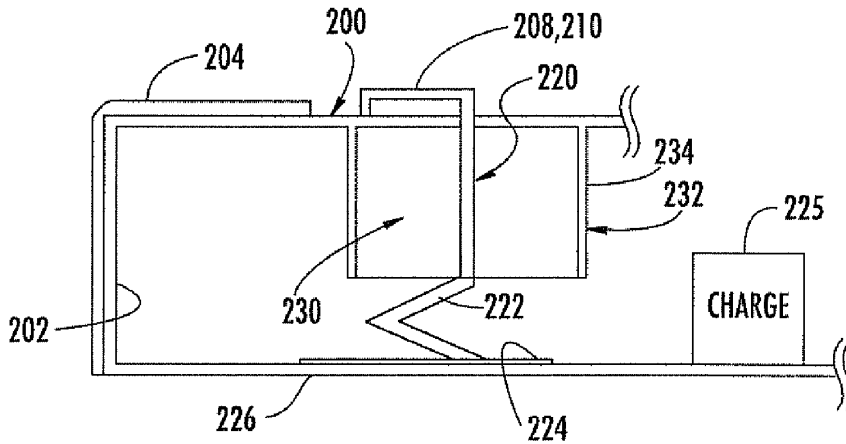
(21) **Appl. No.:** **13/048,202**

A mobile wireless communications device includes a housing and at least one circuit board. Radio frequency (RF) circuitry is carried by the circuit board and includes a transceiver. A processor is carried by the at least one circuit board and operative with the RF circuitry. An antenna is mounted within the housing. An antenna contact is secured on the at least one circuit board and operatively connects the RF circuitry and engages the antenna at an antenna contact point. Electromagnetic interference (EMI) shielding is positioned at the antenna contact point and reduces RF inductance effects.

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

Related U.S. Application Data

(63) Continuation of application No. 12/173,043, filed on Jul. 15, 2008, now Pat. No. 7,932,864.





US 20110163929A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0163929 A1**

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

(54) **SHEET-LIKE DIPOLE ANTENNA**

(57) **ABSTRACT**

(76) Inventors: **Tsai-Yi Yang**, Tainan Hsien (TW);
Wei-Hung Hsu, Tainan Hsien (TW)

(21) Appl. No.: **12/651,587**

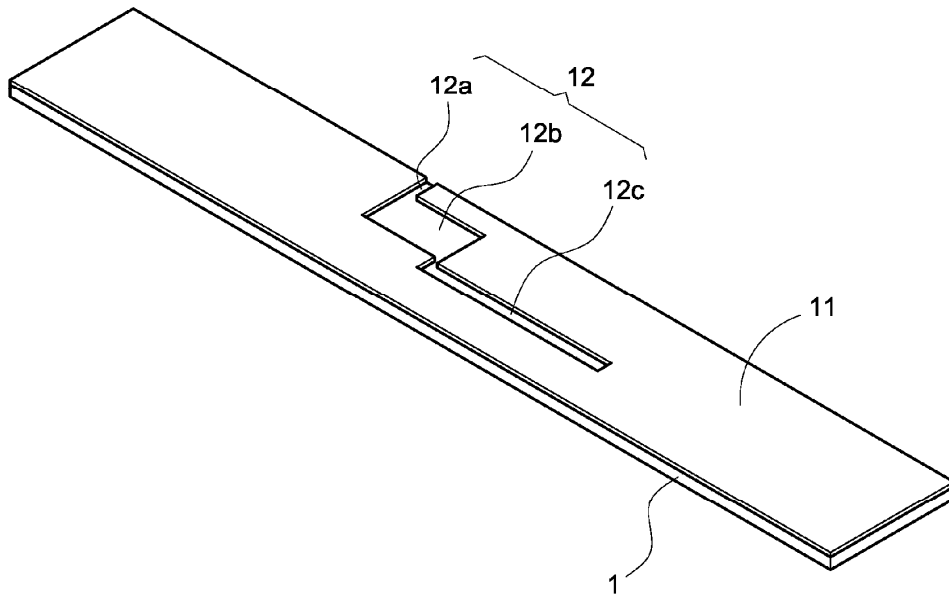
(22) Filed: **Jan. 4, 2010**

Publication Classification

(51) **Int. Cl.**
H01Q 9/28 (2006.01)
H01Q 13/10 (2006.01)

(52) **U.S. Cl.** **343/767; 343/795**

A sheet-like dipole antenna includes a substrate (1), an F-shape antenna (2), and a cable (3). The substrate (1) has a copper clad surface (11) and a slot (12). An insulating film (13) is provided on the copper clad surface (11) and the slot (12). A first soldering region (14), a second soldering region (15), and a third soldering region (16) are positioned adjacent to the slot (12). The cable (3) has a core (31) coated with an insulating layer (32). The insulating layer (32) is coated with a grounding layer (33). The grounding layer (33) is coated with an outer skin (34). One end of the cable (3) is electrically connected to a connector (35). The core (31) is connected to the second soldering region (15). The grounding layer (33) is soldered to the third soldering region (16).





US 20110163933A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0163933 A1**

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

(54) **BOTTOM FEED CAVITY APERTURE ANTENNA**

(52) **U.S. CL.** 343/843; 343/700 MS; 343/846

(75) Inventors: **Shih-Kai Lin**, Taipei City (TW);
Yi-Cheng Lin, Taipei City (TW)

(57) **ABSTRACT**

(73) Assignee: **NATIONAL TAIWAN UNIVERSITY, TAIPEI (TW)**

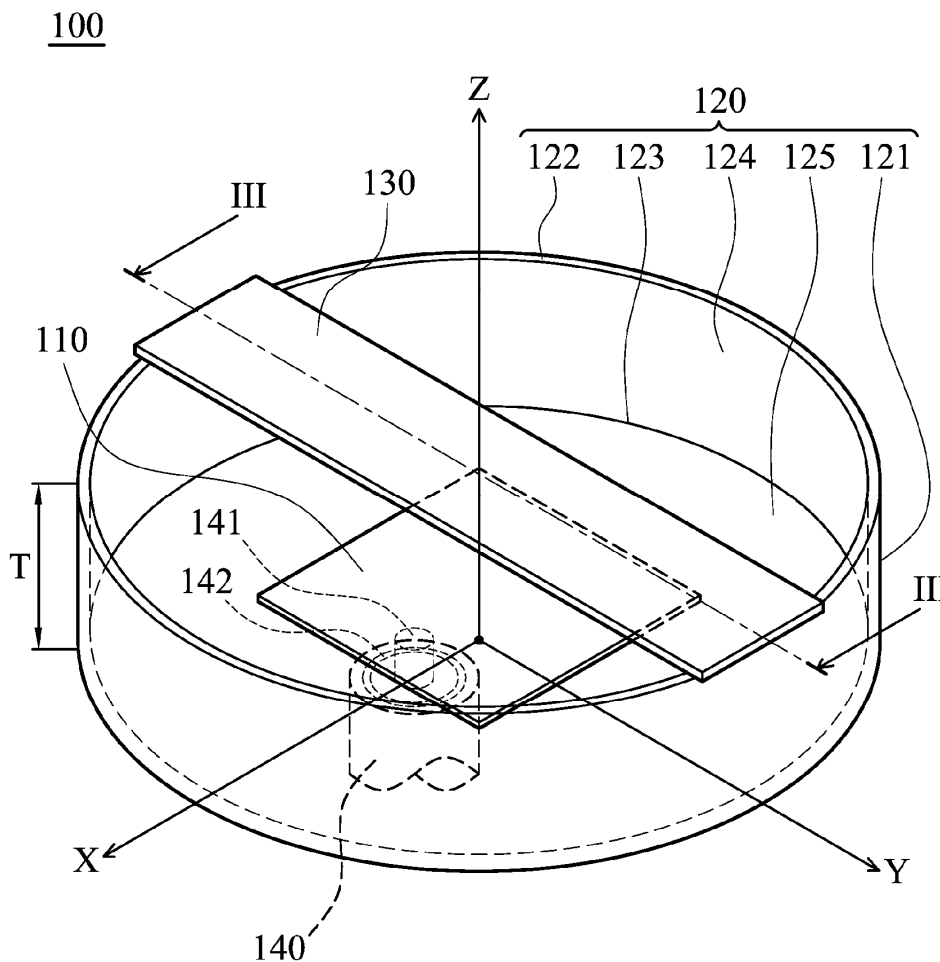
A bottom feed cavity aperture antenna is provided. The bottom feed cavity aperture antenna includes a patch and a ground structure. The patch feeds a signal to the bottom feed cavity aperture antenna. The ground structure includes a continuous wall, and a top end and a bottom end, wherein the continuous wall surrounds the patch, a thickness of the ground structure is formed between the top end and the bottom end, a patch height is formed between the patch and the bottom end, and a ratio of the patch height to the thickness is substantially lower than $\frac{1}{2}$, and a magnetic field is formed at the top end, and magnetic resonance directions of the magnetic field are parallel to a first axis.

(21) Appl. No.: **12/684,057**

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

Publication Classification

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/48 (2006.01)





US 20110163934A1

(19) **United States**

(12) **Patent Application Publication**
Tseng

(10) **Pub. No.: US 2011/0163934 A1**

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

(54) **ANTENNA STRUCTURE**

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

(76) Inventor: **Kuan-Hsueh Tseng, Taipei Hsien**
(TW)

(57) **ABSTRACT**

(21) Appl. No.: **12/752,141**

An antenna structure includes a radiation element, a grounding element, a short element, and a feeding element. The radiation element includes a first radiator and a second radiator, wherein the second radiator is extended from the first radiator and coupled to the first radiator. The short element includes a first end as well as a second end, wherein the first end of the short element is coupled to a joint in between the first radiator and the second radiator, and the second end of the short element is coupled to the grounding element. The feeding element includes a first end and a second end, and the first end of the feeding element is electrically connected with the radiation element. The short element is located on a first plane, and the feeding element is located on a second plane being different from the first plane.

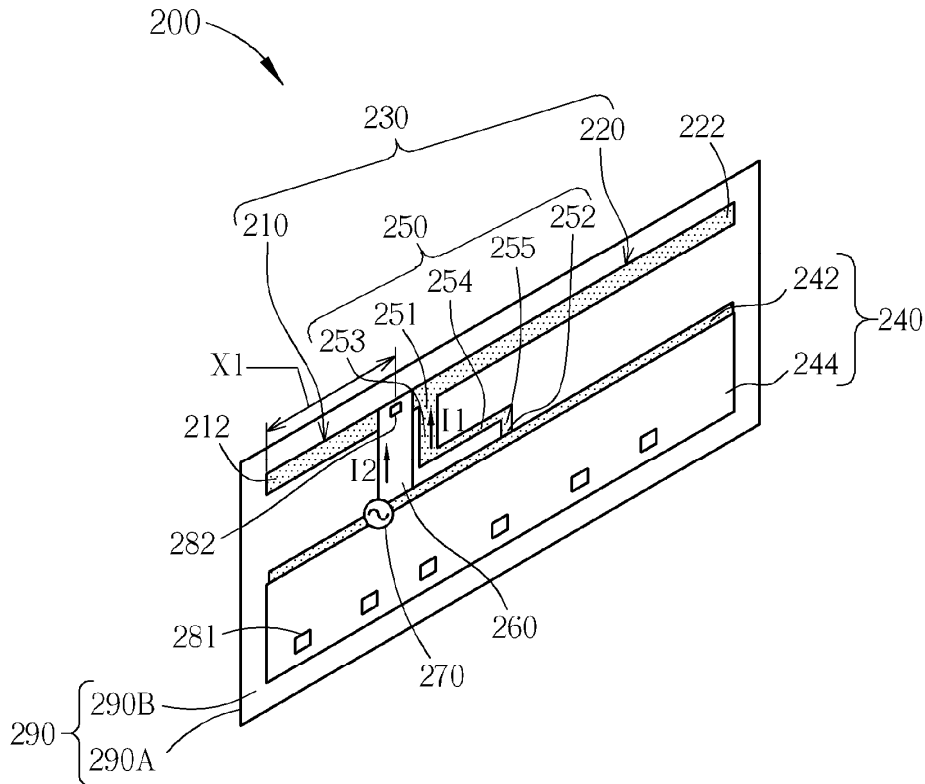
(22) Filed: **Apr. 1, 2010**

(30) **Foreign Application Priority Data**

Jan. 7, 2010 (TW) 099200248

Publication Classification

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/48 (2006.01)





US 20110163937A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0163937 A1**

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

(54) **MULTIBAND ANTENNA USING
ELECTROMAGNETIC COUPLING**

Publication Classification

(75) Inventors: **Jong-Ho Jung**, Yongin-si (KR);
Won-hwi Jin, Seoul (KR);
Byong-Nam Kim, Bucheon-si (KR)

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

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

(73) Assignee: **ACE ANTENA CORP.**, Incheon-si
(KR)

(57) **ABSTRACT**

(21) Appl. No.: **13/062,809**

(22) PCT Filed: **Sep. 10, 2009**

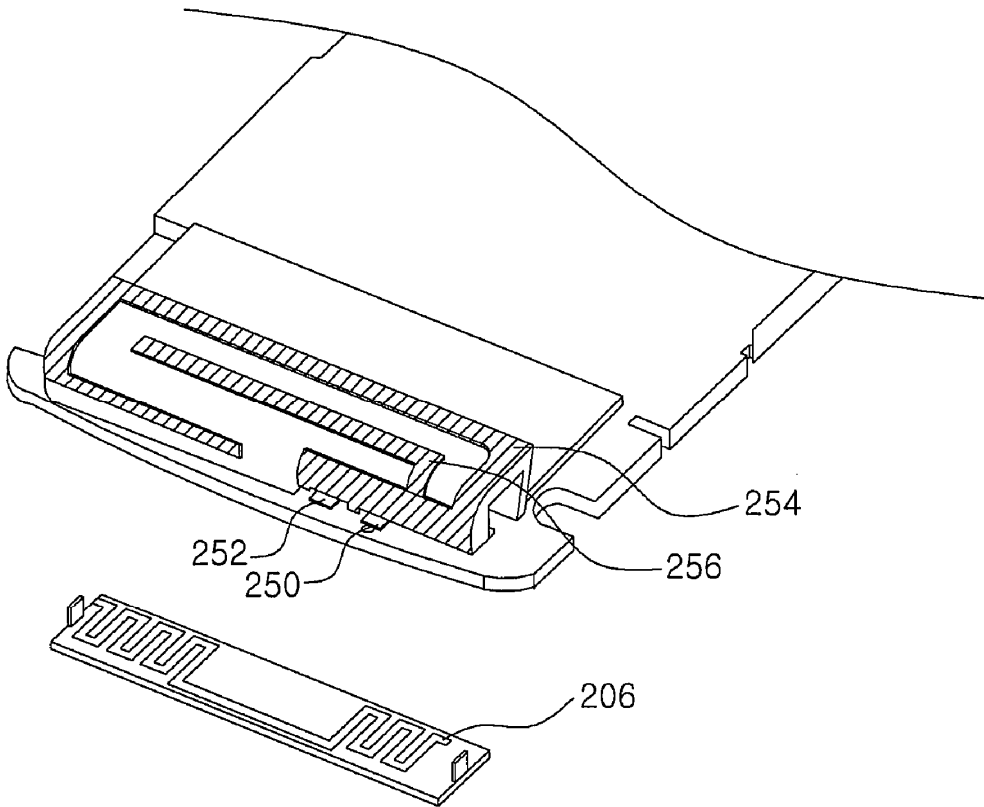
(86) PCT No.: **PCT/KR2009/005143**

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

A multi-band antenna using electromagnetic coupling includes a first carrier; a first antenna pattern, which is formed on the first carrier and which includes a power feed part and a radiator part; a second carrier; and a second antenna pattern formed on the second carrier. The first and second carriers are arranged such that the first and second antenna patterns are separated by a particular distance, and the second antenna pattern is not connected to a ground or a power feed line but is formed independently on the second carrier to be fed by electromagnetic coupling with the power feed part of the first antenna pattern. Thus, the multi-band antenna can employ a single power feed setup. Also, the impact on the human body of the frequency signals generated by a terminal can be reduced, and property changes caused by the hand effect and the head effect can be minimized.

(30) **Foreign Application Priority Data**

Sep. 10, 2008 (KR) 10-2008-0089502





US 20110165915A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0165915 A1**

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

(54) **MOBILE TERMINAL AND AN ANTENNA FOR A MOBILE TERMINAL**

Publication Classification

(75) Inventors: **Jungha Kim**, Seoul (KR);
Namyong Kim, Seoul (KR)

(51) **Int. Cl.**
H04B 1/38 (2006.01)

(52) **U.S. Cl.** **455/566; 345/173**

(73) Assignee: **LG ELECTRONICS INC.**

(57) **ABSTRACT**

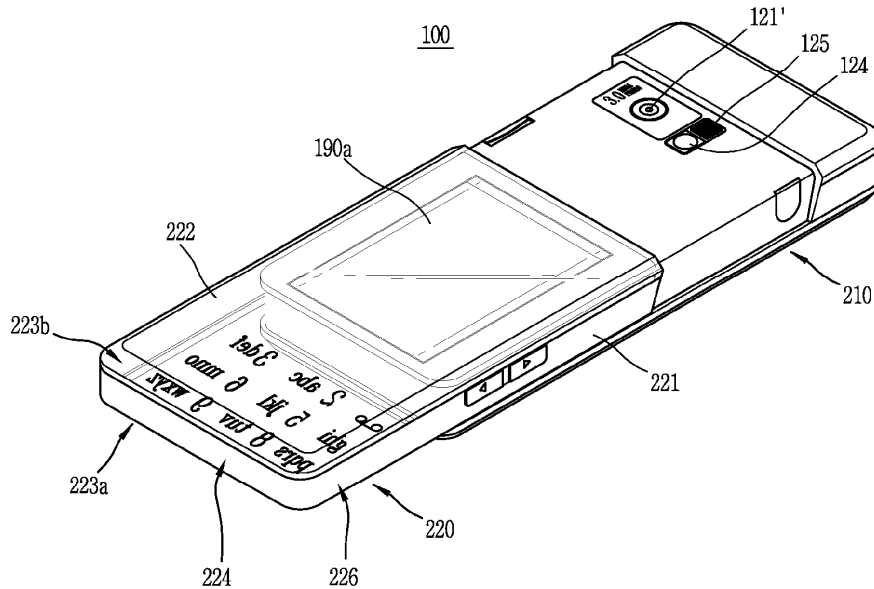
(21) Appl. No.: **12/943,888**

A mobile terminal includes a body having a display unit for displaying at least visual information or a user input unit for inputting a control command on one surface of the display unit. The mobile terminal also includes an antenna pattern positioned near the display unit or the user input unit. The antenna pattern transmits or receives a wireless signal. The display unit or the user input unit is configured to transmit light therethrough from one surface of the body to an opposite surface of the body. The antenna pattern is formed at an end or side surface of the body that is transverse to the surface on which the display unit or user input unit is positioned and is positioned away from the display unit or the user input unit.

(22) Filed: **Nov. 10, 2010**

(30) **Foreign Application Priority Data**

Jan. 7, 2010 (KR) 10-2010-0001396





US 20110169703A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0169703 A1**

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

(54) **ANTENNA ISOLATION FOR PORTABLE ELECTRONIC DEVICES**

(52) **U.S. CL.** 343/702; 343/893; 343/841

(76) **Inventors:** **Robert W. Schlub**, Santa Clara, CA (US); **Robert J. Hill**, Salinas, CA (US)

(57) **ABSTRACT**

(21) **Appl. No.:** 13/073,872

Portable electronic devices are provided with wireless circuitry that includes antennas and antenna isolation elements. The antennas may include antennas that have multiple arms and that are configured to handle communications in multiple frequency bands. The antennas may also include one or more antennas that are configured to handle communications in a single frequency band. The antennas may be coupled to different radio-frequency transceivers. For example, there may be first, second, and third antennas and first and second transceivers. The first and third antennas may be coupled to the first transceiver and the second antenna may be coupled to the second transceiver. The antenna isolation elements may be interposed between the antennas and may serve to reduce radio-frequency interference between the antennas. There may be a first antenna isolation element between the first and second antennas and a second antenna isolation element between the second and third antennas.

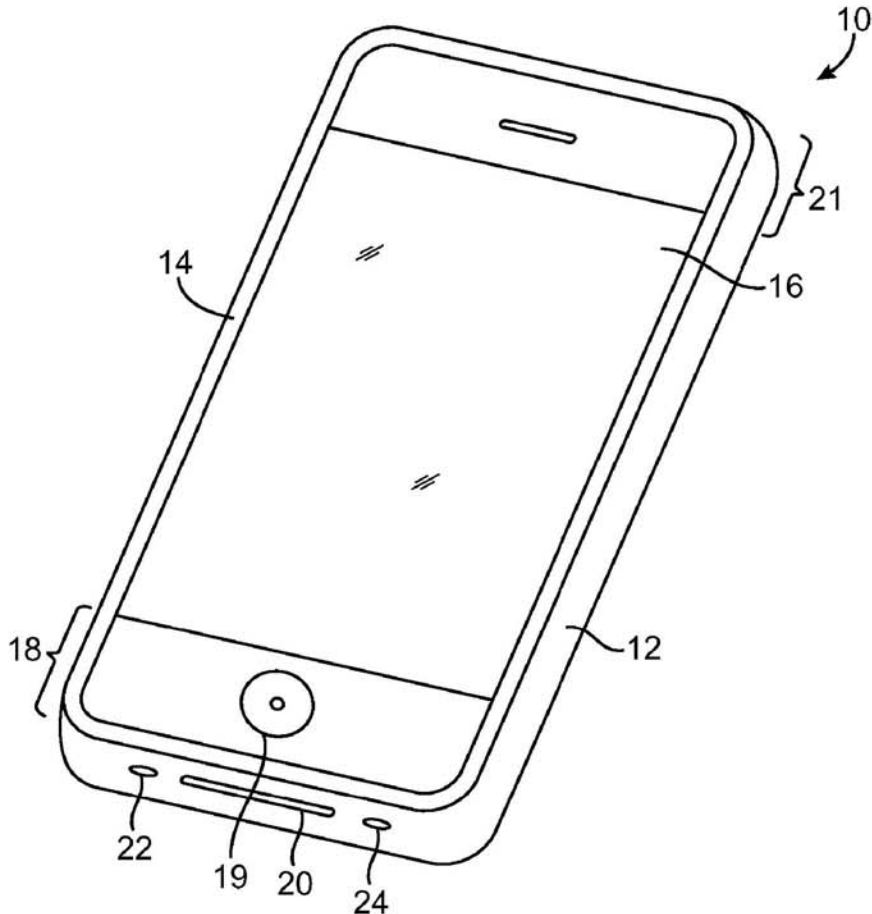
(22) **Filed:** Mar. 28, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/969,684, filed on Jan. 4, 2008, now Pat. No. 7,916,089.

Publication Classification

(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01Q 21/28 (2006.01)
H01Q 1/24 (2006.01)





US 20110169711A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0169711 A1**

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

(54) **ANTENNA FOR CELLULAR HANDSET WITH USER ADJUSTABLE GAIN**

Publication Classification

(75) Inventors: **Joseph A. Bobier**, Sunrise, FL (US); **Nadeem Khan**, Sunrise, FL (US); **Jorge Gil**, Tamarac, FL (US); **Ilya Lisak**, Plantation, FL (US)

(51) **Int. Cl.**
H01Q 3/06 (2006.01)
H01Q 1/50 (2006.01)

(73) Assignee: **xG Technology, Inc.**, Sarasota, FL (US)

(52) **U.S. Cl.** **343/859; 343/882**

(21) Appl. No.: **12/930,302**

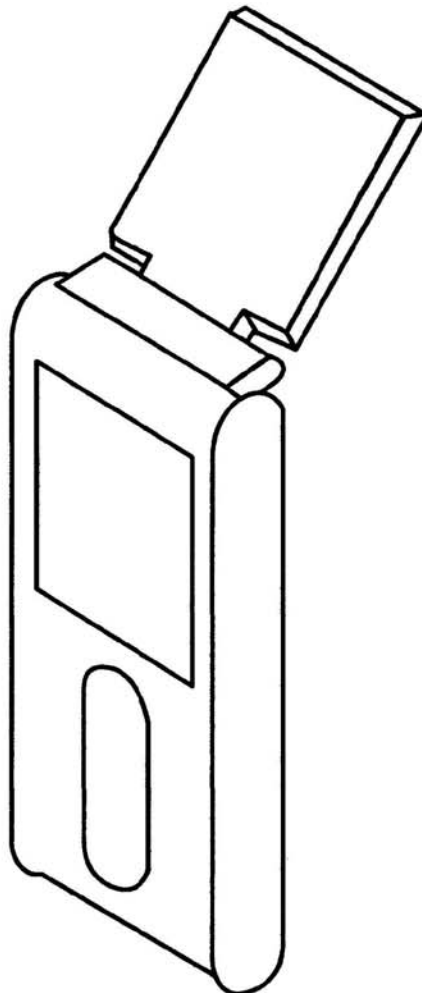
(57) **ABSTRACT**

(22) Filed: **Jan. 3, 2011**

This invention addresses a flip antenna design for mobile devices operating in ISM 900 MHz band. More specifically the present invention addresses the need to change the gain of a transceiver antenna (for mobile devices) with the flip of the antenna without changing any other characteristics of the transceiver.

Related U.S. Application Data

(60) Provisional application No. 61/335,794, filed on Jan. 12, 2010.





US 20110175775A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0175775 A1**

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

(54) **ANTENNA MODULE**

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

(75) **Inventors: Chao-Hsu WU, Luzhu Township (TW); Cheng-Hsiung Wu, Kaohsiung City (TW)**

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

(57) **ABSTRACT**

(21) **Appl. No.: 12/759,758**

An antenna module includes first, second, and third conductor arms. The second conductor arm has first and second end portions, and is coupled to an end portion of the first conductor arm to form a substantially T-shaped connection. The third conductor arm is spaced apart from the first and second conductor arms by first and second gaps, respectively, and is disposed parallel to the first conductor arm. The first end portion of the second conductor arm and the third conductor arm are electrically coupled to a coaxial cable for receiving two signals therefrom, respectively. The second end portion of the second conductor arm is electrically coupled to a ground cable for grounding.

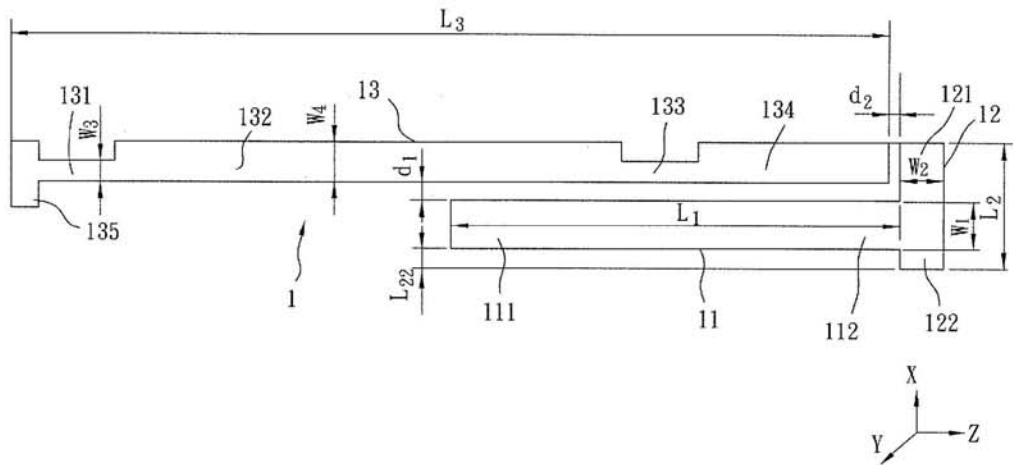
(22) **Filed: Apr. 14, 2010**

(30) **Foreign Application Priority Data**

Jan. 18, 2010 (TW) 099101200

Publication Classification

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





US 20110175776A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0175776 A1**

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

(54) **ANTENNA SET, PORTABLE WIRELESS DEVICE, AND USE OF A CONDUCTIVE ELEMENT FOR TUNING THE GROUND-PLANE OF THE ANTENNA SET**

(30) **Foreign Application Priority Data**

Sep. 19, 2005 (EP) 05108616.3

Publication Classification

(76) **Inventors:** **Jaume Anguera**, Vinaros (ES);
Antonio Condes, Sta. Coloma de Cervello (ES)

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

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

(21) **Appl. No.:** **13/014,283**

(57) **ABSTRACT**

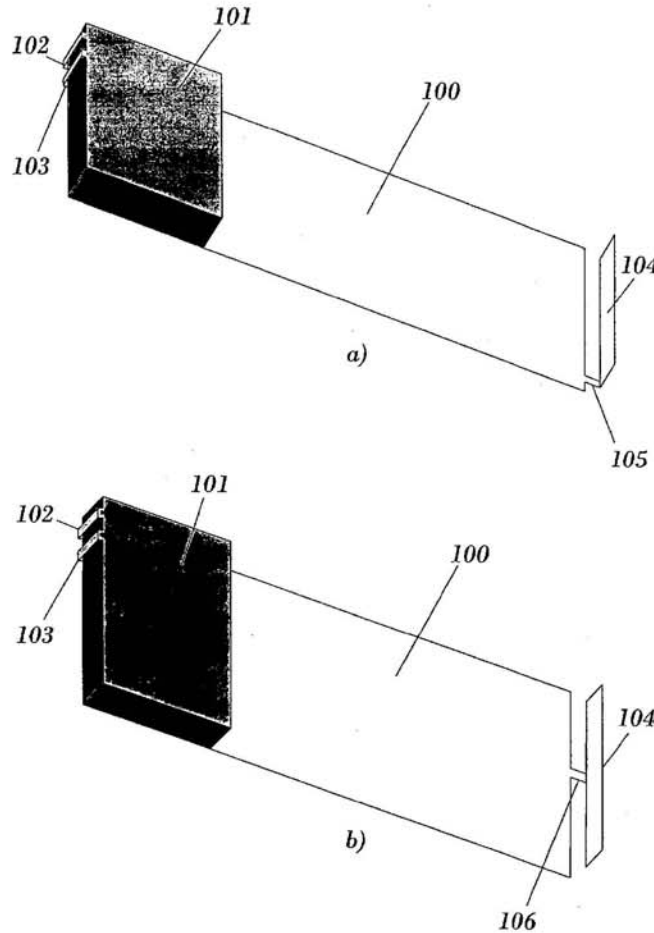
(22) **Filed:** **Jan. 26, 2011**

Related U.S. Application Data

(63) Continuation of application No. 12/066,897, filed on Apr. 22, 2008, now Pat. No. 7,903,034, filed as application No. PCT/EP2006/009019 on Sep. 15, 2006.

(60) Provisional application No. 60/718,537, filed on Sep. 19, 2005.

An antenna set comprising at least one antenna element and a ground plane, is complemented by a conductive element coupled to the ground plane, so as to modify the frequency performance of the antenna set, adding an operating band to the antenna set, and/or increasing the bandwidth of one operating band of the antenna set, and/or enhancing voltage standing wave ration, efficiency and/or gain of the antenna set. Thus, the conductive element can be used to tune the antenna set in accordance with specific requirements concerning, for example, compatibility with different wireless services.





US 20110175783A1

(19) **United States**

(12) **Patent Application Publication**
Kim

(10) **Pub. No.: US 2011/0175783 A1**

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

(54) **MULTILAYER ANTENNA**

Publication Classification

(75) Inventor: **Jung Kim**, Jeonju-si (KR)
(73) Assignee: **Neopulse Co., Ltd.**, Suwon-si, Gyeonggi-do (KR)

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 21/00 (2006.01)
(52) **U.S. Cl.** **343/810; 343/893**

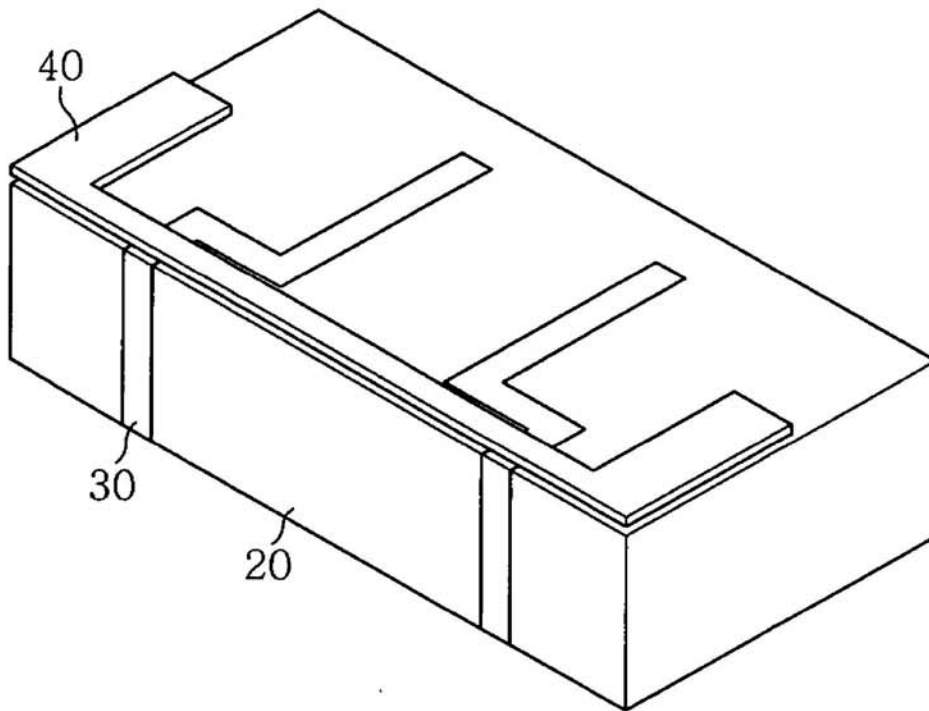
(21) Appl. No.: **12/998,231**
(22) PCT Filed: **Feb. 9, 2009**
(86) PCT No.: **PCT/KR2009/000599**
§ 371 (c)(1),
(2), (4) Date: **Mar. 29, 2011**

(57) **ABSTRACT**

The present invention relates to a multilayer antenna which is capable of improving communication performance by reducing an antenna size and increasing an antenna gain by improving performance of a plurality of antenna elements disposed adjacent to each other using a coupling. The multilayer antenna includes an antenna plate for coupling is arranged over plurality of antenna strips in a manner to be isolated from the antenna strips. With this configuration, the multilayer antenna is capable of increasing channel capacity and data transfer rate by reducing an antenna size and intercepting mutual interference and noise between the antenna elements.

(30) **Foreign Application Priority Data**

Sep. 30, 2008 (KR) 10-2008-0096234
Dec. 26, 2008 (KR) 10-2008-0134807





US 20110175794A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0175794 A1**

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

(54) **MULTI-BAND ANTENNA**

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

(57) **ABSTRACT**

(75) **Inventors:** **LUNG-SHENG TAI**, New Taipei (TW); **CHUN-MING CHIU**, New Taipei (TW); **PO-KANG KU**, New Taipei (TW)

A multi-band antenna (1), comprising a grounding element (10) extending horizontally along a longitudinal direction, comprising a side edge (101) with a connecting point (102) and a grounding point (103) distanced from the connecting point by a length; a radiating element (11) disposed at an upper level parallel to the grounding element and defining a first end and a second end, and operating in a first frequency band; a connecting element (12) located between the radiating element and the grounding element, comprising a first portion (121) connecting to the first end of the radiating element and a second portion (122) linking to said connecting point of the grounding element; a parasitic element (13) extending from the second portion of the connecting element towards the second end of the radiating element along the longitudinal direction, and operating in a second frequency band; a feeding point (141) disposed on the second portion of the connecting element and under the parasitic element; and a feeding line (15) comprising an inner conductor connected to the feeding point and an outer conductor connected to the grounding point; wherein said connecting element, the grounding element, the feeding point and the grounding point together forming a slot (16) operating in a third frequency band.

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

(21) **Appl. No.: 13/007,784**

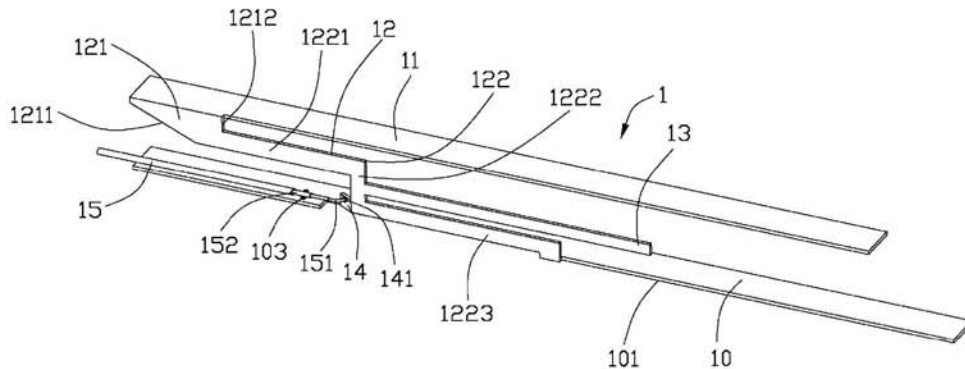
(22) **Filed: Jan. 17, 2011**

(30) **Foreign Application Priority Data**

Jan. 15, 2010 (TW) 99200813

Publication Classification

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





US 20110177849A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0177849 A1**

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

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE ANTENNA ASSEMBLY WITH
FLOATING DIRECTOR ELEMENTS ON
FLEXIBLE SUBSTRATE AND RELATED
METHODS**

Publication Classification

(51) **Int. Cl.**
H04M 1/00 (2006.01)

(52) **U.S. Cl.** **455/575.1**

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

(57) **ABSTRACT**

A mobile wireless communications device may include a portable housing, a circuit board carried by the portable housing and comprising a ground plane, and wireless communications circuitry carried by the circuit board. The device may also include an antenna assembly carried by the housing. The antenna assembly may include a flexible substrate, an electrically conductive antenna element on the flexible substrate and connected to the wireless communications circuitry and the ground plane, and at least one pair of floating, electrically conductive director elements on opposite sides of the flexible substrate for directing a beam pattern of the antenna element.

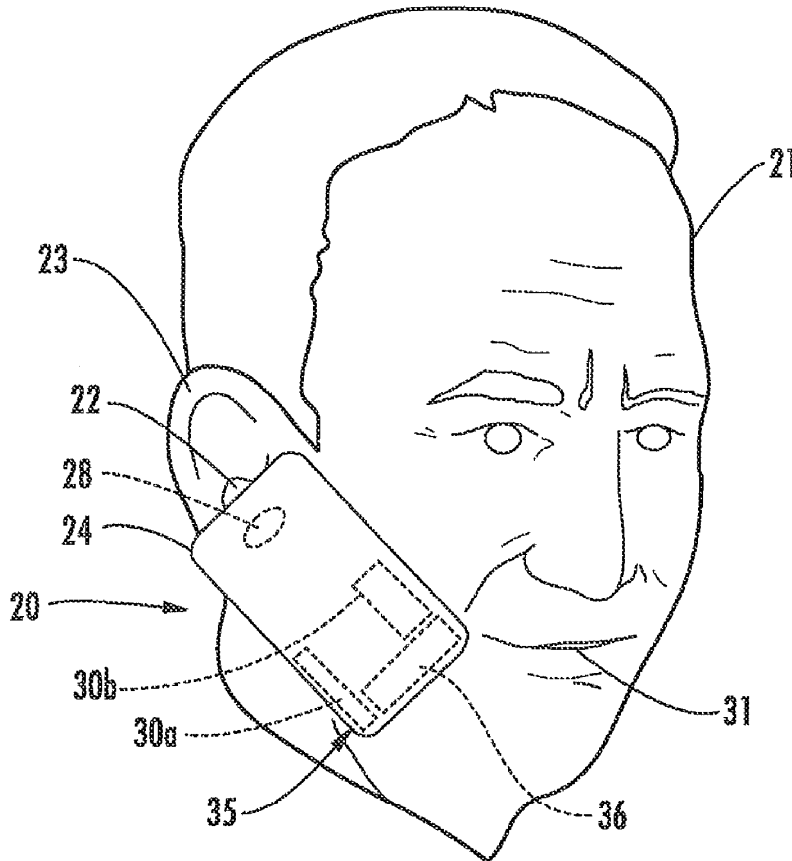
(73) **Assignee:** **Research In Motion Limited**,
Waterloo (CA)

(21) **Appl. No.:** **13/079,112**

(22) **Filed:** **Apr. 4, 2011**

Related U.S. Application Data

(63) Continuation of application No. 11/947,178, filed on
Nov. 29, 2007, now Pat. No. 7,941,116.





US 20110181474A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0181474 A1**

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

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

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

(75) **Inventors:** **CHIH-YUNG HUANG**, Dongshi Township (TW); **Sy-Been Wang**, Zhubei City (TW); **Kuo-Chang Lo**, Toufen Township (TW)

(57) **ABSTRACT**

Provided is a miniature three-dimensional antenna. The subject matter is particularly a miniature, low-height, and three-dimensional structure single-frequency antenna. In accordance with the preferred embodiment, the antenna includes a radiation member with extended structure, and the radiation member has a first radiation plane and a non-coplanar second radiation plane. One end extended from the first radiation plane forms a radiation bent member by a bending process. Furthermore, the antenna includes a feed member and a ground member which are the structure extended from the radiation member. In particular, the first radiation plane, the second radiation plane, the radiation bent member, the feed member, and ground member are not coplanar. The three-dimensional structure is featured to provide the low-height structure, and fortify the antenna structure. Moreover, it is easy to apply to significant number of applications through adjustment of members.

(73) **Assignee:** **ARCADYAN TECHNOLOGY CORPORATION**

(21) **Appl. No.:** **12/885,799**

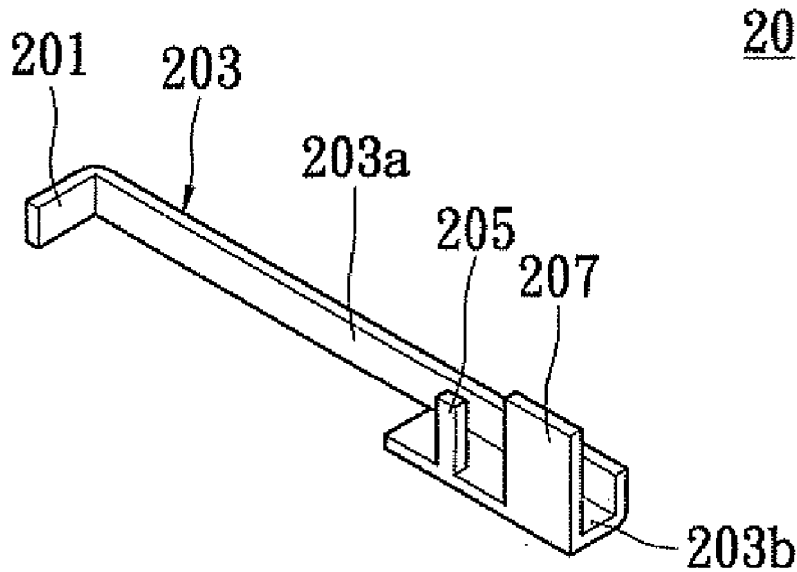
(22) **Filed:** **Sep. 20, 2010**

(30) **Foreign Application Priority Data**

Jan. 25, 2010 (TW) 99101954

Publication Classification

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



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(19) **United States**

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

(10) **Pub. No.: US 2011/0181480 A1**

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

(54) **ANTENNA MODULE**

Publication Classification

(75) Inventors: **TSUNG-LIN HSIEH**, Tu-Cheng (TW); **HSIN-HUNG LIU**, Tu-Cheng (TW)

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 13/10 (2006.01)

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

(52) **U.S. Cl.** **343/767; 343/700 MS**

(21) Appl. No.: **12/764,204**

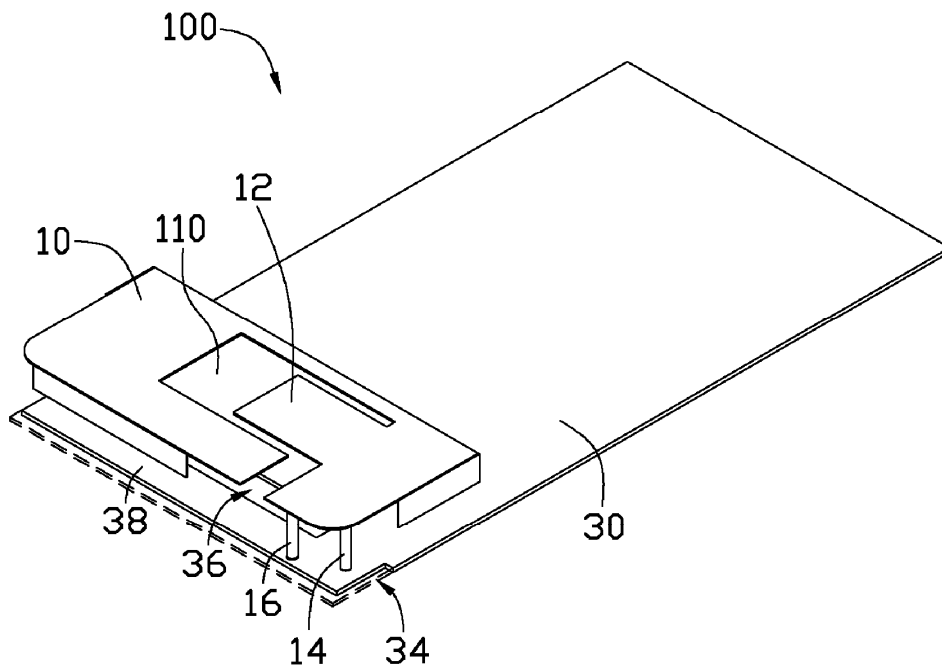
(22) Filed: **Apr. 21, 2010**

(57) **ABSTRACT**

An antenna module used in a portable wireless communication device includes an antenna and a base board. The antenna includes a main portion, a feeding portion, and a grounding portion. The feeding portion and the grounding portion connect to the base board. The base board defines a first slit and a second slit. A coupling area is formed between the first slit and the second slit to resonate with the antenna.

(30) **Foreign Application Priority Data**

Jan. 27, 2010 (TW) 99102325





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(19) **United States**

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

(10) **Pub. No.: US 2011/0181485 A1**

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

(54) **H-J ANTENNA**

Publication Classification

(75) Inventors: **Aviv Shachar**, Ramat-Gan (IL);
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(US); **Motti Elkobi**, Natanya (IL)

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

(52) **U.S. Cl.** **343/848; 343/893**

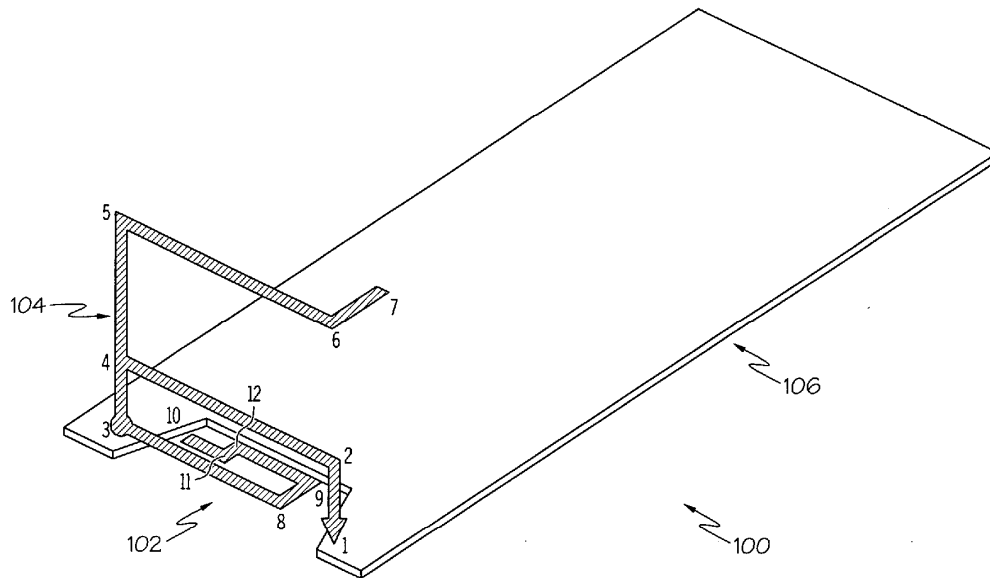
(73) Assignee: **MOTOROLA, INC.**, Schaumburg,
IL (US)

(57) **ABSTRACT**

(21) Appl. No.: **11/965,780**

A dual-band antenna includes a first antenna element having a generally "J" shaped element, and a second antenna element having a generally "h" shaped element. The first antenna element and the second antenna element share a common feed point and each antenna element is oriented substantially perpendicular to the other. The first antenna element and the second antenna element, in one implementation, are adapted to efficiently operate the dual-band antenna at approximately 1575 MHz and approximately 850 MHz, respectively.

(22) Filed: **Dec. 28, 2007**





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(19) **United States**

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

(10) **Pub. No.: US 2011/0181487 A1**

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

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

Publication Classification

(75) Inventors: **Byong-Nam Kim**, Kyeonggi-Do (KR); **Young-Hoon Shin**, Seoul (KR)

(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H01Q 5/01 (2006.01)

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

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

(57) **ABSTRACT**

(21) Appl. No.: **12/811,485**

(22) PCT Filed: **Jan. 8, 2009**

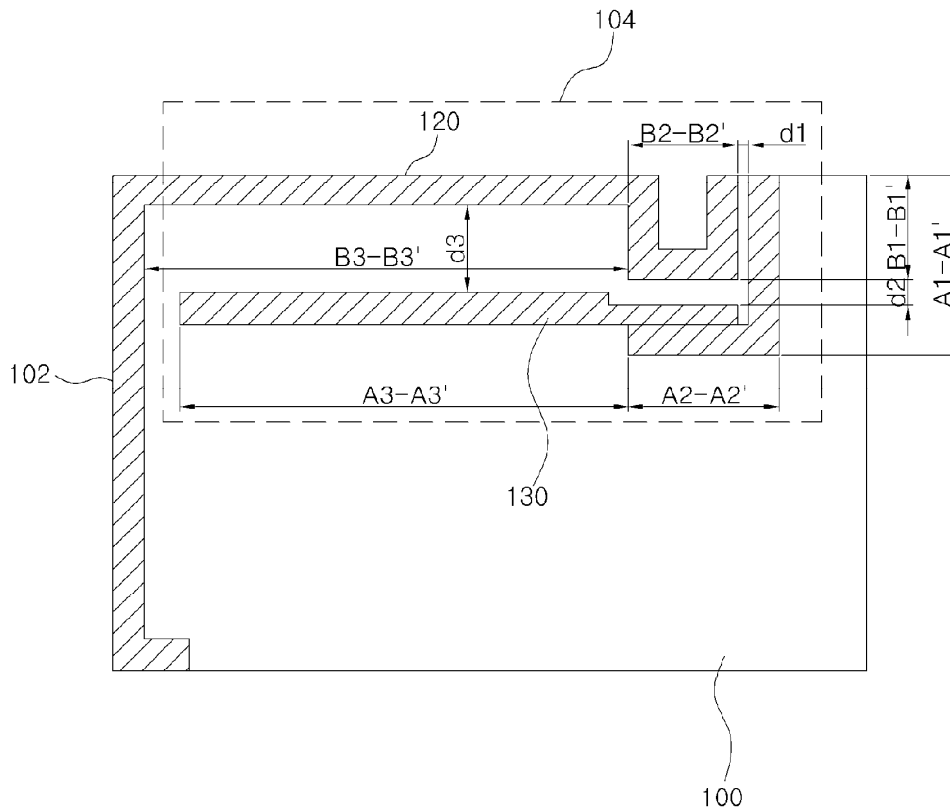
(86) PCT No.: **PCT/KR2009/000095**

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

A multi band internal antenna is disclosed. The antenna may include a board, an impedance matching/feeding part formed on the board, and a first radiation element joined to the impedance matching/feeding part, where the impedance matching/feeding part may include: a first matching element of a particular length that is coupled to a ground, and a second matching element of a particular length that is arranged with a distance from the first matching element and is electrically coupled to a feeding point, and where the distance between the first matching element and the second matching element may vary partially. Thus, a multi band internal antenna can be provided that utilizes coupling matching to achieve wide-band characteristics even for multi-band designs.

(30) **Foreign Application Priority Data**

Jan. 8, 2008 (KR) 10-2008-0002266





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(19) **United States**

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

(10) **Pub. No.: US 2011/0183633 A1**

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

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

Publication Classification

(51) **Int. Cl.**
H04B 1/40 (2006.01)
H01Q 1/50 (2006.01)

(52) **U.S. Cl.** **455/77; 343/722**

(57) **ABSTRACT**

According to one embodiment, an antenna apparatus comprises a first antenna element, a first lumped constant element, a first lumped constant element, a switch and at least one second lumped constant element. The first antenna element comprises a forward part, a folded part and a backward part, the forward part includes a start point connected to a feeding point, and the backward part includes an end point connected to ground. The first lumped constant element is inserted in the backward part. The switch is configured to select a current path in accordance with a control signal. The at least one second lumped constant element is to be selectively connected in parallel to the first lumped constant element through the switch.

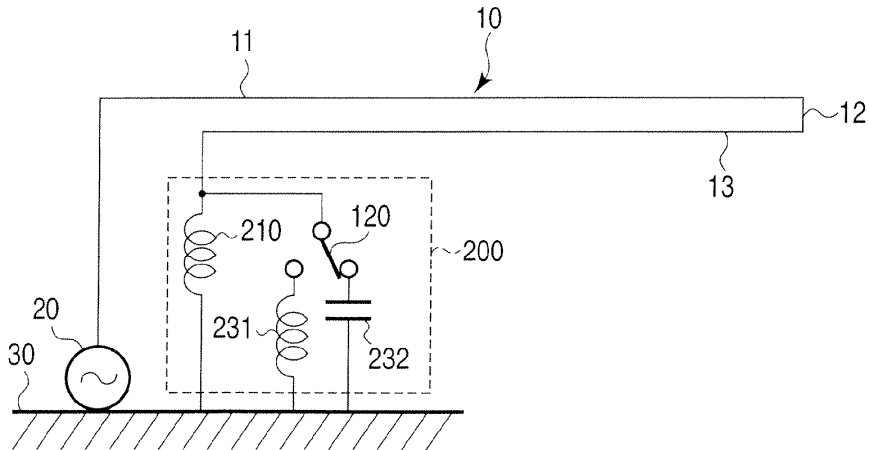
(76) Inventors: **Isao Ohba**, Hachioji-shi (JP);
Hiroyuki Hotta, Hamura-shi (JP);
Koichi Sato, Tachikawa-shi (JP);
Masao Teshima, Kunitachi-shi (JP)

(21) Appl. No.: **13/082,246**

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

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2009/064994, filed on Aug. 27, 2009.





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(19) **United States**

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

(10) **Pub. No.: US 2011/0183721 A1**

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

(54) **ANTENNA FOR HANDHELD ELECTRONIC DEVICES WITH CONDUCTIVE BEZELS**

Publication Classification

(76) Inventors: **Robert J. Hill**, Salinas, CA (US);
Robert W. Schlub, Campbell, CA (US);
Ruben Caballero, San Jose, CA (US)

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

(21) Appl. No.: **13/083,487**

(57) **ABSTRACT**

(22) Filed: **Apr. 8, 2011**

A handheld electronic device may be provided that contains wireless communications circuitry. The handheld electronic device may have a housing and a display. The display may be attached to the housing using a conductive bezel. The handheld electronic device may have one or more antennas for supporting wireless communications. A ground plane in the handheld electronic device may serve as ground for one or more of the antennas. The ground plane and bezel may define an opening. A rectangular slot antenna or other suitable slot antenna may be formed from or within the opening. One or more antenna resonating elements may be formed above the slot. An electrical switch that bridges the slot may be used to modify the perimeter of the slot so as to tune the communications bands of the handheld electronic device.

Related U.S. Application Data

(63) Continuation of application No. 12/941,006, filed on Nov. 5, 2010, now Pat. No. 7,924,231, which is a continuation of application No. 12/564,803, filed on Sep. 22, 2009, now Pat. No. 7,843,396, which is a continuation of application No. 11/821,192, filed on Jun. 21, 2007, now Pat. No. 7,612,725.

