



US 20110187601A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0187601 A1**

(43) **Pub. Date: Aug. 4, 2011**

(54) **METAMATERIAL ANTENNA USING A
MAGNETO-DIELECTRIC MATERIAL**

Publication Classification

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

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

(57) **ABSTRACT**

The invention relates to the size reduction of an antenna using a magneto-dielectric material for a CRLH-TL (Composite Right/Left Handed Transmission Line) antenna. In particular, the invention provides a small and low profile metamaterial antenna attained by performing SRR (Split Ring Resonator) magnetization on a dielectric material and applying the magneto-dielectric material to the CRLH-TL antenna that is composed of patches and vias. Even further, the invention provides a metamaterial antenna using a magneto-dielectric material, the antenna comprising: a substrate which is made up of a magneto-dielectric material and which has an SRR structure inserted thereto; patches with a CRLH-TL structure formed at a predetermined distance above the substrate; and a ground plane formed at a predetermined distance below the substrate.

(76) Inventors: **Byung Hoon Ryou**, Seoul (KR);
Won Mo Sung, Gyeonggi-do (KR);
Kyung Duk Jang, Daegu (KR);
Wee Sang Park, Gyeongbuk (KR)

(21) Appl. No.: **12/919,728**

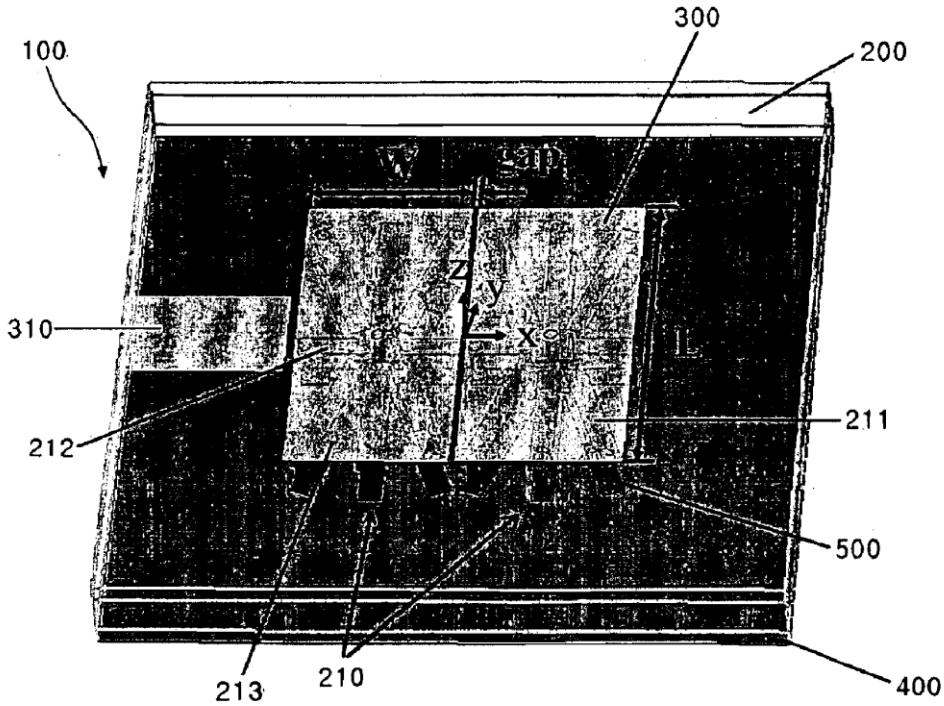
(22) PCT Filed: **Feb. 3, 2009**

(86) PCT No.: **PCT/KR2009/000520**

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

(30) **Foreign Application Priority Data**

Feb. 20, 2008 (KR) 10-2008-0015244





US 20110187603A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0187603 A1**

(43) **Pub. Date: Aug. 4, 2011**

(54) **DIELECTRIC ANTENNA AND WIRELESS COMMUNICATION DEVICE**

Publication Classification

(75) Inventors: **Kunihiro KOMAKI**, Kyoto-fu (JP); **Masayuki ATOKAWA**, Kyoto-fu (JP); **Masahiro IZAWA**, Kyoto-fu (JP); **Tsuyoshi MUKAI**, Kyoto-fu (JP)

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

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

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

(57) **ABSTRACT**

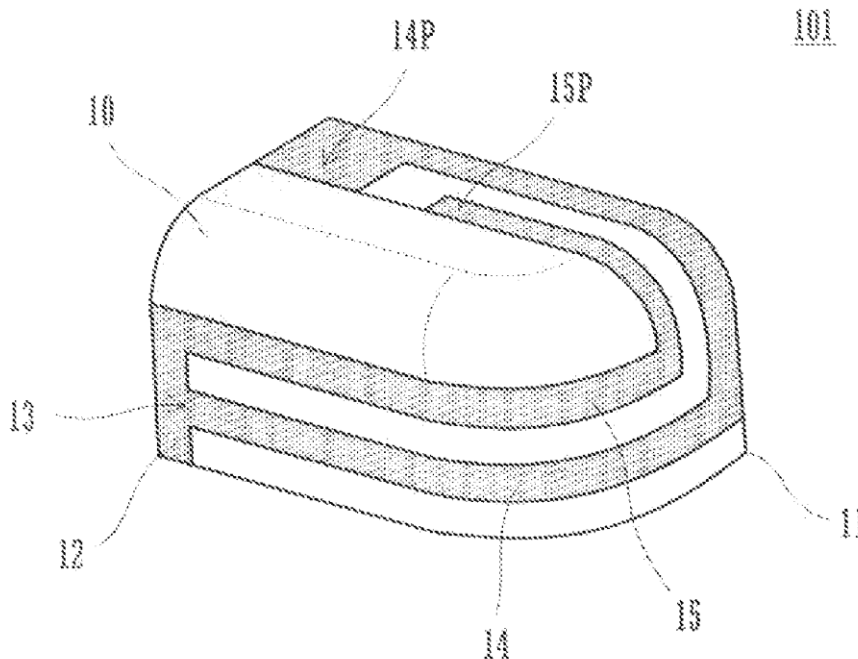
(21) Appl. No.: **13/020,439**

A dielectric antenna and wireless communication device including the dielectric antenna includes a molded body formed of a composite material of dielectric ceramic and a resin, and a flexible substrate including a radiation electrode. The radiation electrode is excitable at frequencies of 500 MHz to 5 MHz. The composition ratio and the like of the molded body are determined so that the Q value (Qd) thereof due to dielectric loss falls within the range of about 500 to about 1500.

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

(30) **Foreign Application Priority Data**

Feb. 4, 2010 (JP) 2010-022724





US 20110187606A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0187606 A1**

(43) **Pub. Date: Aug. 4, 2011**

(54) **DUAL-BAND MOBILE COMMUNICATION
DEVICE AND ANTENNA STRUCTURE
THEREOF**

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

(76) **Inventors: Kin-Lu Wong, Tapei Hsien (TW);
Chih-Hua Chang, Tapei Hsien
(TW)**

(57) **ABSTRACT**

(21) **Appl. No.: 12/775,578**

A dual-band mobile communication device includes a circuit board, a ground plane, an antenna element, and a dual-band inductively-coupled element. The ground plane has an edge. The antenna element is located on the circuit board or adjacent to the circuit board. The antenna element has a first operating band and a second operating band. The dual-band inductively-coupled element is located at the edge of the ground plane. The dual-band inductively-coupled element excites two different resonant modes at two specific frequencies corresponding to the first and the second operating bands of the antenna element, respectively. The dual-band inductively-coupled element comprises a connection element, an inductive element, a first metal plate, and a second metal plate. The first metal plate is electrically connected to the ground plane through the connection element. The second metal plate is electrically connected to the inductive element.

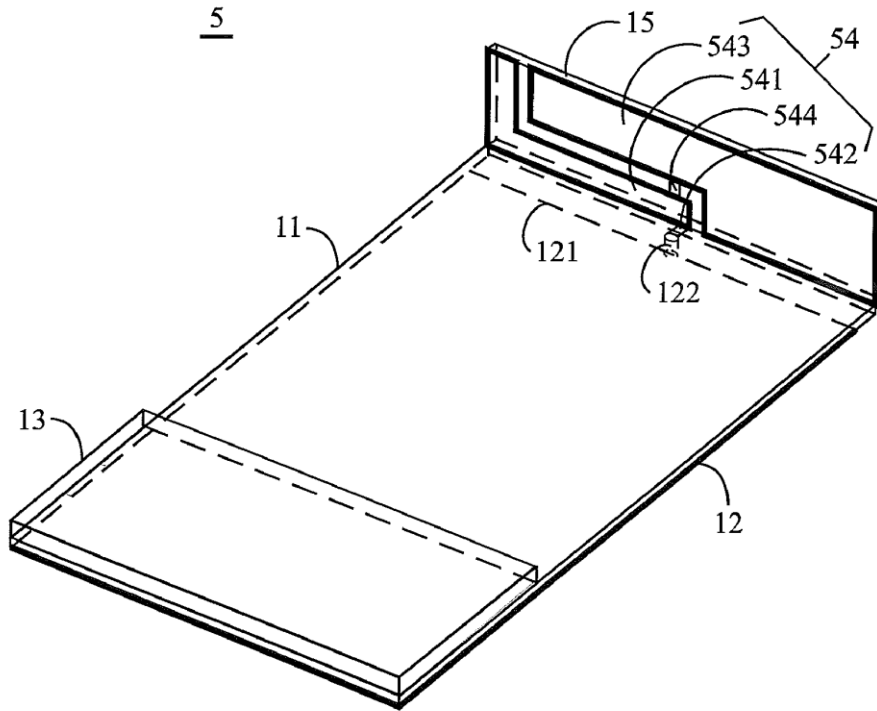
(22) **Filed: May 7, 2010**

(30) **Foreign Application Priority Data**

Feb. 1, 2010 (TW) 099102889

Publication Classification

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





US 20110187607A1

(19) **United States**

(12) **Patent Application Publication**
LU

(10) **Pub. No.: US 2011/0187607 A1**

(43) **Pub. Date: Aug. 4, 2011**

(54) **ANTENNA FOR PORTABLE ELECTRONIC DEVICE**

Publication Classification

(75) Inventor: **CHUN-YI LU**, Tu-Cheng (TW)

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

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

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

(21) Appl. No.: **12/859,160**

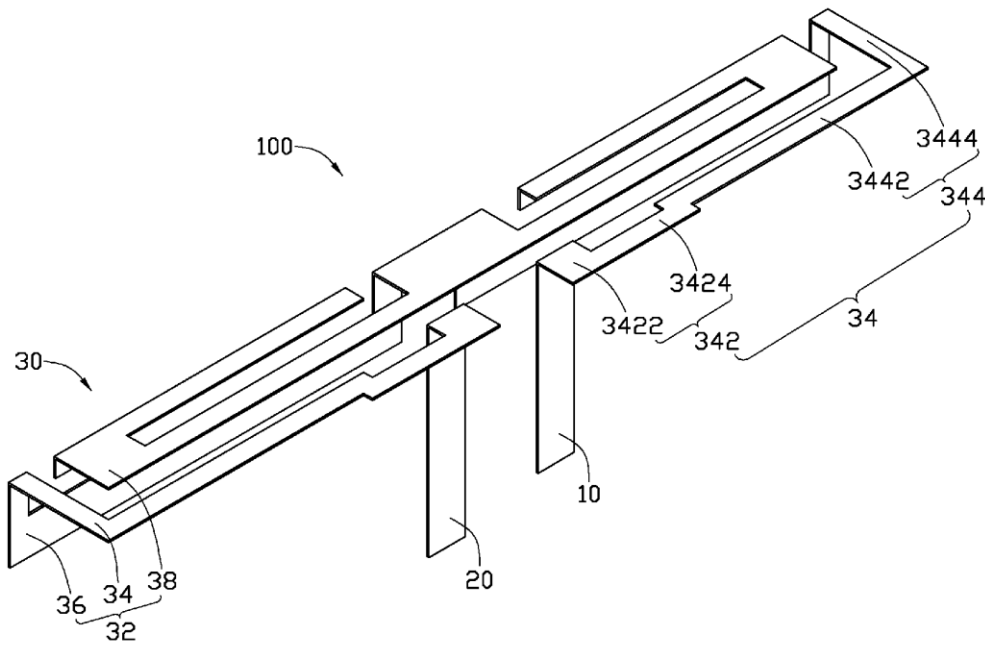
(57) **ABSTRACT**

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

An antenna for a portable electronic device includes a feeding end, a grounding end; and a radiating body. The radiating body includes two symmetrical radiating units respectively connected to the feeding end and the grounding end. Each radiating unit includes a first radiating part, a second radiating part connected to the first radiating part, and a third radiating part connected to the second radiating part and surrounded by the first and second radiating parts.

(30) **Foreign Application Priority Data**

Jan. 29, 2010 (TW) 99102525





US 20110187608A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0187608 A1**

(43) **Pub. Date: Aug. 4, 2011**

(54) **BUILT-IN ANTENNA FOR PORTABLE TERMINAL**

Publication Classification

(75) Inventors: **Joon-Ho BYUN**, Yongin-si (KR);
Seong-Tae JEONG, Yongin-si (KR);
Bum-Jin CHO, Hwaseong-si (KR);
Soon-Ho HWANG, Gangnam-gu (KR)

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

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

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

(57) **ABSTRACT**

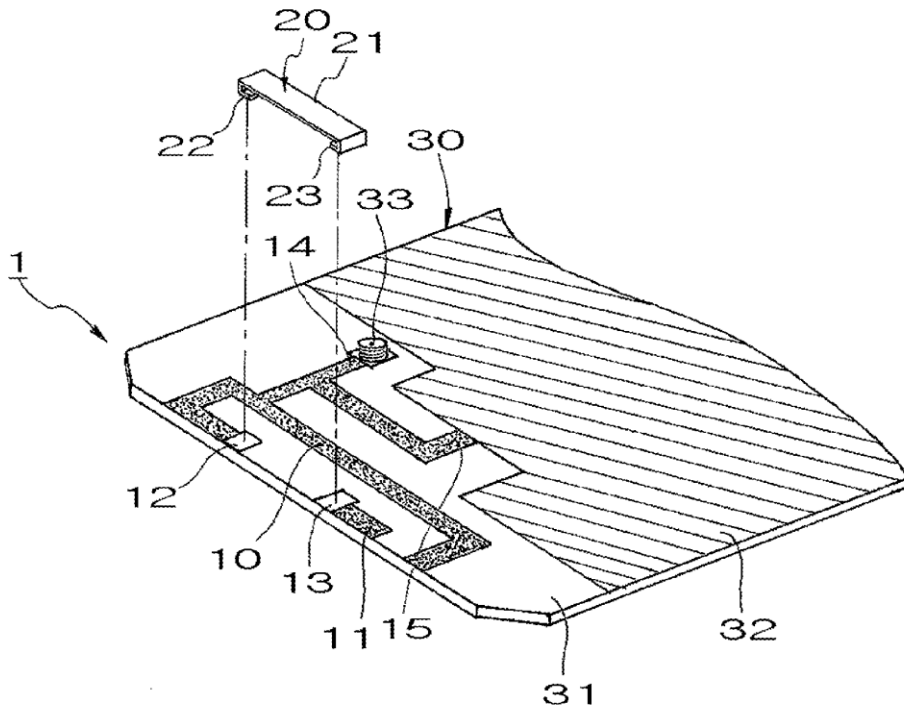
(21) Appl. No.: **12/963,063**

(22) Filed: **Dec. 8, 2010**

A built-in antenna for a portable terminal is provided. The built-in antenna includes a substrate including a ground region and a non-ground region, an antenna radiator formed in a pattern with a preset shape within the non-ground region of the substrate, at least one sub-radiation pattern formed in a pattern type while including a preset spacing distance from the antenna radiator, and a conductive plate with a preset height, electrically connecting the sub-radiation pattern to the antenna radiator and/or the sub-radiation pattern.

(30) **Foreign Application Priority Data**

Jan. 29, 2010 (KR) 10-2010-0008372





US 20110187609A1

(19) **United States**

(12) **Patent Application Publication**
Abe

(10) **Pub. No.: US 2011/0187609 A1**

(43) **Pub. Date: Aug. 4, 2011**

(54) **ELECTRIC DEVICE WITH AN ANTENNA
DEVICE AND A SOLAR PANEL**

(52) **U.S. Cl. 343/702; 343/720**

(75) **Inventor: Kazuaki Abe, Iruma-shi (JP)**

(57) **ABSTRACT**

(73) **Assignee: CASIO COMPUTER CO., LTD.,
Tokyo (JP)**

(21) **Appl. No.: 13/014,274**

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

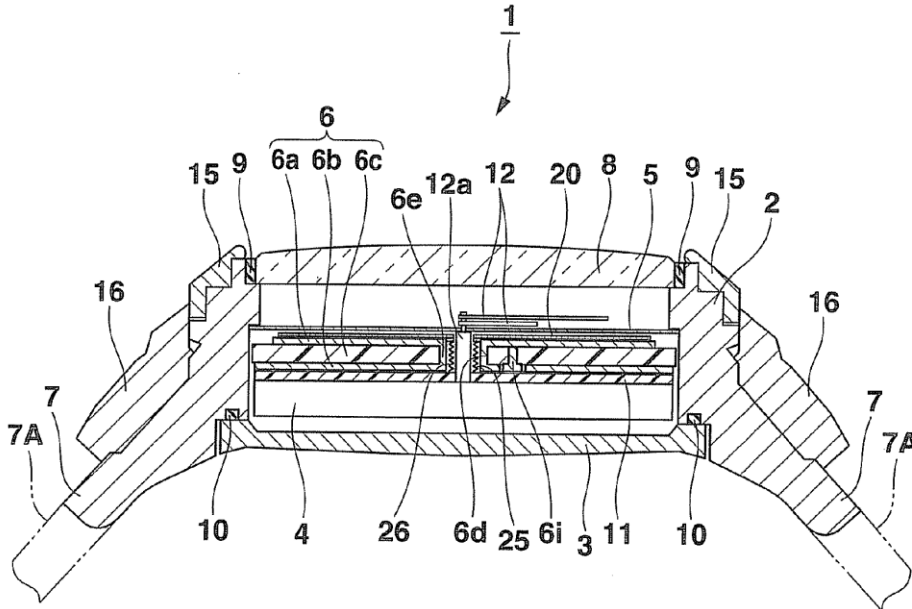
(30) **Foreign Application Priority Data**

Jan. 29, 2010 (JP) 2010-018081

Publication Classification

(51) **Int. Cl.**
H01Q 1/00 (2006.01)
H01Q 1/22 (2006.01)

An electronic apparatus includes an antenna device, a solar panel disposed on a front side of the antenna device and a circuit board disposed on a back side of the antenna device. The antenna device includes a plate-shaped dielectric, a plate-shaped radiation conductor disposed on a front side of the dielectric and a plate-shaped grounding conductor disposed on a back side of the dielectric. The dielectric has a through hole formed therein, and the solar panel has electrode pads on a back side thereof, electrode pads being exposed within the through hole in the dielectric. The circuit board has conductive patterns at positions thereon facing the electrode pads, and the conductive patterns are electrically connected to the electrode pads by electric connection members disposed within the through hole in the dielectric.





US 20110187618A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0187618 A1**

(43) **Pub. Date: Aug. 4, 2011**

(54) **DUAL-BAND ANTENNA**

Publication Classification

(75) Inventors: **PING LI, SHANGHAI (CN);
CHONG ZHANG, SHANGHAI
(CN); CHO-JU CHUNG,
Tu-Cheng (TW)**

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 13/10 (2006.01)

(73) Assignees: **AMBIT MICROSYSTEMS
(SHANGHAI) LTD., SHANGHAI
(CN); HON HAI PRECISION
INDUSTRY CO., LTD., Tu-Cheng
(TW)**

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

(21) Appl. No.: **12/758,032**

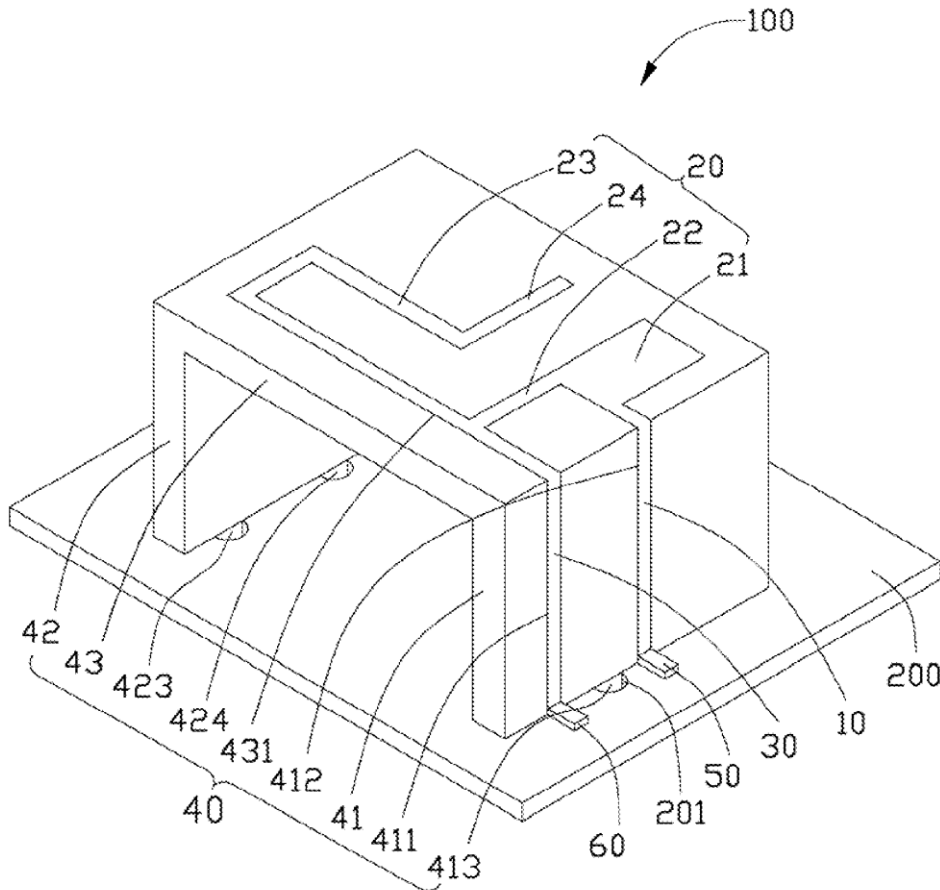
(22) Filed: **Apr. 12, 2010**

(30) **Foreign Application Priority Data**

Feb. 2, 2010 (CN) 201020302141.6

(57) **ABSTRACT**

A dual-band antenna includes a feeding portion, a radiating portion, a grounding portion, and an insulating support portion. The insulating support portion includes a first support wall, a second support wall, and a third support wall. The third support wall is parallel to the substrate, and perpendicularly connected to the first support wall and the second support wall, to position the radiating portion.





US 20110189963A1

(19) **United States**

(12) **Patent Application Publication**
YOON

(10) **Pub. No.: US 2011/0189963 A1**

(43) **Pub. Date: Aug. 4, 2011**

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

(52) **U.S. CL.** 455/90.2; 343/843; 343/893

(75) **Inventor:** Sung-Hyuk YOON, Nagano (JP)

(57) **ABSTRACT**

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

An antenna element includes a feeding path unit connected to a feeding point, first and second antenna main body units, and first and second short-circuit path units. The first antenna main body unit has one end connected to the feeding path unit and the other end that is opened. The second antenna main body unit has one end connected to a connection point between the feeding path unit and the first antenna main body unit and the other end that is opened. The first short-circuit path unit contributes to a resonance to a radio signal in a predetermined first frequency band, and is formed between the connection point and a ground point. The second short-circuit path unit contributes to a resonance to a radio signal in a second frequency band higher than the first frequency band, and has a path length different from that of the first short-circuit path unit.

(21) **Appl. No.:** 12/984,131

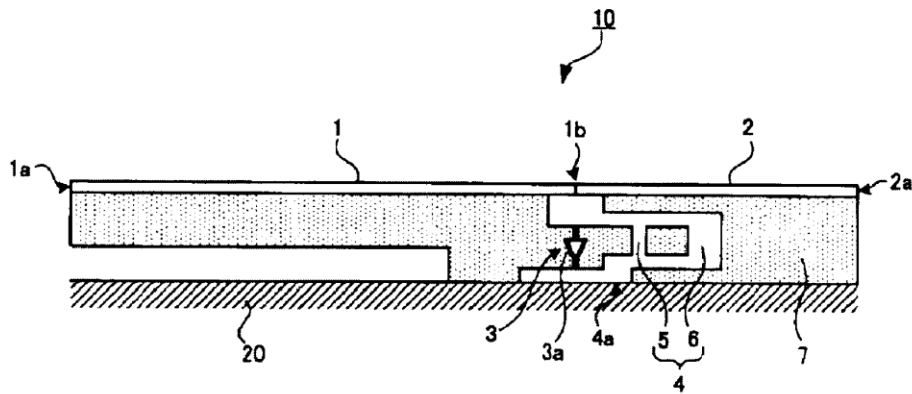
(22) **Filed:** Jan. 4, 2011

(30) **Foreign Application Priority Data**

Feb. 4, 2010 (JP) 2010-023421

Publication Classification

(51) **Int. Cl.**
H01Q 21/30 (2006.01)
H04B 1/38 (2006.01)



Structural example of antenna element of first embodiment



US 20110193747A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0193747 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **MICRO STRIP ANTENNA**

Publication Classification

(75) Inventors: **Jeong Ki Ryoo**, Anyang (KR); **Jae Yul Choo**, Yongin (KR); **Chu Yong Lee**, Seoul (KR); **Hosung Choo**, Seoul (KR); **Ikmo Park**, Yongin (KR)

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

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

(73) Assignee: **LS INDUSTRIAL SYSTEMS CO., LTD.**

(57) **ABSTRACT**

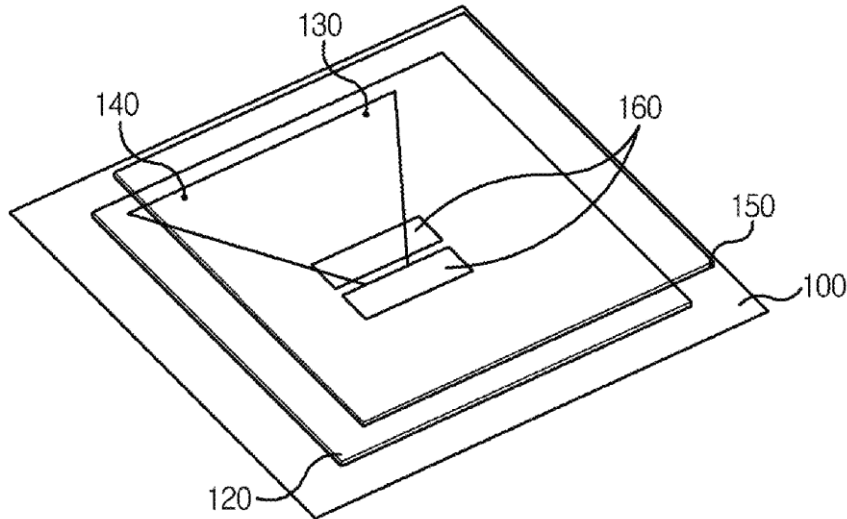
(21) Appl. No.: **12/714,393**

The invention provides a micro strip antenna used for both a near-field region and a remote-field region. A micro strip antenna comprises: a first dielectric substrate; a main patch, having a triangle shape under the first dielectric substrate, configured to feed a radiation current; a second dielectric substrate over the first dielectric substrate; and a sub patch, formed under the second dielectric substrate, configured to desert a current from the main patch to provide a vertical magnetic field.

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

(30) **Foreign Application Priority Data**

Feb. 9, 2010 (KR) 10-2010-0012070





US 20110193748A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0193748 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **MULTIBAND ANTENNA**

Publication Classification

(75) Inventors: **CHANG-HSIN KUO**, Tu-Cheng (TW); **SHIH-TSUNG KAN**, Tu-Cheng (TW)

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 5/00 (2006.01)
(52) **U.S. Cl.** **343/700 MS**

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

(57) **ABSTRACT**

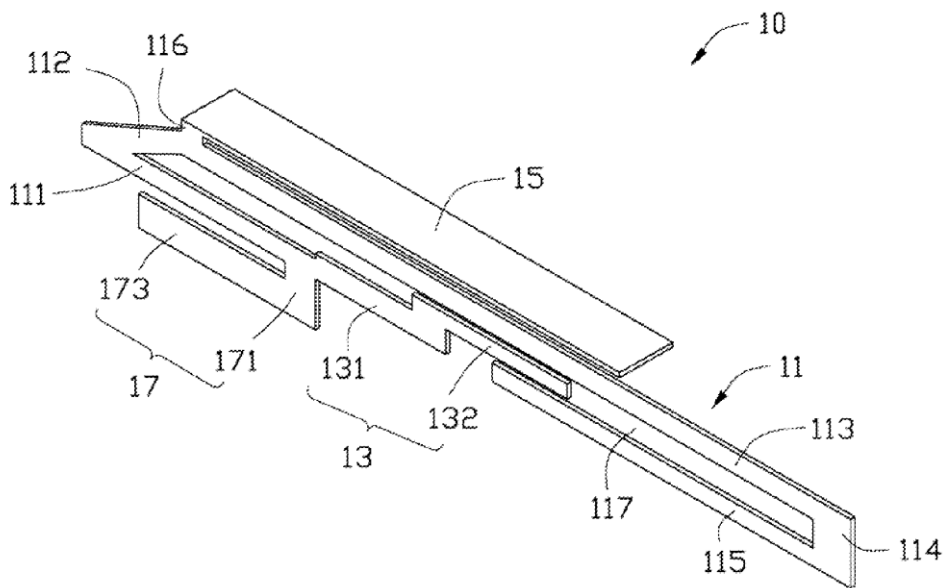
(21) Appl. No.: **12/784,504**

A multiband antenna used for a portable communication device includes a first antenna unit, a second antenna unit, a third antenna unit, and feed member. The first antenna unit, the second antenna unit and the third antenna unit are capable of receiving and/or sending wireless signals. The second antenna unit is connected to the first antenna unit, the third antenna unit is connected to the first antenna unit, and the feed member is electrically connected to the first antenna unit and the second antenna unit. The feed member receives wireless signals and transmits the wireless signals through the first antenna, the second antenna unit and the third antenna unit to generate corresponding current paths, and the first antenna unit is located between the second antenna unit and the third antenna unit to isolate the second antenna unit and the third antenna unit to avoid coupling interference of their resonant frequencies.

(22) Filed: **May 21, 2010**

(30) **Foreign Application Priority Data**

Feb. 5, 2010 (TW) 99103514





US 20110193752A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0193752 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **HANDHELD DEVICE**

Publication Classification

(75) Inventors: **Ching-Sung Wang**, Taoyuan County (TW); **Huang-Jen Chen**, Taoyuan County (TW); **Bing-Hsiao Wang**, Taoyuan County (TW)

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

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

(57) **ABSTRACT**

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

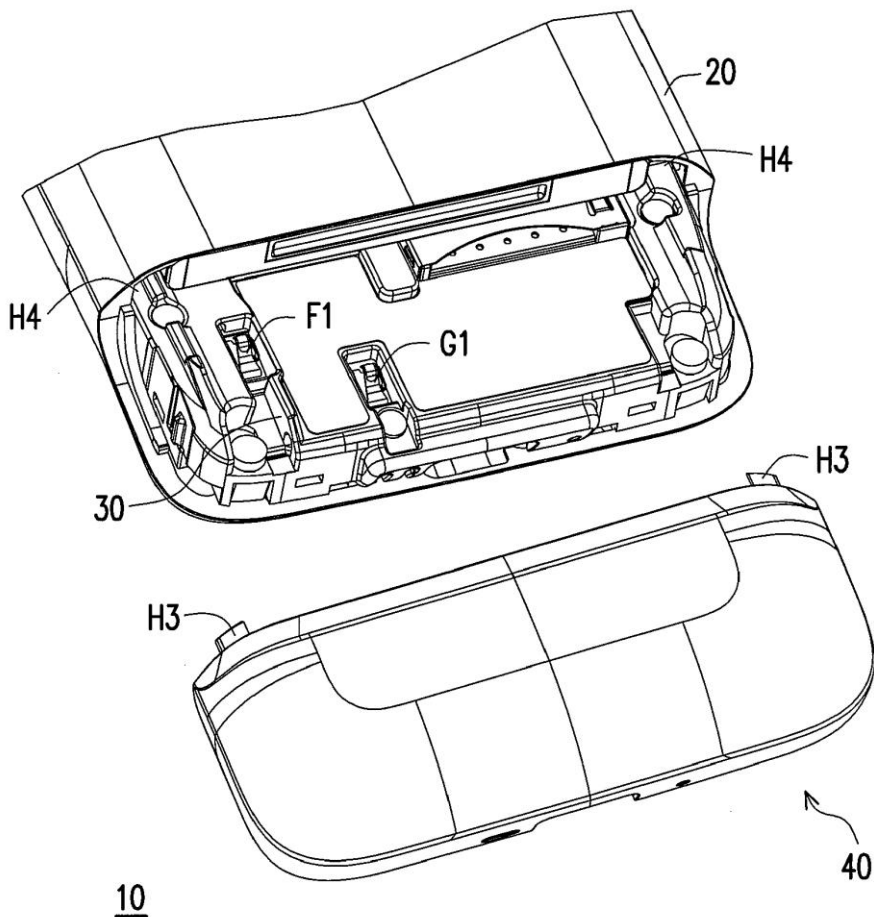
A handheld device is disclosed, which includes an appearance part, a system ground plane and a detachable element. The detachable element includes a carrier and a planar antenna. The system ground plane is disposed in the appearance part and has a feed point. The planar antenna is disposed on the carrier and has a connection point. The carrier is detachably connected to the appearance part. When the carrier is connected to the appearance part, the above-mentioned connection point is electrically connected to the feed point. In this way, the radiation performance of the antenna can be improved and the frequency band of the antenna of the handheld device can be changed by replacing the detachable element.

(21) Appl. No.: **12/769,628**

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

(30) **Foreign Application Priority Data**

Feb. 10, 2010 (TW) 99104158





US 20110193753A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0193753 A1**

(43) **Pub. Date: Aug. 11, 2011**

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

(30) **Foreign Application Priority Data**

Feb. 8, 2010 (KR) 10-2010-0011574

(75) Inventors: **Woon-Chun KIM**, Suwon-si (KR);
Won-Tae Choi, Hwasung-si (KR);
Byung-Hoon Kim, Suwon-si (KR);
Jung-Ho Yoon, Anyang-si (KR);
Gyu-Won Kim, Suwon-si (KR)

Publication Classification

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

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

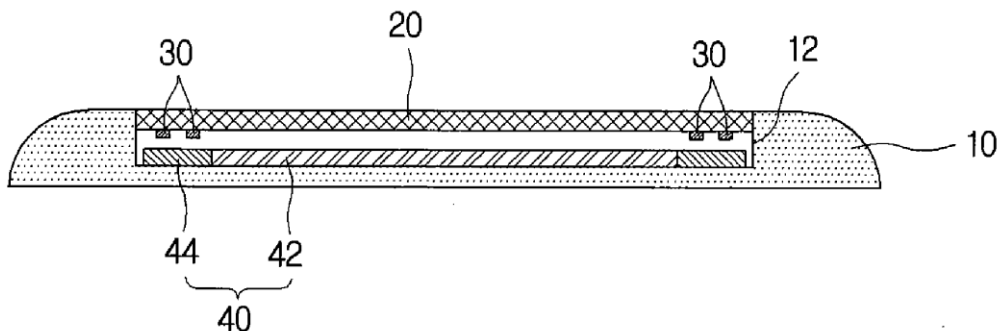
(57) **ABSTRACT**

(73) Assignee: **SAMSUNG
ELECTRO-MECHANICS CO.,
LTD.**

An antenna device and a portable terminal having the antenna device are disclosed. As an antenna device installed in a portable terminal in which a solar cell module or a display module is installed, the antenna device in accordance with an embodiment of the present invention can include a case, which has a housing part formed therein, a transparent protective window, which covers the housing part and allows a ray of light to pass through, and an antenna pattern, which is formed on the transparent protective window.

(21) Appl. No.: **12/878,505**

(22) Filed: **Sep. 9, 2010**





US 20110193756A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0193756 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **WIRELESS NETWORK RECEIVER**

Publication Classification

(75) Inventors: **Shih-Chieh CHENG**, Kaohsiung City (TW); **Kuo-Chang Lo**, Miaoli County (TW)

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

(52) **U.S. Cl.** **343/720**

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

(57) **ABSTRACT**

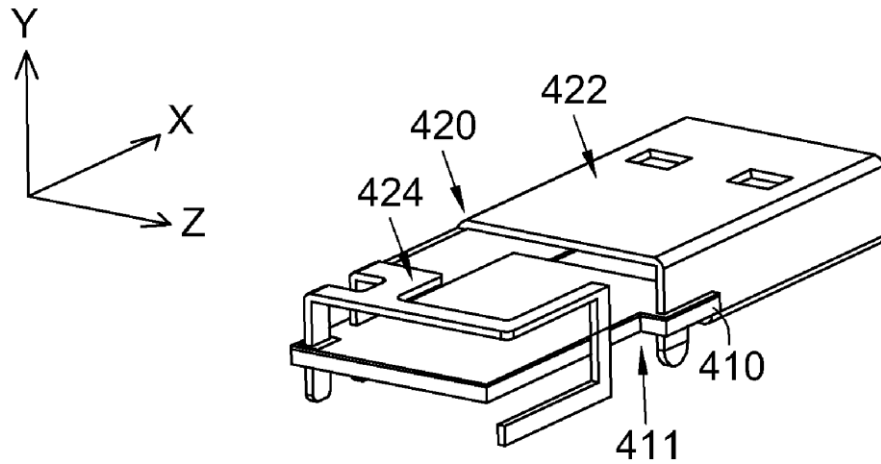
(21) Appl. No.: **13/023,267**

A wireless network receiver includes a circuit board and a connector structure. The connector structure is fixed on the circuit board, and the connector structure includes a connector and an antenna. The antenna, crossing the circuit board, and the connector are integrally formed with as a whole. The antenna includes a feeding connecting member, a horizontal radiator, a vertical radiator and a grounding connecting member. The horizontal radiator generates a horizontally polarized wave and is connected to the feeding connecting member. The vertical radiator generates a vertically polarized wave and is connected to the horizontal radiator. The grounding connecting member connects the horizontal radiator to the connector.

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

(30) **Foreign Application Priority Data**

Feb. 9, 2010 (TW) 99104014



40



US 20110193757A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0193757 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **GROUND RADIATOR USING CAPACITOR**

May 7, 2010 (KR) 10-2010-0043190

Jun. 14, 2010 (KR) 10-2010-0056207

Dec. 23, 2010 (KR) 10-2010-0133923

(75) Inventors: **Hyeng-cheul CHOI**, Seoul (KR);
Yang LIU, Seoul (KR); **Oul CHO**,
Suwon-si (KR); **Hyun min JANG**,
Jecheon-si (KR)

Publication Classification

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

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

(21) Appl. No.: **13/081,104**

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

(22) Filed: **Apr. 6, 2011**

(57) **ABSTRACT**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2010/
009340, filed on Dec. 24, 2010.

A ground radiation antenna is disclosed. Herein, the ground radiation antenna provides a ground radiator inducing resonance by using the inductance of a ground. Since the ground radiator efficiently uses the inductance of the ground, the ground radiator may operate as a radiator of the ground radiation antenna by using a simple structure of combining a capacitive element with the ground. As described above, by providing an antenna radiator having a remarkably simple structure, the fabrication cost for the antenna may be decreased, and the size of the antenna may also be largely reduced.

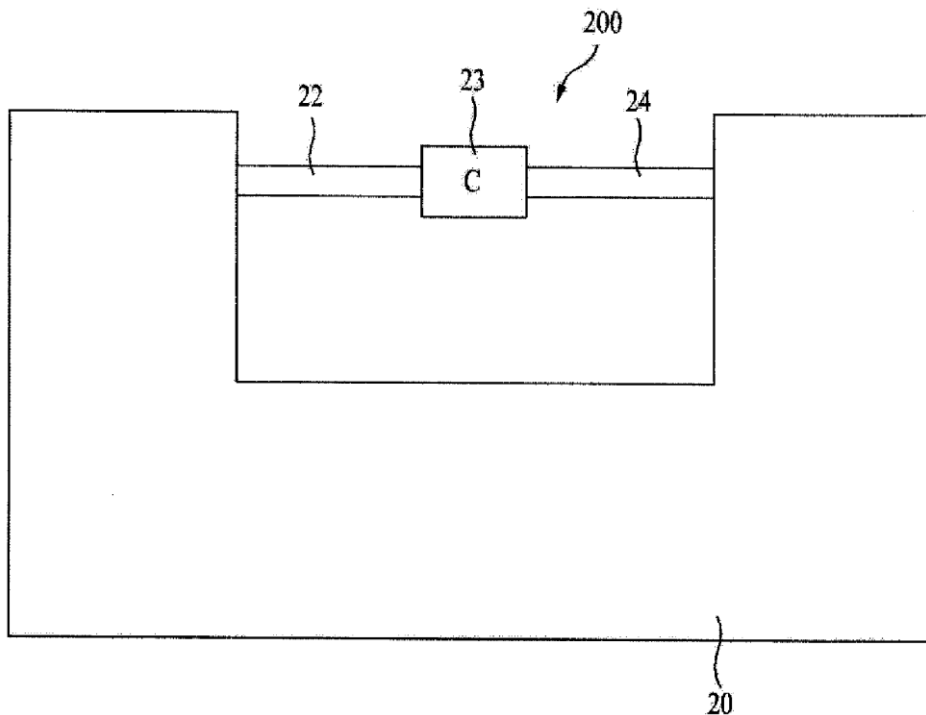
(30) **Foreign Application Priority Data**

Feb. 11, 2010 (KR) 10-2010-0012775

Apr. 9, 2010 (KR) 10-2010-0032922

May 7, 2010 (KR) 10-2010-0043186

May 7, 2010 (KR) 10-2010-0043189





US 20110193758A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0193758 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **ANTENNA ARRANGEMENT AND A RADIO APPARATUS INCLUDING THE ANTENNA ARRANGEMENT**

Publication Classification

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

(75) **Inventors: Zidong Liu, Dorset (GB); Kevin Boyle, Horsham (GB)**

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

(73) **Assignee: NXP B.V., Eindhoven (NL)**

(57) **ABSTRACT**

(21) **Appl. No.: 13/055,173**

(22) **PCT Filed: Jul. 23, 2009**

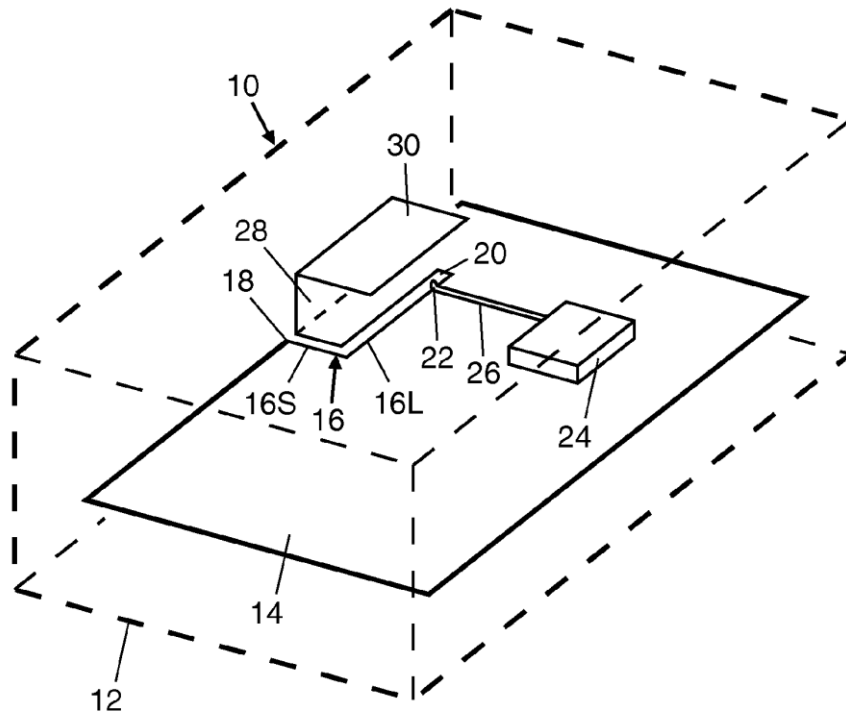
(86) **PCT No.: PCT/IB09/53210**

§ 371 (c)(1),
(2), (4) **Date: Apr. 14, 2011**

An antenna arrangement comprises a ground plane (14) and a planar antenna element (30) mounted spaced from and parallel to the ground plane. An open-ended slot (16) is provided in the ground plane (14), the slot being coextensive with an edge portion of the ground plane and having a first end (18) opening into the edge portion of the ground plane and a second closed end (20). An antenna feed (22) is coupled to the slot at a location intermediate the first and second ends. The planar antenna element is connected by an electrically conductive wall (28) to the edge portion of the ground plane, the wall (28) being co-extensive with the slot (16). The combination of the slot shape, slot location and the wall serves to increase the bandwidth of the antenna arrangement.

(30) **Foreign Application Priority Data**

Jul. 24, 2008 (EP) 08104868.8
Jul. 23, 2009 (IB) PCT/IB2009/053210





US 20110193759A1

(19) **United States**

(12) **Patent Application Publication**
You

(10) **Pub. No.: US 2011/0193759 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **ANTENNA DEVICE**

(52) **U.S. CL.** **343/770**

(76) **Inventor:** **You-Cheng You, Jhongli City (TW)**

(57) **ABSTRACT**

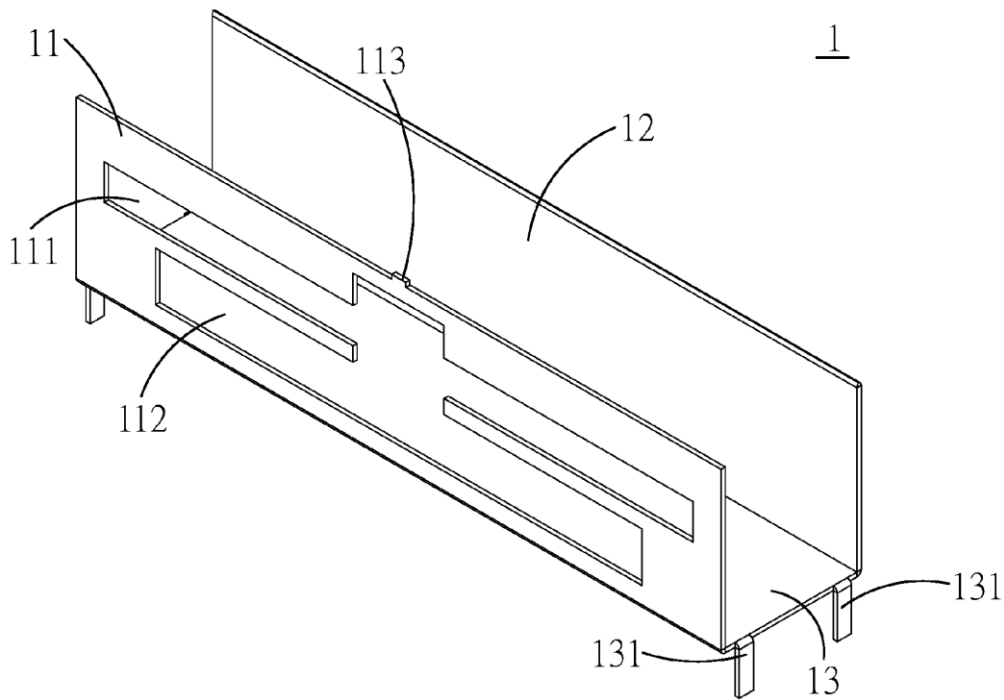
(21) **Appl. No.:** **12/701,777**

An antenna device includes an antenna radiation portion, a reflection portion and a connecting portion. The reflection portion and the antenna radiation portion are installed in parallel with each other at both ends of the connecting portion respectively, such that the connecting portion is connected to the antenna radiation portion and the reflection portion, and the antenna radiation portion and the reflection portion are formed by integrally bending a metal plate to reduce interferences caused by other external factors, so as to achieve the expected directivity, lower the production cost, and shorten the manufacturing time.

(22) **Filed:** **Feb. 8, 2010**

Publication Classification

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





US 20110193760A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0193760 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **ANTENNA USING COMPLEX STRUCTURE HAVING PERIODIC, VERTICAL SPACING BETWEEN DIELECTRIC AND MAGNETIC SUBSTANCES**

Publication Classification

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

(52) **U.S. Cl.** 343/787

(57) **ABSTRACT**

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

The present invention relates to an antenna using a complex structure in which dielectric substances having a low dielectric constant and magnetic substances having a high magnetic permeability are arranged vertically and periodically in order to improve the gain, efficiency, and bandwidth of the antenna while maintaining a small size which is an advantage of a conventional antenna using dielectric substances having a high dielectric constant. The present invention provides the antenna using a complex structure having a vertical and periodic structure of dielectric substances and magnetic substances, comprising a substrate and a radiation patch formed on the substrate. The substrate includes a plurality of layers. Each of the layers has the dielectric substances and the magnetic substances of a bar shape alternately arranged therein and has the dielectric substances and the magnetic substances alternately laminated thereon even in a height direction.

(21) **Appl. No.:** 13/054,786

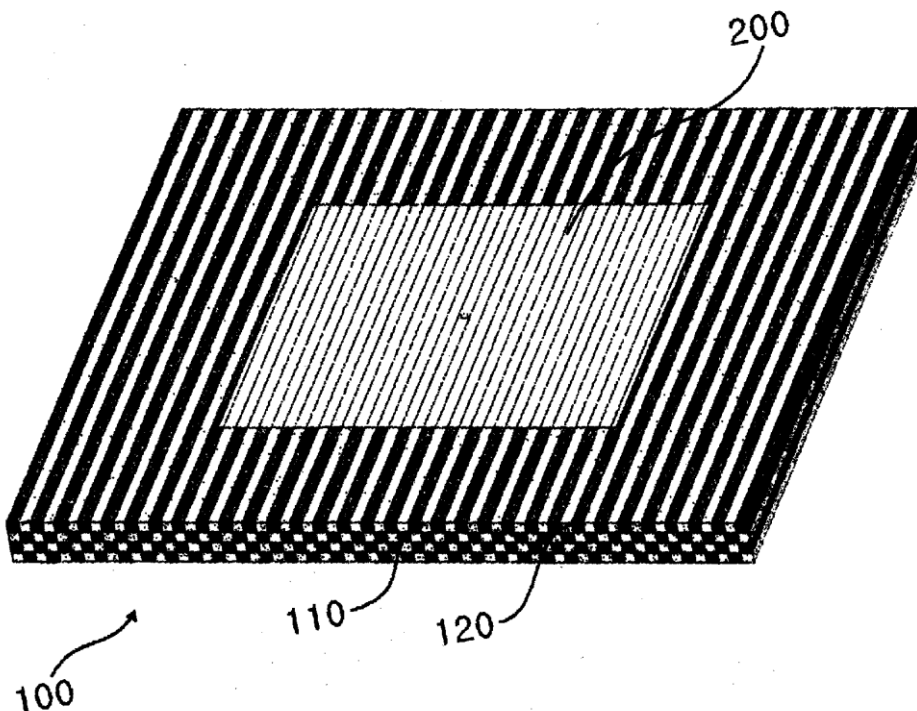
(22) **PCT Filed:** Jul. 20, 2009

(86) **PCT No.:** PCT/KR2009/004005

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

(30) **Foreign Application Priority Data**

Jul. 18, 2008 (KR) 1020080069884
Jul. 18, 2008 (KR) 1020080069885





(19) **United States**

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

(10) **Pub. No.: US 2011/0193762 A1**

(43) **Pub. Date: Aug. 11, 2011**

(54) **GROUND RADIATION ANTENNA**

May 7, 2010 (KR) 10-2010-0043186

May 7, 2010 (KR) 10-2010-0043189

May 7, 2010 (KR) 10-2010-0043190

Jun. 14, 2010 (KR) 10-2010-0056207

Dec. 23, 2010 (KR) 10-2010-0133919

(75) Inventors: **Hyeng-cheul CHOI**, Seoul (KR);
Jaeseok Lee, Seoul (KR); **Oul Cho**,
Suwon-si (KR); **Hyungjin Lee**,
Ansan-si (KR); **Bumki Park**, Seoul
(KR)

Publication Classification

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

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

(21) Appl. No.: **13/081,014**

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

(22) Filed: **Apr. 6, 2011**

(57) **ABSTRACT**

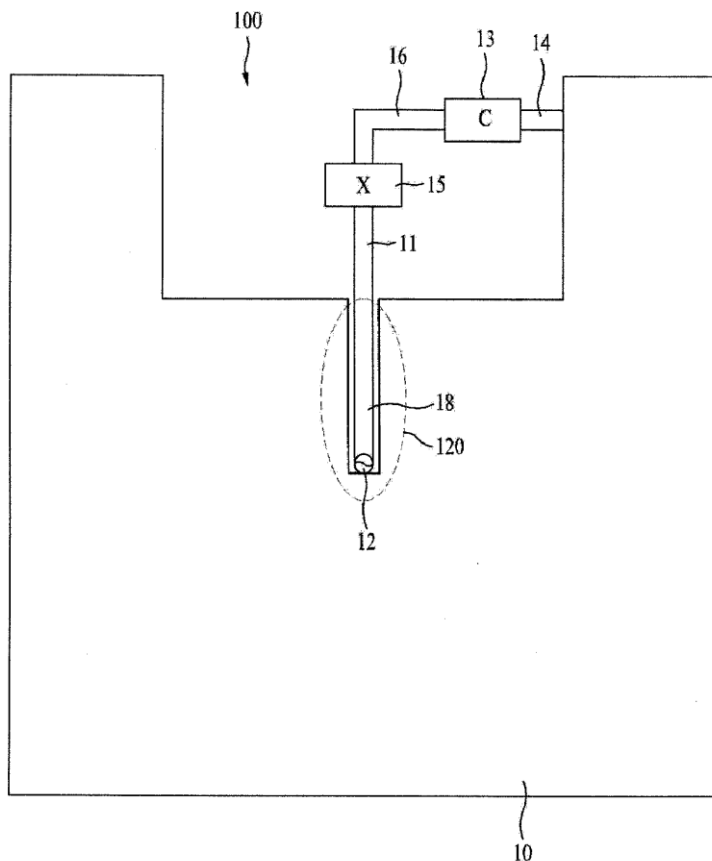
Related U.S. Application Data

(63) Continuation of application No. PCT/KR2010/
009338, filed on Dec. 24, 2010.

A ground radiation antenna is disclosed. Herein, the ground radiation antenna provides a radiator-forming circuit, which is formed to have a simple structure using a capacitive element, as well as a feeding circuit suitable for the provided radiator-forming circuit. Thus, the structure of the antenna becomes simpler and the size of the antenna becomes smaller. Accordingly, the fabrication process of the antenna is simplified, thereby largely reducing the fabrication cost.

Foreign Application Priority Data

(30) Feb. 11, 2010 (KR) 10-2010-0012775
Apr. 9, 2010 (KR) 10-2010-0032922





US 20110199265A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0199265 A1**

(43) **Pub. Date: Aug. 18, 2011**

(54) **THREE-BAND ANTENNA DEVICE WITH
RESONANCE GENERATION AND PORTABLE
ELECTRONIC DEVICE HAVING THE SAME**

Publication Classification

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

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

(57) **ABSTRACT**

A three-band antenna device with resonance generation includes a dielectric layer having an upper surface and a lower surface, a grounding element, a first radiating element, and a second radiating element. The first radiating element is arranged on the upper surface for providing a first frequency band. The second radiating element is arranged on the lower surface and stacked below the first radiating element via the dielectric layer for providing a second frequency band, so as to generate a parasitic capacitance therebetween. A third frequency band is provided by the resonance of the parasitic capacitance and the parasitic inductance in the second radiating element.

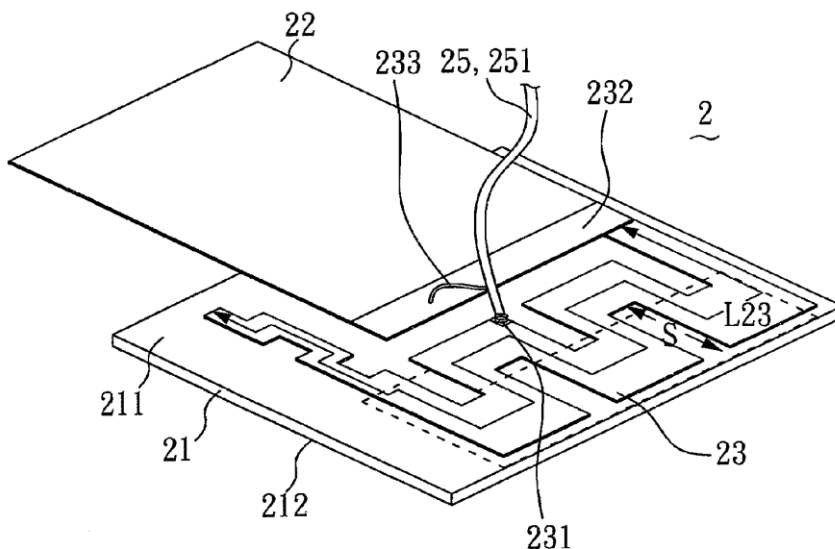
(76) Inventors: **Hsiao-Kuang LIN**, Taipei City (TW); **Yu-Cheng Chang**, Taipei City (TW); **Chih-Chun Chang**, Taipei City (TW)

(21) Appl. No.: **13/020,529**

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

(30) **Foreign Application Priority Data**

Feb. 12, 2010 (TW) 099104729





US 20110199267A1

(19) **United States**

(12) **Patent Application Publication**
Hayashi

(10) **Pub. No.: US 2011/0199267 A1**

(43) **Pub. Date: Aug. 18, 2011**

(54) **ANTENNA DEVICE**

Publication Classification

(75) **Inventor: Toshiteru Hayashi, Kanagawa (JP)**

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

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

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

(57) **ABSTRACT**

(21) **Appl. No.: 13/124,823**

(22) **PCT Filed: Aug. 27, 2009**

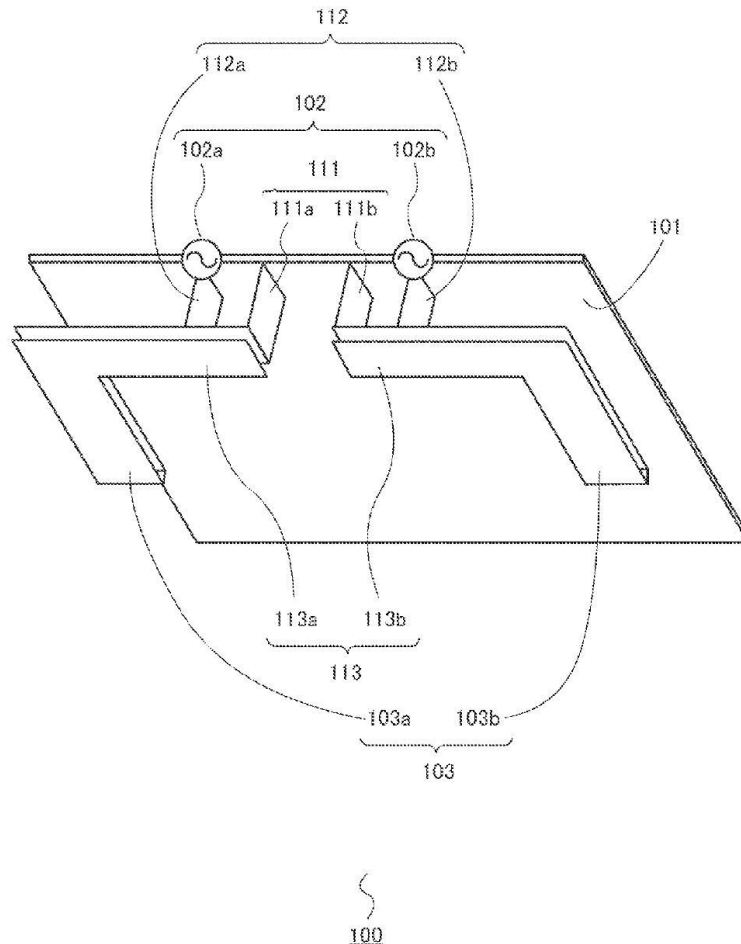
(86) **PCT No.: PCT/JP2009/004182**

§ 371 (c)(1),
(2), (4) **Date: Apr. 18, 2011**

Provided is an antenna device having excellent antenna characteristics at desired frequencies by suppressing influences to a human body and the like to minimum. In the device, a power feeding section (102) is arranged on a ground plate (101). An antenna element (103) has a section (112) to be fed with power supplied from the power feeding section (102), a grounding section (111) grounded to the ground plate (101), and a main body section (113) formed by making the surfaces of a conductive plate face each other by folding the conductive plate midway. The section (112) to be fed with power and the grounding section (111) form a reverse F-shape by being connected to the main body section (113), and are arranged at an end portion of the ground plate (101).

(30) **Foreign Application Priority Data**

Oct. 20, 2008 (JP) 2008-269988





US 20110199272A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0199272 A1**

(43) **Pub. Date: Aug. 18, 2011**

(54) **FIELD-CONFINED PRINTED CIRCUIT BOARD-PRINTED ANTENNA FOR RADIO FREQUENCY FRONT END INTEGRATED CIRCUITS**

(52) **U.S. CL. 343/741**

(57) **ABSTRACT**

(76) **Inventors:** **ZIMING HE**, Irvine, CA (US);
Ping Peng, Irvine, CA (US)

A printed circuit board (PCB)-printed antenna is disclosed. There is a printed circuit board substrate, and an electrically conductive radiating element fixed thereto. The radiating element is defined by a first main branch segment, a second main branch segment in a spaced parallel relation thereto, and a perpendicular bend segment connecting the first and second main branch segments. A feed line is electrically connected to the radiating element, and defines a feed port. Additionally, a ground line is electrically connected to the radiating element, and defines a ground port. A high frequency current loop is successively formed with an origin from the feed line, to the first main branch segment, to the bend segment, to the second main branch segment, and with a terminus of the ground line. The high frequency current loop confines the current and electromagnetic fields on the radiating element.

(21) **Appl. No.:** **13/029,554**

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

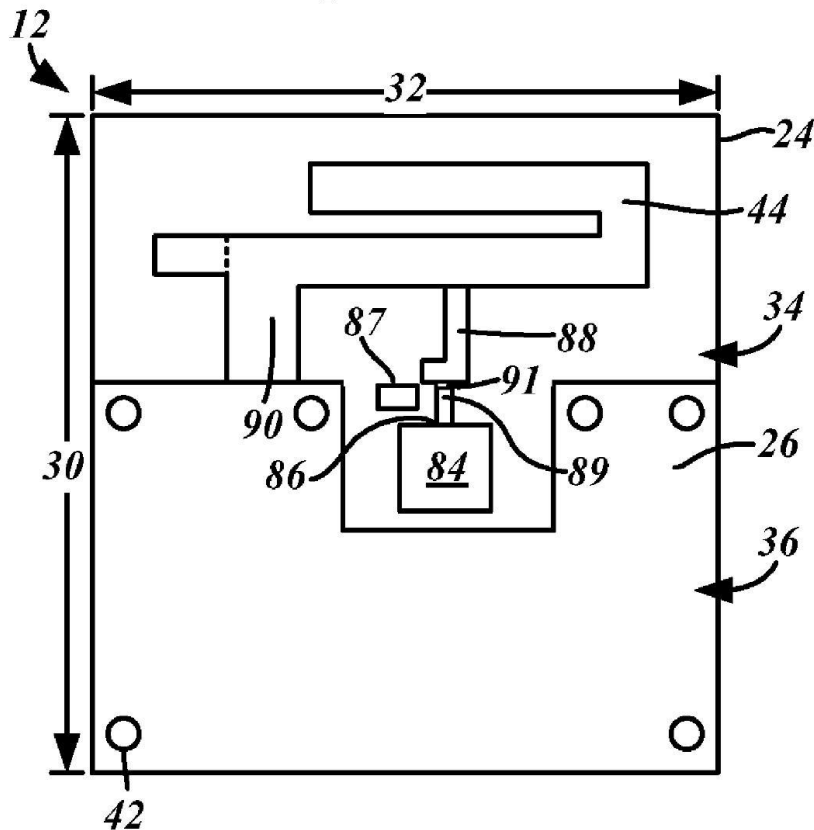
Related U.S. Application Data

(60) Provisional application No. 61/305,288, filed on Feb. 17, 2010.

Publication Classification

(51) **Int. Cl.**
H01Q 7/00 (2006.01)
H01Q 11/12 (2006.01)

TOP VIEW





US 20110205126A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0205126 A1**

(43) **Pub. Date: Aug. 25, 2011**

(54) **LOW-PROFILE FOLDED DIPOLE ANTENNAS AND RADIO COMMUNICATIONS DEVICES EMPLOYING SAME**

Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 9/26 (2006.01)
(52) **U.S. Cl.** **343/702; 343/803**

(75) **Inventors:** **Katsunori Ishimiya**, Tokyo (JP);
Magnus Steijner, Loddekopinge (SE)

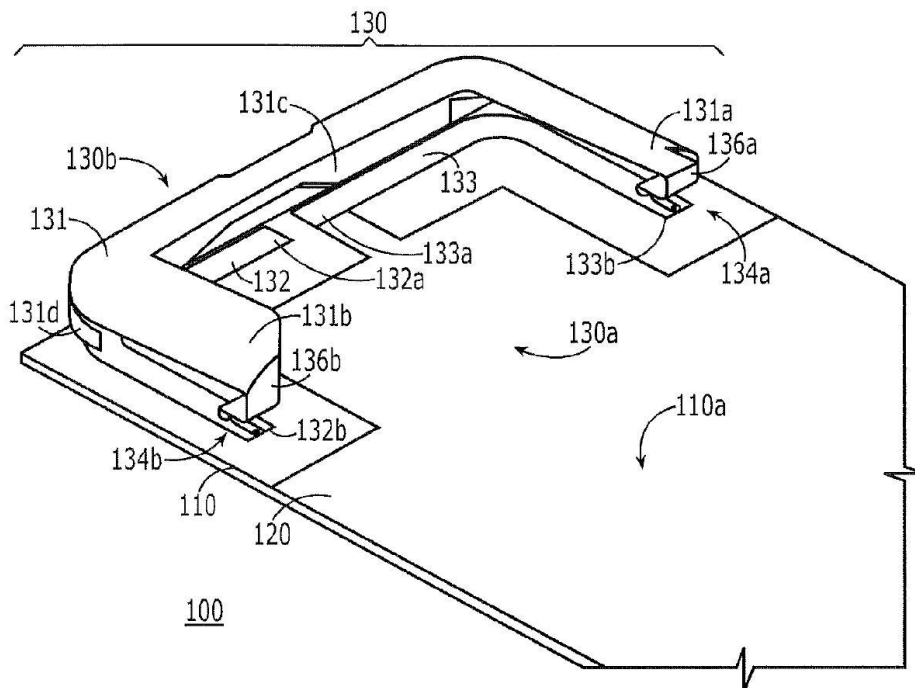
(57) **ABSTRACT**

An antenna system includes a folded loop radiator including a first loop portion conforming to a major surface of a planar substrate and an opposing second loop portion spaced apart from the planar substrate and including first and second ends electrically coupled to respective first and second ends of the first loop portion. The first and second loop portions may be disposed on the same side of the substrate or on opposite sides of the substrate.

(73) **Assignee:** **Sony Ericsson Mobile Communications AB**

(21) **Appl. No.:** **12/712,782**

(22) **Filed:** **Feb. 25, 2010**





US 20110205138A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0205138 A1**

(43) **Pub. Date: Aug. 25, 2011**

(54) **ANTENNA DEVICE**

Publication Classification

(75) Inventors: **Masahiro Yanagi**, Tokyo (JP);
Shigemi Kurashima, Tokyo (JP);
Hideaki Yoda, Tokyo (JP)

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/48 (2006.01)
(52) **U.S. Cl.** **343/845**

(73) Assignee: **FUJITSU COMPONENT LIMITED**, Tokyo (JP)

(57) **ABSTRACT**

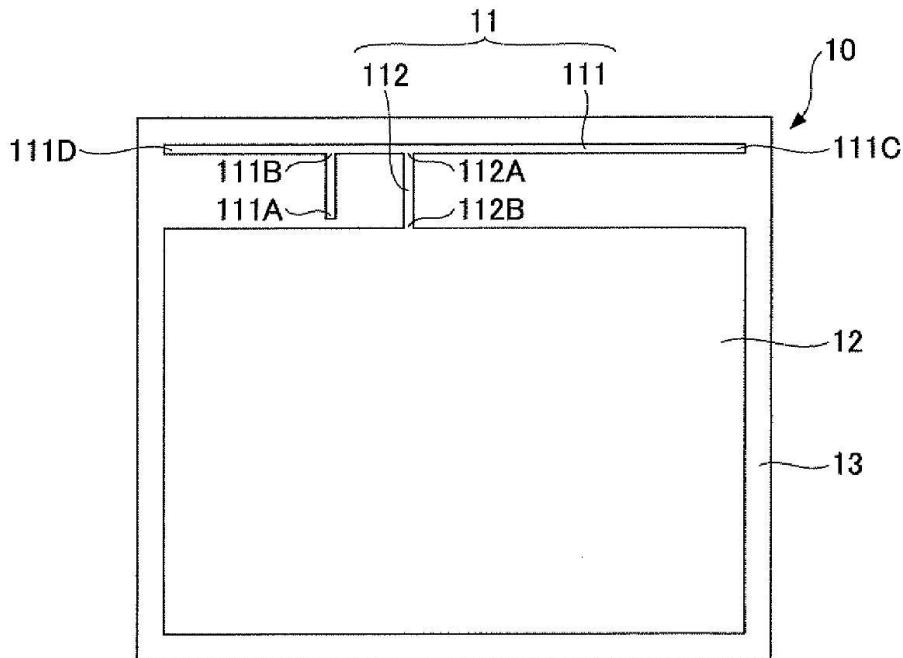
(21) Appl. No.: **12/956,048**

An antenna device includes a T-shaped element having a first end part, a second end part, and a third end part, the first end part being a feeding point, the T-shaped element being bifurcated at an intermediate point; and a stub having one end connected between the intermediate point and the second end point and another end connected to ground, the stub forming a π -shaped configuration with the T-shaped element; wherein a length of a first line between the first end part and the second end part is longer than a length of a second line between the first end part and the third end part; and the length of the first line and the length of the second line correspond to a first resonance frequency and a second resonance frequency.

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

(30) **Foreign Application Priority Data**

Feb. 25, 2010 (JP) 2010-039657





US 20110205141A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0205141 A1**

(43) **Pub. Date: Aug. 25, 2011**

(54) **ANTENNA PATTERN FRAME AND MOLD FOR MANUFACTURING ELECTRONIC DEVICE CASE INCLUDING THE SAME**

Publication Classification

(51) **Int. Cl.**
H01Q 1/40 (2006.01)
H01Q 1/12 (2006.01)
B29C 45/14 (2006.01)

(75) **Inventors:** **Ha Ryong HONG**, Gyeonggi-do (KR); **Sung Eun CHO**, Suwon (KR); **Dae Kyu LEE**, Suwon (KR); **Chan Gwang AN**, Suwon (KR); **Jae Suk SUNG**, Yongin (KR); **Ki Won CHANG**, Suwon (KR); **Dae Ki LIM**, Seongnam (KR); **Chang Mok HAN**, Cheonan (KR); **Hyun Do PARK**, Yongin (KR)

(52) **U.S. Cl.** **343/873; 425/116**

(73) **Assignee:** **SAMSUNG ELECTRO-MECHANICS CO., LTD.**, Gyeonggi-do (KR)

(57) **ABSTRACT**

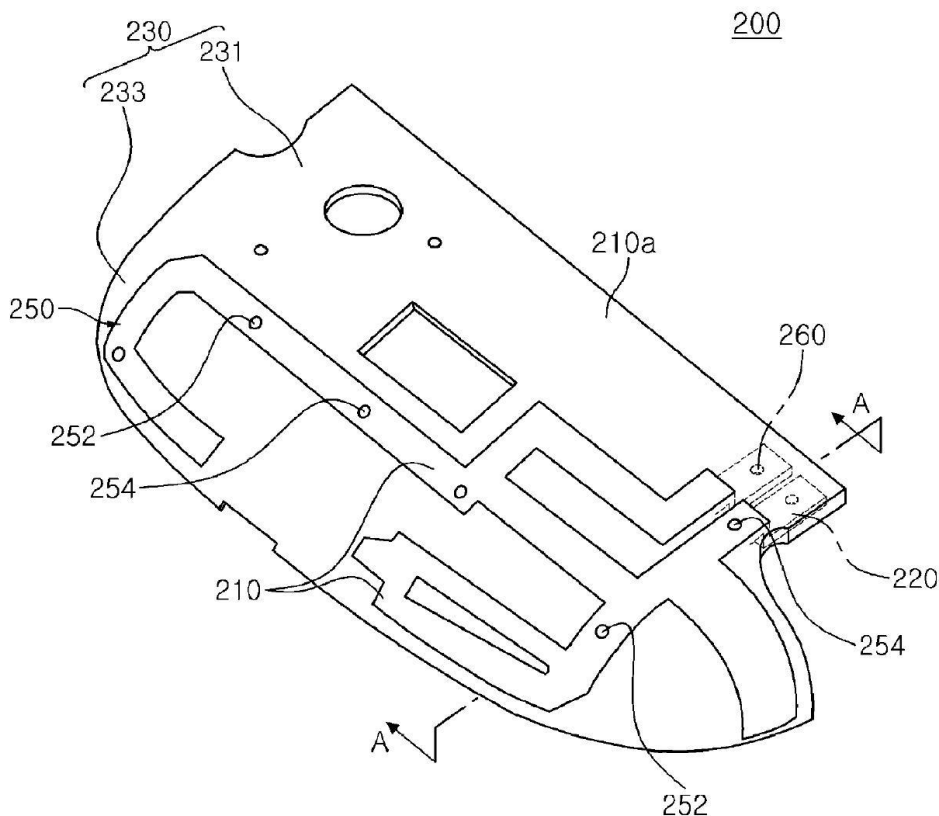
There is provided an antenna pattern frame including: a radiator comprising an antenna pattern portion transmitting and receiving a signal and a connection terminal portion allowing the signal to be transmitted to and received from a circuit board of an electronic device; and a radiator frame manufactured by injection molding on the radiator, allowing the antenna pattern portion to be embedded in a case of the electronic device, and supporting the radiator. The radiator frame includes a hydraulic recess introducing a resin material to a mold for manufacturing a case of the electronic device in which the radiator is embedded through injection molding, so that the radiator frame contacts the mold by injection pressure.

(21) **Appl. No.:** **13/027,345**

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

(30) **Foreign Application Priority Data**

Feb. 25, 2010 (KR) 10-2007-0017247





US 20110207422A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0207422 A1**

(43) **Pub. Date: Aug. 25, 2011**

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

Publication Classification

(75) Inventors: **Yasumitsu Ban**, Kawasaki (JP);
Takashi Yamagajo, Kawasaki (JP)

(51) **Int. Cl.**
H04B 1/034 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** **455/128; 343/700 MS**

(73) Assignee: **FUJITSU LIMITED**,
Kawasaki-shi (JP)

(57) **ABSTRACT**

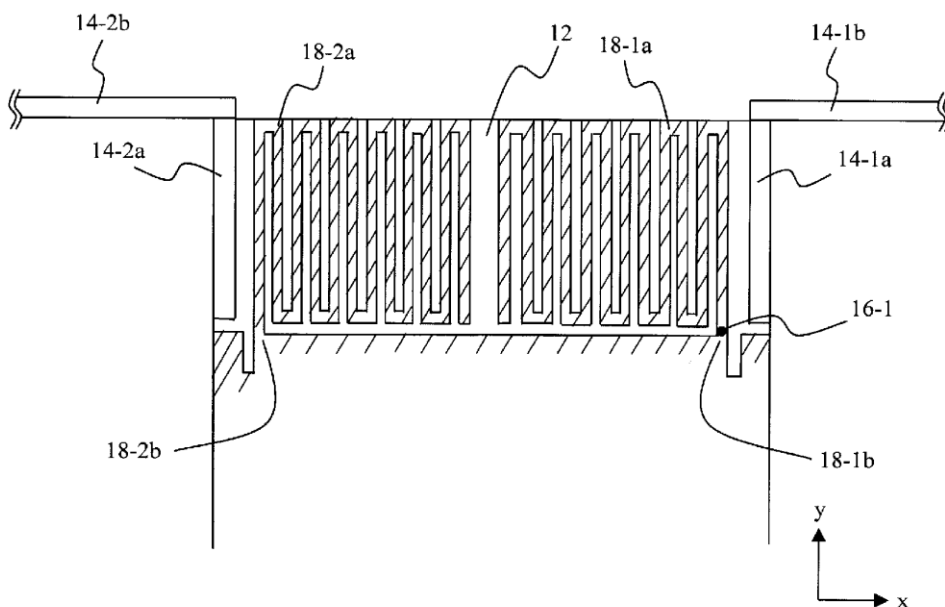
(21) Appl. No.: **13/020,175**

An antenna apparatus, including: a substrate; an antenna element which is arranged on the substrate and transmits or receives a radio signal; a feed point which is connected to the antenna element and feeds a current or a voltage to the antenna element; and a wiring pattern, one end of which is connected to a ground pattern formed on a portion of the substrate, wherein two or more sets of the antenna element, the feed point, and the wiring pattern is included if the antenna element, the feed point, and the wiring pattern form one set.

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

(30) **Foreign Application Priority Data**

Feb. 24, 2010 (JP) 2010-38584





US 20110210897A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0210897 A1**

(43) **Pub. Date: Sep. 1, 2011**

(54) **ANTENNA DEVICE FOR A PORTABLE TERMINAL**

Publication Classification

(76) Inventors: **Joon-Ho Byun**, Gyeonggi-do (KR);
Soon-Ho Hwang, Seoul (KR);
Mun-Il Kim, Seoul (KR); **Do-Won Kim**, Seoul (KR); **Hyun-Seok Park**, Seoul (KR)

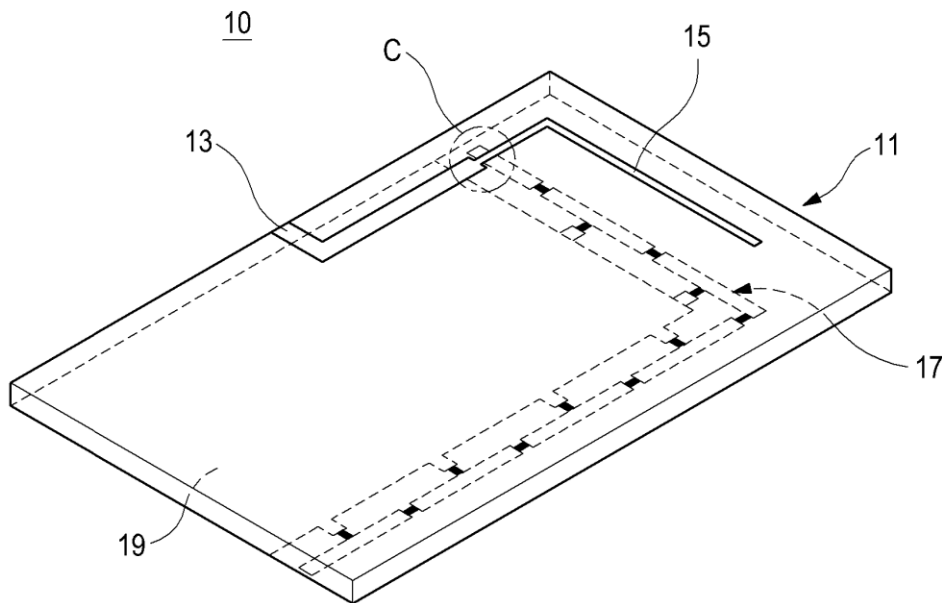
(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 9/06 (2006.01)
(52) **U.S. Cl.** **343/749; 343/700 MS**

(21) Appl. No.: **12/999,802**
(22) PCT Filed: **Jun. 12, 2009**
(86) PCT No.: **PCT/KR2009/003171**
§ 371 (c)(1),
(2), (4) Date: **May 20, 2011**

(57) **ABSTRACT**
An antenna device for a portable terminal includes: a ground pattern provided on one surface of a circuit board; a first antenna pattern configured to resonate at a first frequency band and provided on an opposite surface of the circuit board; and a second antenna pattern configured to resonate at a second frequency band different from the first frequency band and arranged along a periphery of the ground pattern. The second antenna pattern is a zeroth order mode resonator including a plurality of capacitors and a plurality of inductors. The antenna device easily secures the operation characteristics of different operation frequency bands and contributes to miniaturization of the portable terminal. Thus, a user can conveniently carry and use the portable terminal.

(30) **Foreign Application Priority Data**

Jun. 19, 2008 (KR) 10-2008-0057814





US 20110210898A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0210898 A1**

(43) **Pub. Date: Sep. 1, 2011**

(54) **GROUND RADIATION ANTENNA**

May 7, 2010 (KR) 10-2010-0043186

May 7, 2010 (KR) 10-2010-0043189

May 7, 2010 (KR) 10-2010-0043190

Jun. 14, 2010 (KR) 10-2010-0056207

Dec. 23, 2010 (KR) 10-2010-0133920

(75) Inventors: **Hyeng-cheul CHOI**, Seoul (KR);
Jaeseok Lee, Seoul (KR); **Oul Cho**,
Suwon-si (KR); **Xinxin Lu**, Seoul
(KR); **Jin-hyuk Jang**, Cheonan-si
(KR)

Publication Classification

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

(51) **Int. Cl.**
H01Q 1/48 (2006.01)
H01Q 9/06 (2006.01)

(21) Appl. No.: **13/081,063**

(52) **U.S. Cl.** **343/749; 343/848; 343/904**

(22) Filed: **Apr. 6, 2011**

(57) **ABSTRACT**

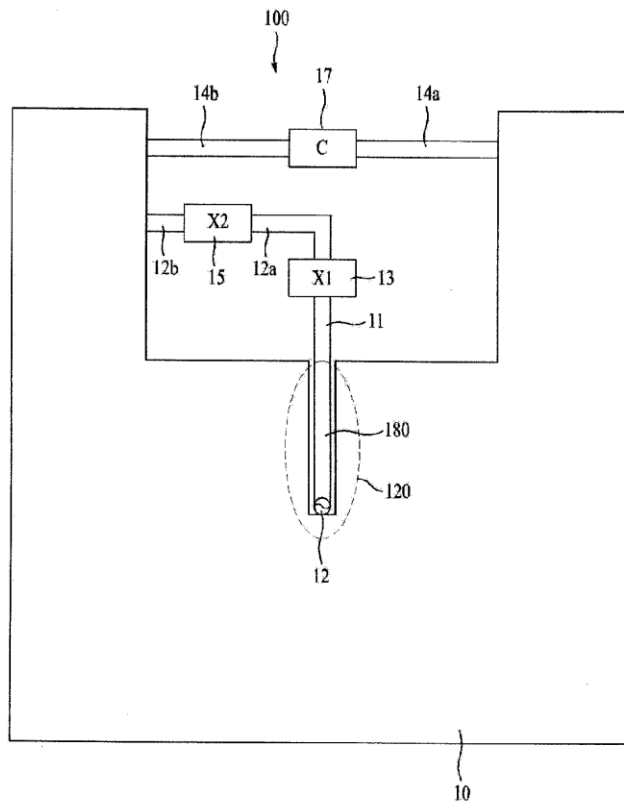
Related U.S. Application Data

(63) Continuation of application No. PCT/KR2010/
009339, filed on Dec. 24, 2010.

A ground radiation antenna is disclosed. Herein, the ground radiation antenna provides a radiator-forming circuit, which is formed to have a simple structure using a capacitive element, as well as a feeding circuit suitable for the provided radiator-forming circuit. Thus, the structure of the antenna becomes simpler and the size of the antenna becomes smaller. Accordingly, the fabrication process of the antenna is simplified, thereby largely reducing the fabrication cost.

Foreign Application Priority Data

Feb. 11, 2010 (KR) 10-2010-0012775
Apr. 9, 2010 (KR) 10-2010-0032922





US 20110210902A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0210902 A1**

(43) **Pub. Date: Sep. 1, 2011**

(54) **MOBILE COMMUNICATION DEVICE AND METHOD FOR ASSEMBLING THE MOBILE COMMUNICATION DEVICE**

Publication Classification

(75) Inventors: **Hiroaki Sakashita**, Kawasaki (JP);
Tatsuhito Araki, Kawasaki (JP);
Hiroaki Matsuda, Kawasaki (JP);
Takehisa Ishikawa, Kawasaki (JP);
Takashi Suzuki, Kawasaki (JP);
Kouki Murakami, Kawasaki (JP);
Hidehiko Hizuka, Kawasaki (JP)

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

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

(73) Assignee: **FUJITSU IMITED**, Kawasaki-shi (JP)

(57) **ABSTRACT**

A mobile terminal device includes a circuit board accommodated in a casing and an antenna disposed on the outside of the casing electrically connected to each other via an opening formed in the casing, a first conductive member fixed to an inner surface of the casing while being connected to the circuit board, a second conductive member detachably attached to an outer surface of the casing while being connected to the antenna, and a conductive fastening member fitted into the opening from outside the casing and fastening the first conductive member and the second conductive member together.

(21) Appl. No.: **12/872,242**

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

(30) **Foreign Application Priority Data**

Sep. 1, 2009 (JP) 2009-202067

