



US 20110267236A1

(19) **United States**

(12) **Patent Application Publication**
YOSHIOKA

(10) **Pub. No.: US 2011/0267236 A1**

(43) **Pub. Date: Nov. 3, 2011**

(54) **BROADBAND ANTENNA UNIT COMPRISING
A FOLDED PLATE-SHAPED MONOPOLE
ANTENNA PORTION AND AN EXTENDING
PORTION**

Publication Classification

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

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

(75) **Inventor:** Hiroki YOSHIOKA, Tokyo (JP)

(57) **ABSTRACT**

(73) **Assignee:** MITSUMI ELECTRIC CO.,
LTD., Tokyo (JP)

In a broadband antenna unit including a ground plate, an antenna element disposed in the vicinity of an end of the ground plate, and a dielectric substrate for mounting the antenna element therein, the antenna element includes a folded plate-shaped monopole antenna portion having a U-shape in cross section and an extending portion extending from the folded plate-shaped monopole antenna portion. The antenna element is disposed on the side of one side edge of the ground plate. The broadband antenna unit has a feeding point between the ground plate and the antenna element that is disposed at a feeding position apart from the one side by a predetermined distance. A ratio between a width of the ground plate and the predetermined distance is substantially 5:2 when a ratio between the width of the ground plate and a width of the folded plate-shaped monopole antenna portion is 2:1.

(21) **Appl. No.:** 13/182,999

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

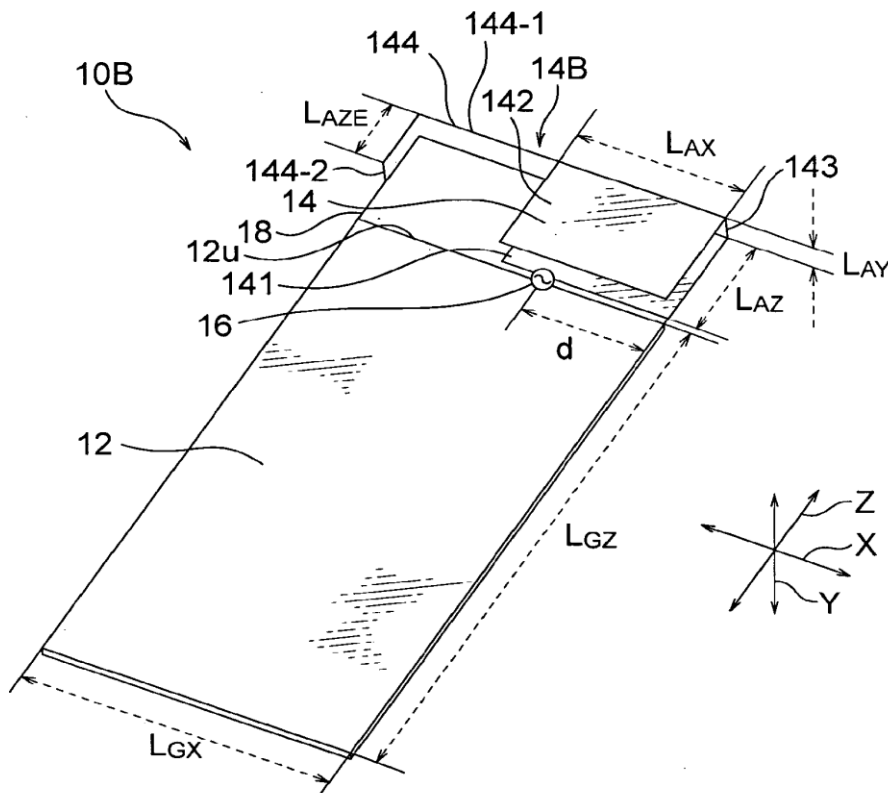
Related U.S. Application Data

(62) Division of application No. 12/069,332, filed on Feb. 8, 2008.

(30) **Foreign Application Priority Data**

Feb. 20, 2007 (JP) 2007-38737

Jul. 31, 2007 (JP) 2007-200132





US 20110267237A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0267237 A1**

(43) **Pub. Date: Nov. 3, 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**, Hsichih (TW);
Wei-Yu Chen, Hsichih (TW)

(57) **ABSTRACT**

(21) **Appl. No.:** **12/851,588**

A dual-band mobile communication device includes a ground plane and an antenna. The antenna is located on a dielectric substrate and includes a feeding portion and a shorted radiating portion. One end of the feeding portion is a feeding point of the antenna. The A length of the shorted radiating portion is at least twice that of the feeding portion. One A first end of the shorted radiating portion, electrically connected to the ground plane, is a shorting end, and the other second end of the shorted radiating portion is an open end. The shorted radiating portion includes multiple bendings which form multiple fractional sections, wherein the open end of the shorted radiating portion extends toward a first fractional section of the shorting end of the shorted radiating portion. A coupling gap is existed between a second fractional section of the open end of the shorted radiating portion and the feeding portion.

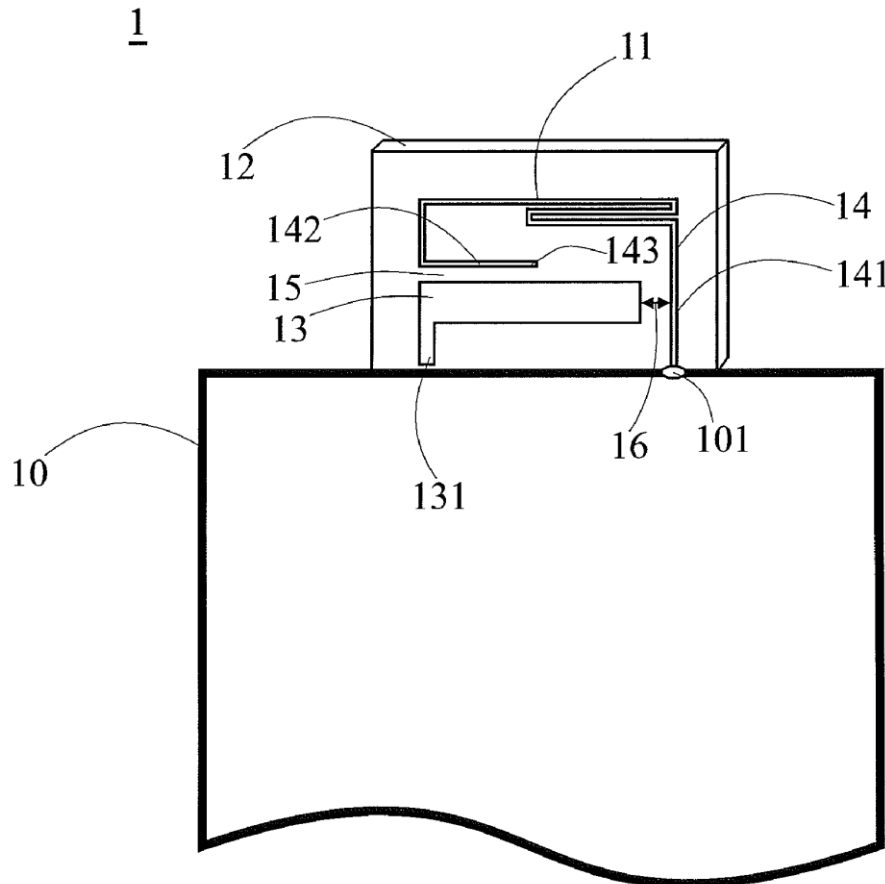
(22) **Filed:** **Aug. 6, 2010**

(30) **Foreign Application Priority Data**

May 3, 2010 (TW) 099114095

Publication Classification

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





US 20110267238A1

(19) **United States**

(12) **Patent Application Publication**
Nekozuka

(10) **Pub. No.: US 2011/0267238 A1**

(43) **Pub. Date: Nov. 3, 2011**

(54) **PORTABLE ELECTRONIC DEVICE**

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

(75) **Inventor:** Hikaru Nekozuka, Kanagawa (JP)

(57) **ABSTRACT**

(73) **Assignee:** Kyocera Corporation

Disclosed is a portable electronic device that is capable of transforming into a first state and a second state and that is equipped with an antenna which is disposed such that in the first state said antenna is near a magnetic field-shielding part and communication is not possible and in the second state said antenna is separated from the magnetic field-shielding part and communication is possible. This portable electronic device (1) is equipped with: an operation-unit-side chassis (2); a display-unit-side chassis (3); a connecting part (4) that connects the operation-unit-side chassis (2) and the display-unit-side chassis (3) such that transformation to the first state and to the second state are possible; a magnetic field-shielding part (170) disposed in the operation-unit-side chassis (2); and an antenna that is disposed in the display-unit-side chassis (3), and in the first state is disposed in a proximal position which is near the magnetic field-shielding part (170), and in the second state is disposed in a separated position which is farther from the magnetic field-shielding part (170) than the proximal position.

(21) **Appl. No.:** 13/131,534

(22) **PCT Filed:** Nov. 26, 2009

(86) **PCT No.:** PCT/JP2009/006395

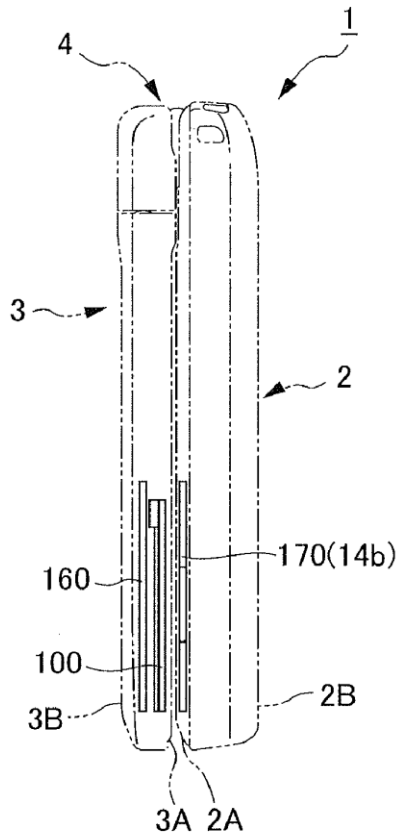
§ 371 (c)(1),
(2), (4) **Date:** Jul. 25, 2011

(30) **Foreign Application Priority Data**

Nov. 26, 2008 (JP) 2008-301184

Publication Classification

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





US 20110267239A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0267239 A1**

(43) **Pub. Date: Nov. 3, 2011**

(54) **PORTABLE RADIO DEVICE**

(30) **Foreign Application Priority Data**

(75) Inventors: **Nobuharu Mashima**, Toyama (JP);
Tadashi Oga, Kanagawa (JP);
Shoichi Kajiwara, Osaka (JP);
Kiyoshi Nakanishi, Kanagawa (JP)

Jan. 6, 2009 (JP) 2009-000615

Publication Classification

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

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

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

(57) **ABSTRACT**

(21) Appl. No.: **13/143,283**

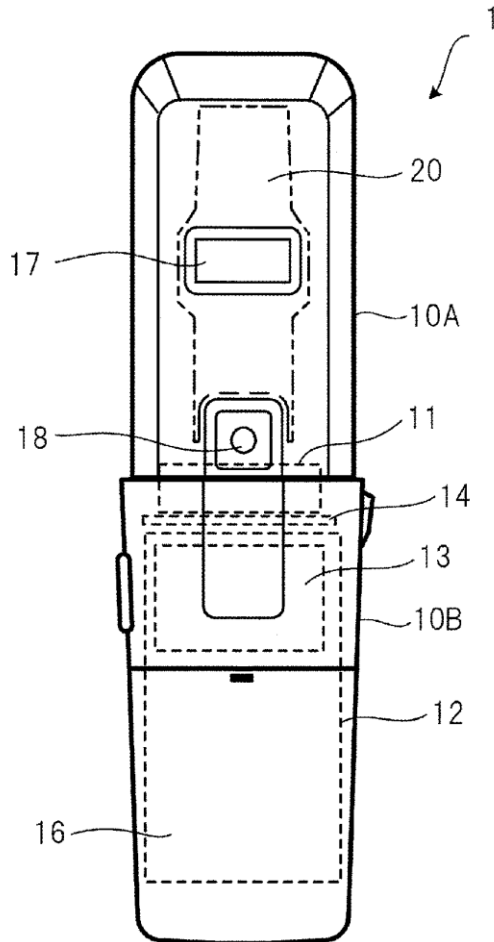
(22) PCT Filed: **Nov. 20, 2009**

(86) PCT No.: **PCT/JP2009/006275**

§ 371 (c)(1),
(2), (4) Date:

Jul. 5, 2011

A portable radio device includes: a housing made of non-conductor having a first permittivity; a circuit board disposed in the housing; a radio circuit disposed on the circuit board; an antenna element connected to the radio circuit; and a dielectric body. The dielectric body is disposed substantially in a center of the housing in a lateral direction thereof and has a second permittivity higher than the first permittivity.





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(19) **United States**

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

(10) **Pub. No.: US 2011/0267240 A1**

(43) **Pub. Date: Nov. 3, 2011**

(54) **PORTABLE WIRELESS DEVICE**

Publication Classification

(75) Inventors: **Haruhiko Kakitsu**, Shizuoka (JP);
Toshihiro Asahina, Kanagawa (JP)

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

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

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

(57) **ABSTRACT**

(21) Appl. No.: **13/143,583**

(22) PCT Filed: **Nov. 24, 2009**

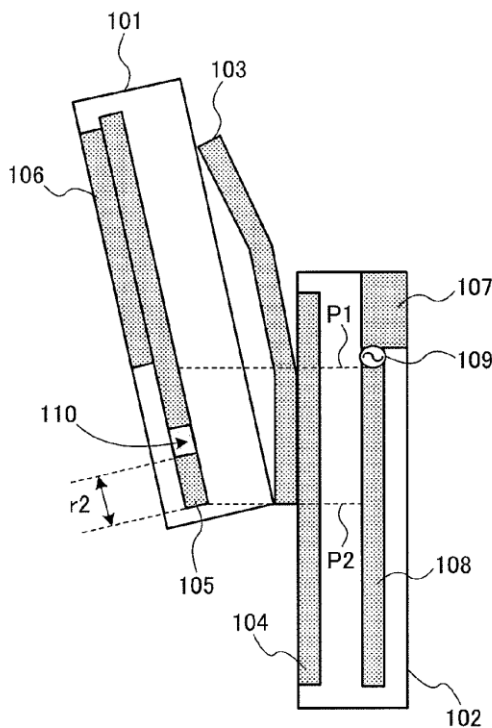
A portable wireless device wherein antenna performance deterioration when using a slide mechanism having a metal member can be prevented. In this portable wireless device, a second housing (102) is slidably attached to a first housing (101). The circuit board (105) is provided in the first housing (101) and has a slit (110) which extends in a direction crossing the sliding direction of the first housing (101) and is located below a power feed unit (109) when the wireless device is opened. The circuit board (108) is provided in the second housing (102) and overlaps with the bottom side of the circuit board (105) as seen from a plan view when the first housing (101) is slid open. The antenna (107) is provided on the upper side of the second housing (102). The power feed unit (109) supplies power to the antenna (107) at a position close to the antenna (107).

(86) PCT No.: **PCT/JP2009/006320**

§ 371 (c)(1),
(2), (4) Date: **Jul. 7, 2011**

(30) **Foreign Application Priority Data**

Jan. 9, 2009 (JP) 2009-003635





US 20110267244A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0267244 A1**

(43) **Pub. Date: Nov. 3, 2011**

(54) **MULTI-FUNCTIONAL CRLH ANTENNA DEVICE**

Publication Classification

(76) Inventors: **Sunil Kumar Rajgopal**, San Diego, CA (US); **Ajay Gummalla**, Sunnyvale, CA (US); **Cheng Jung Lee**, Santa Clara, CA (US); **Vaneet Pathak**, San Diego, CA (US)

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01P 11/00 (2006.01)
H01Q 1/50 (2006.01)
(52) **U.S. Cl.** **343/720; 343/700 MS; 343/850; 29/601**

(21) Appl. No.: **13/038,450**

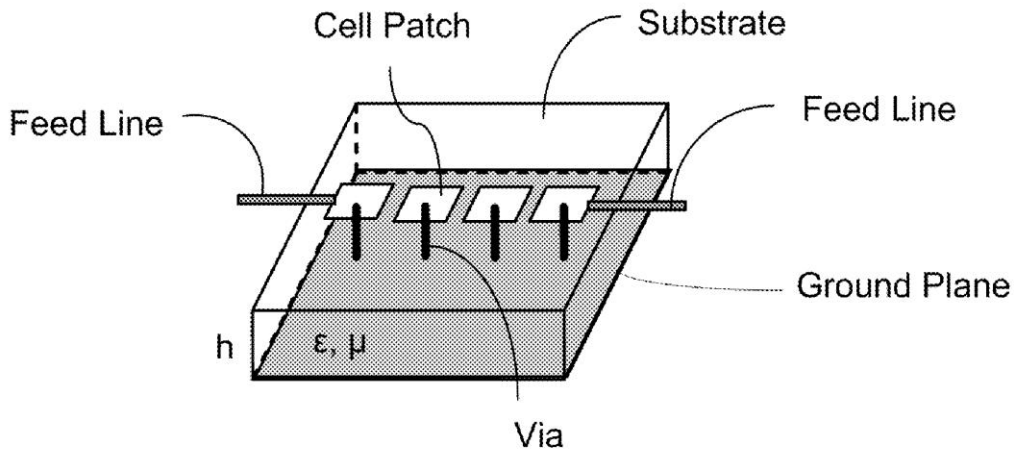
(57) **ABSTRACT**

(22) Filed: **Mar. 2, 2011**

This application relates to a multi-functional Composite Right and Left Handed CRLH antenna device. A conductive element of a wireless device is incorporated into the antenna structure for reuse. In one embodiment a peripheral feature, such as a key dome, is incorporated into the antenna device. In this way, the antenna structure includes portions which are multi-functional.

Related U.S. Application Data

(60) Provisional application No. 61/310,220, filed on Mar. 3, 2010.





US 20110267245A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0267245 A1**

(43) **Pub. Date: Nov. 3, 2011**

(54) **MULTIPLE-INPUT MULTIPLE-OUTPUT ANTENNA SYSTEM**

Publication Classification

(75) Inventors: **Gyu Bok PARK**, Yongin-si (KR);
Se Hyun PARK, Suwon-si (KR);
Dong Hyun LEE, Suwon-si (KR);
Austin KIM, Seongnam-si (KR);
Joon Ho BYUN, Yongin-si (KR);
Jaе Hoon JO, Seoul (KR); **Kyung Kyun KANG**, Suwon-si (KR)

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

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

(57) **ABSTRACT**

A Multiple-Input Multiple-Output (MIMO) antenna system with multiple antennas is provided. The MIMO antenna system includes a number of conductive elements, and a number of band stop devices. The conductive elements are spaced apart from each other and operate in corresponding resonant frequency bands respectively when they receive electric power. When the conductive elements are operated, the band stop devices block interference between the conductive elements in the resonant frequency bands, and isolate the conductive elements from each other. The band stop devices are located between adjacently separate conductive elements and connect the conductive elements to each other. The MIMO antenna system can stop interference between the conductive elements via the band stop devices, thereby increasing the operational efficiency of the conductive elements.

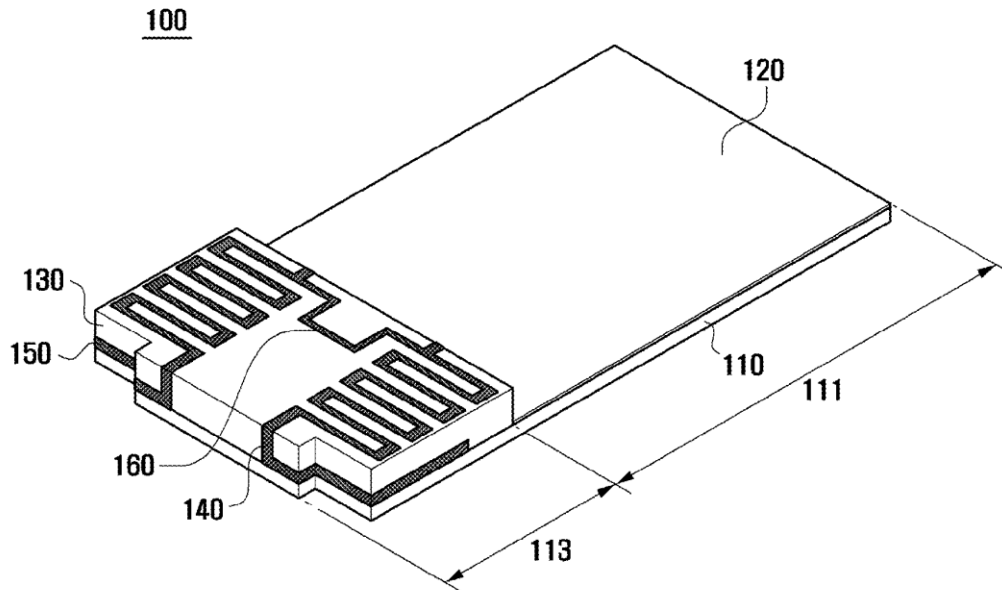
(73) Assignee: **SAMSUNG ELECTRONICS CO. LTD.**, Suwon-si (KR)

(21) Appl. No.: **13/051,382**

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

(30) **Foreign Application Priority Data**

May 3, 2010 (KR) 10-2010-0041244





US 20110267246A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0267246 A1**

(43) **Pub. Date: Nov. 3, 2011**

(54) **MULTI-FREQUENCY ANTENNA**

Publication Classification

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

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

(52) **U.S. Cl.** **343/750; 343/749**

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

(57) **ABSTRACT**

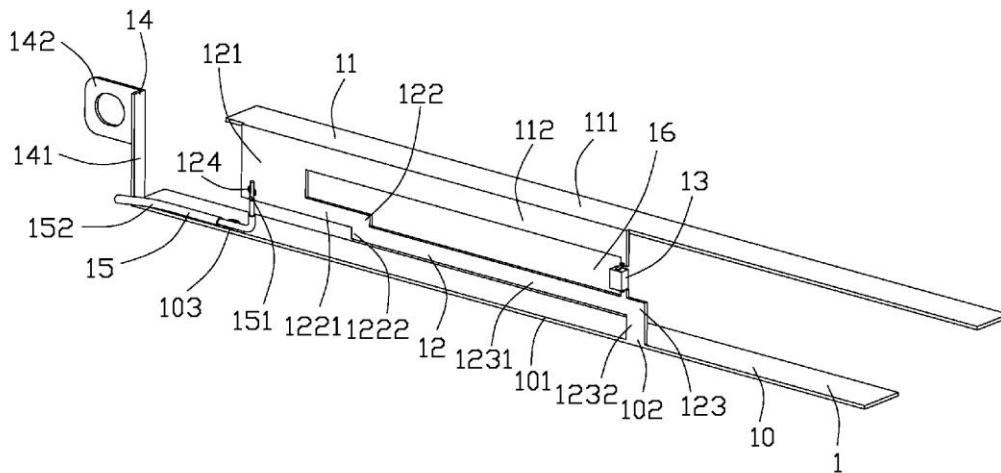
(21) Appl. No.: **13/069,386**

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

A multi-frequency antenna (1) includes a grounding portion (1) extending along a transversal direction; a radiating arm (11) extending along a transversal direction and disposed above the grounding portion; a connecting arm (12) connected to the grounding portion and the radiating arm; a capacitor (13) connected to the radiating portion and the connecting arm; and a cable (15) having an inner conductor connected to the connecting arm and an outer conductor connected to the grounding portion.

(30) **Foreign Application Priority Data**

Apr. 28, 2010 (TW) 99113420





US 20110267311A1

(19) **United States**

(12) **Patent Application Publication**
Yeh

(10) **Pub. No.: US 2011/0267311 A1**

(43) **Pub. Date: Nov. 3, 2011**

(54) **TOUCH PANEL HAVING HIDDEN ANTENNA**

G06F 3/045 (2006.01)

H01Q 1/22 (2006.01)

(76) Inventor: **Fu-Lin Yeh**, New Taipei City (TW)

(52) **U.S. Cl.** **345/174; 343/720; 345/173**

(21) Appl. No.: **13/091,221**

(57) **ABSTRACT**

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

(30) **Foreign Application Priority Data**

Apr. 30, 2010 (TW) 099207954

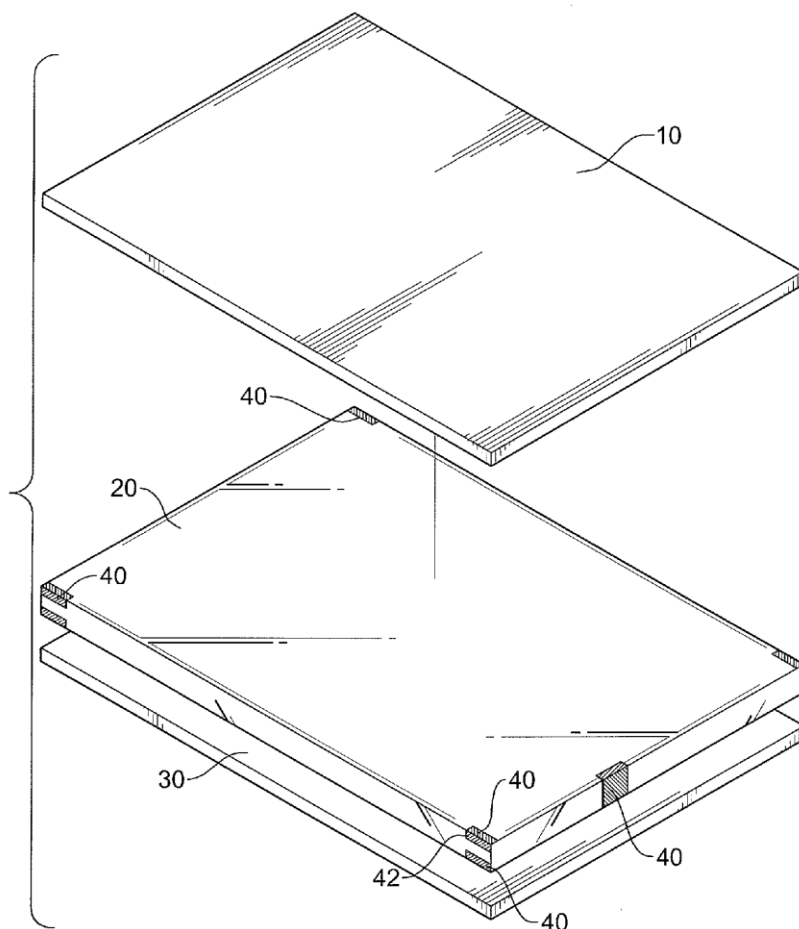
Publication Classification

(51) **Int. Cl.**

G06F 3/044 (2006.01)

G06F 3/041 (2006.01)

A touch panel having hidden antenna has a multi-layer body and at least one antenna unit. The multi-layer body has a first electrode, a second electrode and an intermediate layer sandwiched by the first electrode and the second electrode. The at least one antenna unit is mounted on different positions inside the multi-layer body to constitute a plane antenna or a three-dimensional antenna. Accordingly, hidden inside the multi-layer body, the at least one antenna unit is not prone to defacement and damage, occupies little space, has a good communication quality and is durable.





US 20110273336A1

(19) **United States**

(12) **Patent Application Publication**
Wolf

(10) **Pub. No.: US 2011/0273336 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **ANTENNA HAVING PLANAR CONDUCTING ELEMENTS, ONE OF WHICH HAS A PLURALITY OF ELECTROMAGNETIC RADIATORS AND AN OPEN SLOT**

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

(57) **ABSTRACT**

(75) **Inventor: Forrest D. Wolf, Reno, NV (US)**

(73) **Assignee: Pinyon Technologies, Inc., Reno, NV (US)**

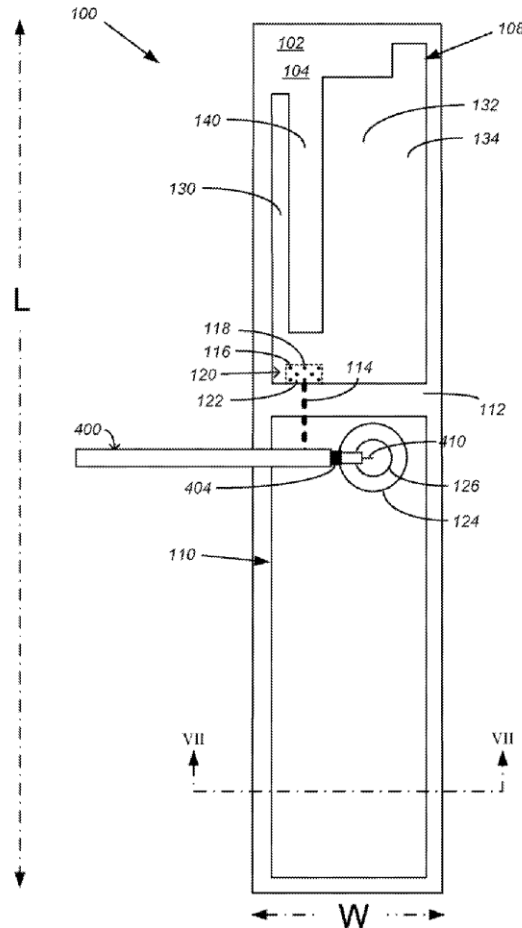
(21) **Appl. No.: 12/777,103**

(22) **Filed: May 10, 2010**

An antenna includes a dielectric material having i) a first side opposite a second side, and ii) a conductive via therein. A first planar conducting element is on the first side of the dielectric material and has an electrical connection to the conductive via. A second planar conducting element is also on the first side of the dielectric material. A gap electrically isolates the first and second planar conducting elements from each other. An electrical microstrip feed line on the second side of the dielectric material electrically connects to the conductive via and has a route that extends from the conductive via, to across the gap, to under the second planar conducting element. The first planar conducting element has a plurality of electromagnetic radiators, each having dimensions that cause it to resonate over a range of frequencies that differs from a range of frequencies over which an adjacent radiator resonates. At least first and second of the radiators bound an open slot in the first planar conducting element. The open slot has an orientation perpendicular to the gap.

Publication Classification

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





US 20110273340A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0273340 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **ANTENNA DEVICE FOR MOBILE TERMINAL**

Publication Classification

(75) Inventors: **Jong Hyeok JEON**, Seoul (KR);
Seon Kyeng KIM, Yongin-si (KR);
Jung Min YANG, Seongnam-si (KR)

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

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

(57) **ABSTRACT**

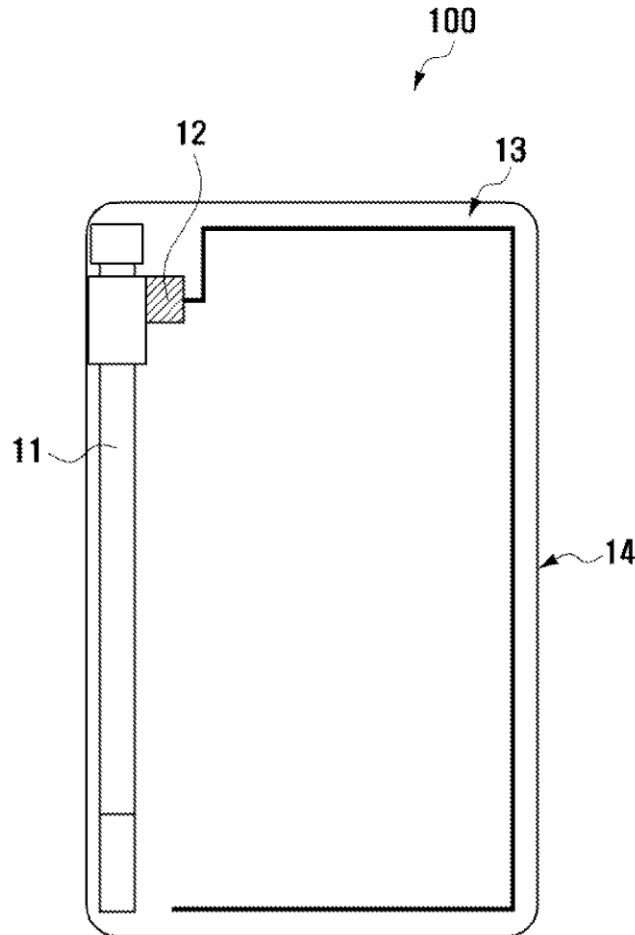
(21) Appl. No.: **13/099,710**

An antenna device for a mobile terminal is provided. The antenna device is adapted for digital broadcast reception. The mobile terminal is composed of a front case, a rear case, a battery cover, a main board and a feed supplying power on the main board. The mobile terminal includes a first antenna, electrically connected to the feed, for receiving electric current from the feed to receive a digital broadcast signal, and a second antenna, electrically connected to the feed and installed separately from the first antenna, for receiving electric current from the feed to receive a digital broadcast signal. The first antenna and the second antenna are used for antenna matching and bandwidth maintenance during digital broadcast reception. Hence, reception performance of digital broadcast signals can be improved.

(22) Filed: **May 3, 2011**

(30) **Foreign Application Priority Data**

May 6, 2010 (KR) 10-2010-0042543





US 20110273341A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0273341 A1**

(43) **Pub. Date: Nov. 10, 2011**

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

Publication Classification

(75) Inventors: **Sang Min HAN**, Suwon-si (KR);
Jin Kyu BANG, Suwon-si (KR);
Min Kyung LEE, Hwaseong-si (KR)

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

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

(73) Assignee: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR)

(57) **ABSTRACT**

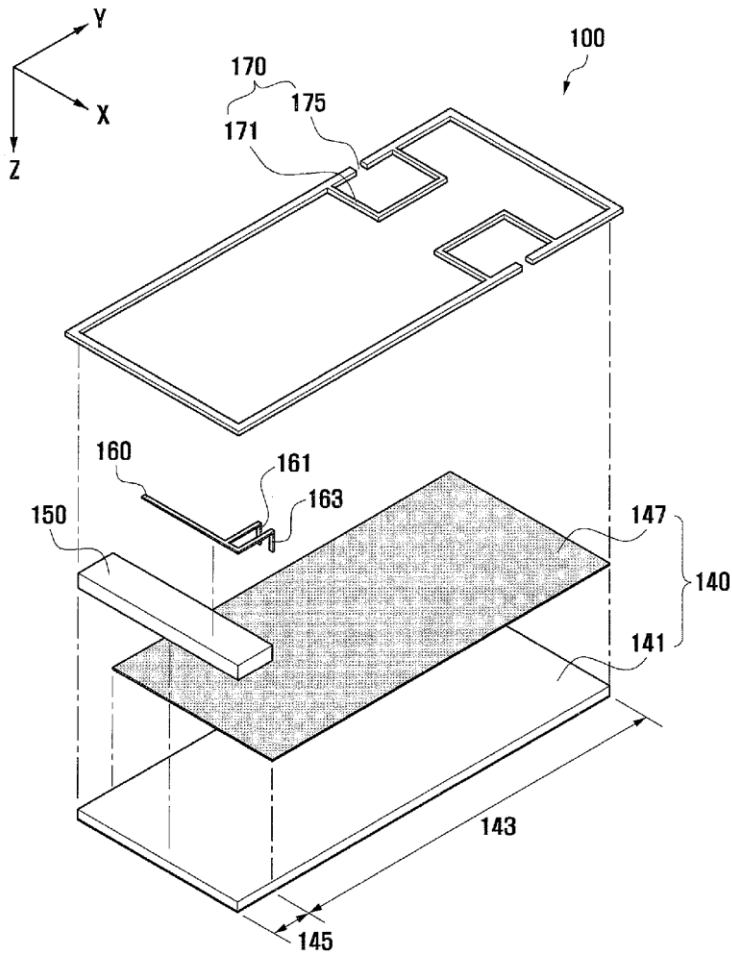
(21) Appl. No.: **13/099,733**

A communication terminal and an antenna apparatus of the communication terminal are provided. The communication terminal includes a board body having a structure of a flat panel, an antenna element which is arranged at one end of the body and, when electric current is supplied, resonant in a resonant frequency band for transmitting and receiving signals, and at least one blocking plate which is arranged around the antenna element and alters, when the antenna element is resonant, at least one of a radiation pattern and a radiation strength of the antenna element.

(22) Filed: **May 3, 2011**

(30) **Foreign Application Priority Data**

May 10, 2010 (KR) 10-2010-0043326
Apr. 21, 2011 (KR) 10-2011-0037439





US 20110273343A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0273343 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE COMPRISING MULTI-FREQUENCY
BAND ANTENNA AND RELATED METHODS**

Publication Classification

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

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

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

(57) **ABSTRACT**

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

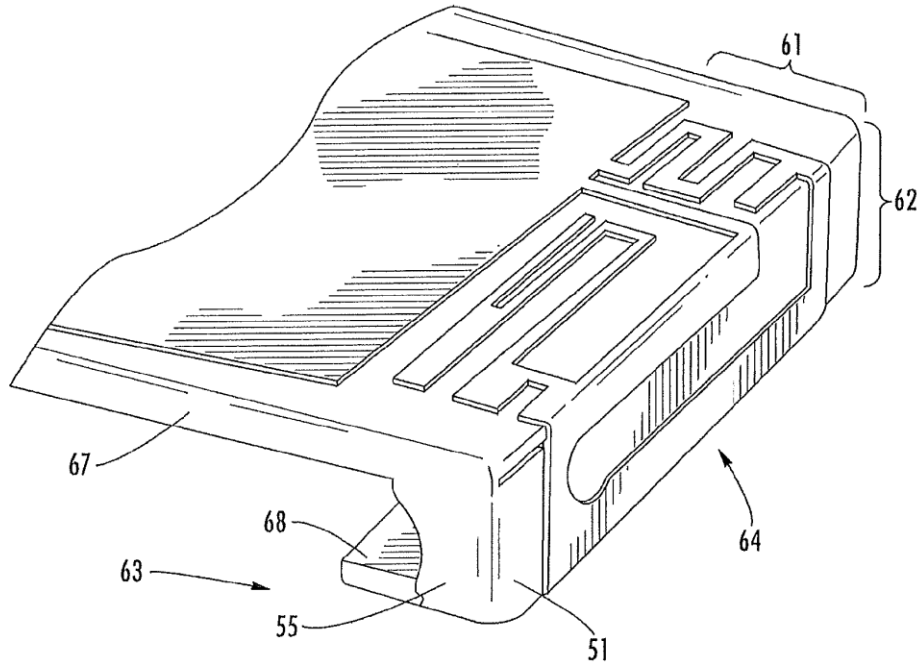
A mobile wireless communications device may include a housing and a multi-frequency band antenna carried within the housing. The multi-frequency band antenna may include a main loop conductor having a gap therein defining first and second ends of the main loop conductor, a first branch conductor having a first end connected adjacent the first end of the main loop conductor and having a second end defining a first feed point, and a second branch conductor having a first end connected adjacent the second end of the main loop conductor and a second end defining a second feed point. A third branch conductor has a first portion within the main loop conductor, and a second portion connected to the second feed point. A tuning branch conductor may have a first end connected to the main loop conductor between the respective first ends of the first and second branches.

(21) **Appl. No.:** **13/184,635**

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

Related U.S. Application Data

(63) Continuation of application No. 12/358,054, filed on Jan. 22, 2009, now Pat. No. 7,982,677, which is a continuation of application No. 11/167,506, filed on Jun. 27, 2005, now Pat. No. 7,489,276.





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(19) **United States**

(12) **Patent Application Publication**
Nekozuka

(10) **Pub. No.: US 2011/0273346 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **PORTABLE ELECTRONIC DEVICE**

Publication Classification

(75) Inventor: **Hikaru Nekozuka, Kanagawa (JP)**

(51) **Int. Cl.**
H01Q 7/02 (2006.01)

(73) Assignee: **Kyocera Corporation, Kyoto (JP)**

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

(21) Appl. No.: **13/131,567**

(57) **ABSTRACT**

(22) PCT Filed: **Nov. 26, 2009**

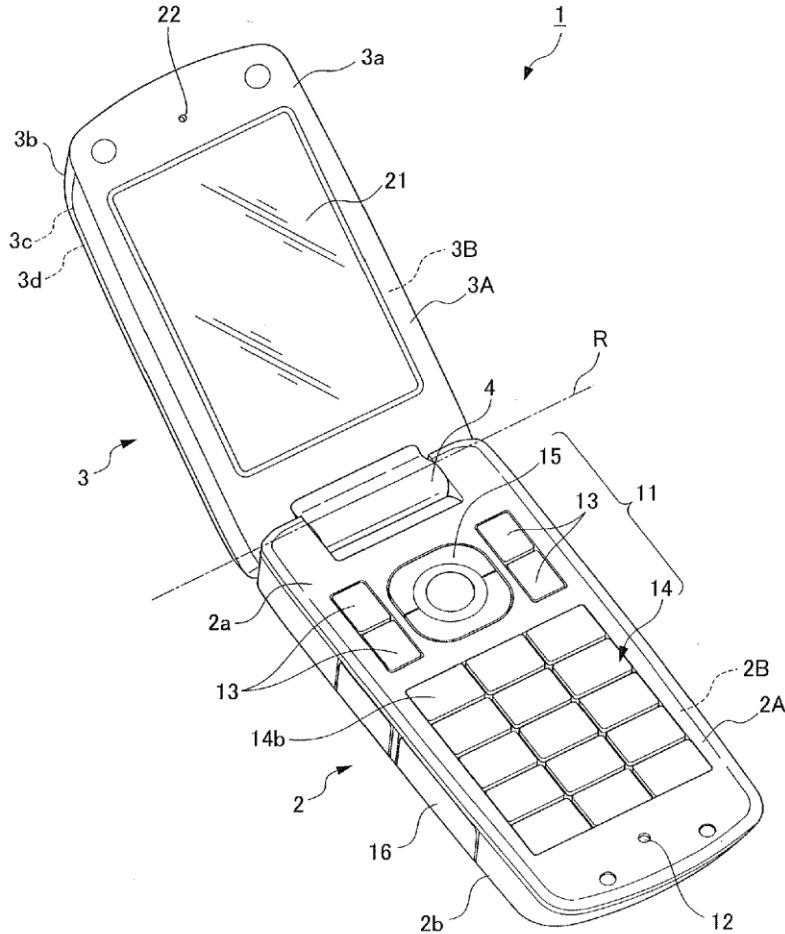
Provided is a portable electronic device which can be changed between a first state and a second state and comprises an antenna that forms a loop in the first state and does not form the loop in the second state. A mobile telephone (1) comprises: an operation unit-side casing (2); a display unit-side casing (3); a linking part (4) which links the operation unit-side casing (2) and the display unit-side casing (3) in such a way that it is possible to change between the first state and the second state; and a loop antenna (100) which is disposed at the operation unit-side casing (2) and the display unit-side casing (3) and is changed to form a loop in the first state and not to form the loop in the second state.

(86) PCT No.: **PCT/JP2009/006396**

§ 371 (c)(1),
(2), (4) Date: **Jul. 25, 2011**

(30) **Foreign Application Priority Data**

Nov. 26, 2008 (JP) 2008-301189





US 20110273348A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0273348 A1**

(43) **Pub. Date: Nov. 10, 2011**

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

Publication Classification

(76) Inventors: **Norberto Lopez**, San Diego, CA (US); **Ajay Gummalla**, Sunnyvale, CA (US)

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

(21) Appl. No.: **13/083,081**

(52) **U.S. Cl.** **343/749; 343/700 MS; 29/601**

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

(57) **ABSTRACT**

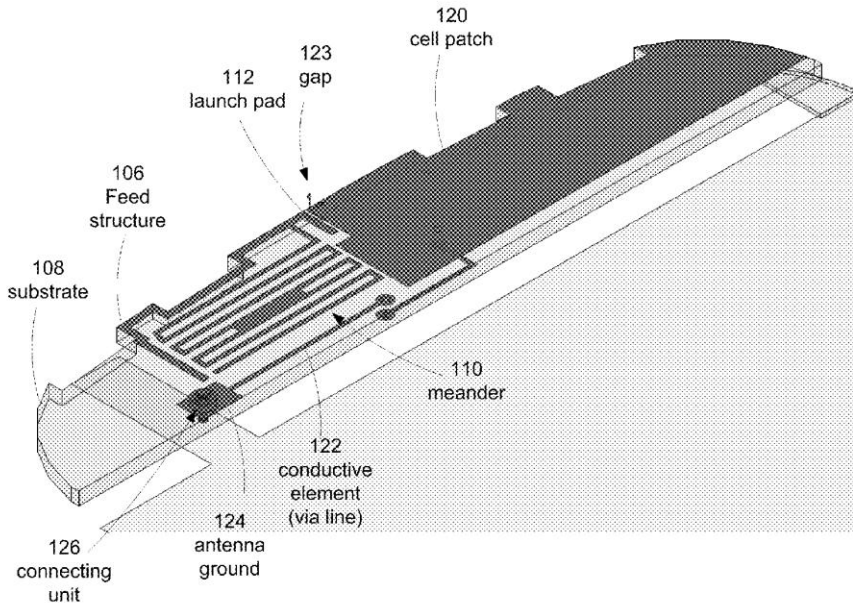
Related U.S. Application Data

A wireless device incorporating an antenna made of Composite Right Left Hand (CRLH) structures, having a connection element coupling a portion of the antenna to a ground electrode. In some embodiments a wireless device has one or more mechanical connection units made of electrically conductive materials to provide both mechanical engagement and electrical conduction for the antenna devices.

(63) Continuation-in-part of application No. 12/604,306, filed on Oct. 22, 2009.

(60) Provisional application No. 61/322,260, filed on Apr. 8, 2010.

100 ↘





US 20110273352A1

(19) United States

Pub. No.: US 2011/0273352 A1
Pub. Date: Nov. 10, 2011

(12) Patent Application Publication (10)
YOU (43)

ABSTRACT

(54) ANTENNA STRUCTURE

(57)

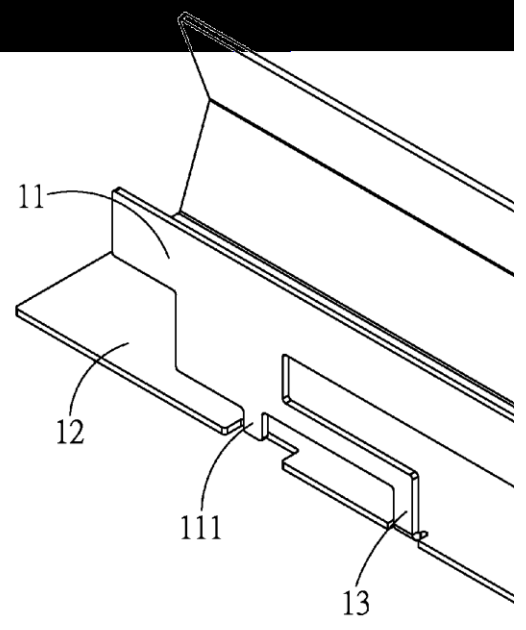
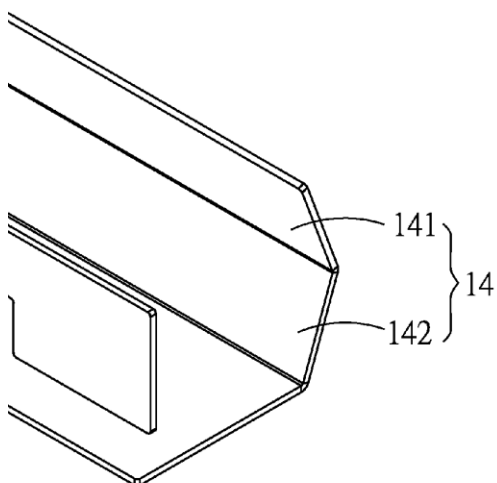
A structure includes an antenna radiating portion, a connecting portion, and a reflecting element, and the antenna radiating portion, the connecting portion, and the reflecting element are formed integrally by bending a metal sheet to achieve effects of reducing interferences caused by external factors, providing the desired directivity, lowering the production cost, and reducing the manufacturing time.

Inventor: You-Cheng YU
(21) Appl. No.: 12/774,417
(22) Filed: May 5, 2010

Publication Classification

(51) Int. Cl. H01Q 3/64 (2006.01)
H01Q 1/70 (2006.01)
(52) U.S. Cl. 343/534; 343/700 MS

1





US 20110273353A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0273353 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **HYBRID METAMATERIAL ANTENNA STRUCTURES**

on May 7, 2010, provisional application No. 61/366,520, filed on Jul. 21, 2010.

(76) Inventors: **Maha Achour**, Encinitas, CA (US);
Ajay Gummalla, Sunnyvale, CA (US);
Vaneet Pathak, San Diego, CA (US)

Publication Classification

(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H01P 11/00 (2006.01)

(21) Appl. No.: **13/040,496**

(52) **U.S. Cl.** **343/850; 29/600**

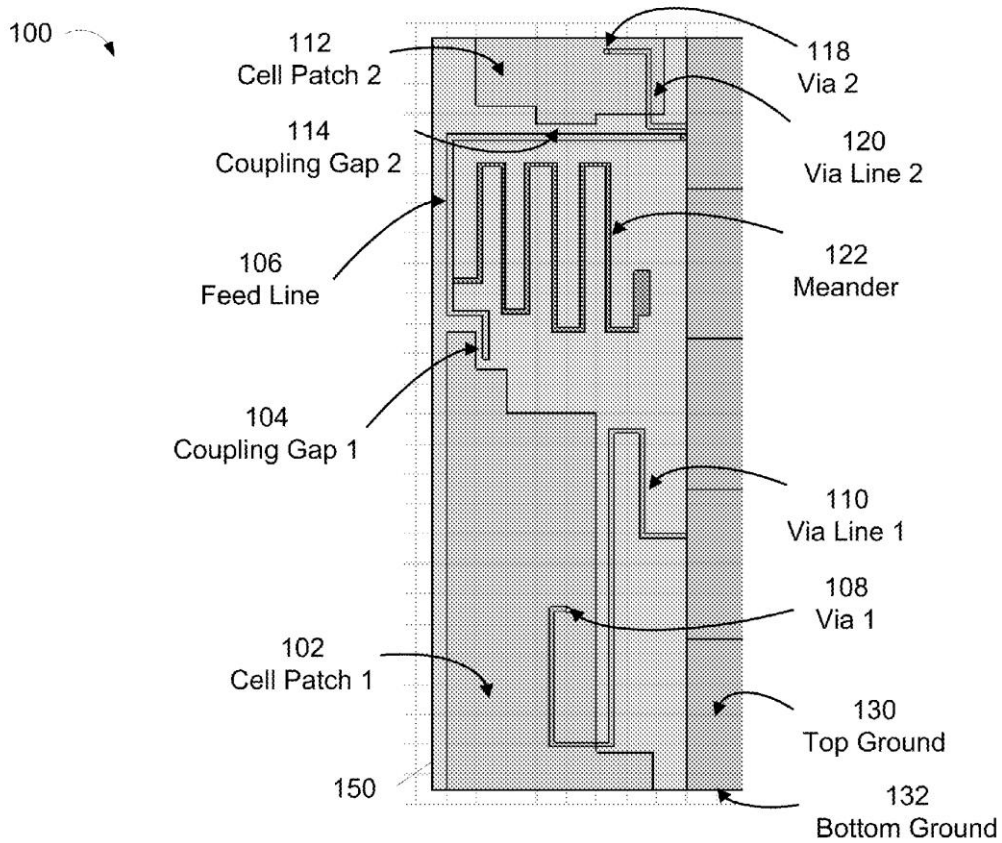
(22) Filed: **Mar. 4, 2011**

(57) **ABSTRACT**

Related U.S. Application Data

(60) Provisional application No. 61/310,623, filed on Mar. 4, 2010, provisional application No. 61/332,620, filed

A wireless device having a CRLH antenna structure incorporates a meander line at the feed and adds a three dimensional conductive structure to shift a meander mode resonance frequency.





US 20110273354A1

(19) **United States**

(12) **Patent Application Publication**
Davidson

(10) **Pub. No.: US 2011/0273354 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **TRANSFER UNIT FOR RADIO FREQUENCY SIGNALS AND METHOD FOR ALTERNATIVELY USING AN ELECTRICAL ANTENNA OR A MAGNETIC ANTENNA WITH A CLASSIC ANTENNA TUNER**

(52) **U.S. Cl. 343/852**

(75) **Inventor: Ronald Davidson, Clamart (FR)**

(73) **Assignee: Comrod AS, Tau (NO)**

(21) **Appl. No.: 12/989,946**

(22) **PCT Filed: May 4, 2009**

(86) **PCT No.: PCT/NO2009/000171**

§ 371 (c)(1),
(2), (4) **Date: Nov. 30, 2010**

(30) **Foreign Application Priority Data**

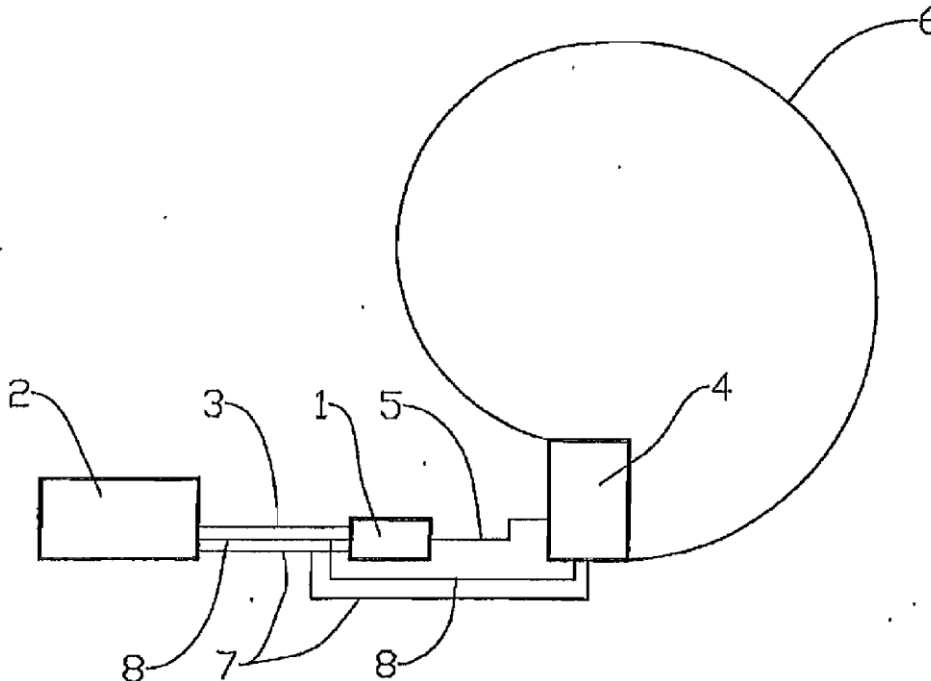
May 8, 2008 (NO) 20082153

Publication Classification

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

(57) **ABSTRACT**

A transfer unit for transferring a radio frequency signal between a classical antenna tuner and an antenna where the transfer unit comprises a switch for alternatively selecting a first direct route for the radio frequency signal between the tuner and the antenna or a second route via a reactive element; said reactive element comprising a variable serial capacitance and a shunt inductance connected to system earth; and where a control unit controls the switch and is adapted to select the first route when the frequency is above a predetermined value and otherwise select the second route. The variable serial capacitance comprises a set of capacitors organized as a set of binary weighted parallel capacitance values, and the transfer unit further comprises switches to engage or disengage each capacitor from the reactive element to increase or decrease the resulting capacitance as the radio frequency is decreased or increased. The control unit can use a subset of the capacitors for one range of frequencies and a different subset of the capacitors for a different range of frequencies. The control unit can alternatively measure the radio frequency by means of a sensor or receive frequency values via a data link.





US 20110273358A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0273358 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **PORTABLE TERMINAL**

(52) **U.S. CL. 343/876**

(75) Inventors: **Tadashi Koyama**, Yokohama-shi (JP); **Kunihiko Watanabe**, Yokohama-shi (JP)

(57) **ABSTRACT**

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

Provided is a portable terminal that can suppress reduction of antenna sensitivity. A portable telephone (1) is provided with an actuating side casing (2) and a display side casing (3), an open-close sensor (45), a circuit (32) that is disposed on the actuating side casing (2) and comprises a ground part (35), a power supply part (36) and signal processing part (37), a first conducting part (31) that is disposed on the actuating side casing (2) and connected to the ground part (35), a second conducting part (33) that is disposed on the display side casing (3) and is connected to the power supply part (36), an antenna element (61), a receiver (22) that is disposed opposite the antenna element (61) when the telephone is closed, a switching part (51) that is configured to be able to select between a first connection state wherein the second conducting part (33) and the receiver (22); are connected at high frequency and a second connection state wherein the second conducting part (33) and the receiver (22) are disconnected at high frequency, and a control part (44) that selects the first connection state when an opened state is detected and selects the second state when a closed state is detected.

(21) Appl. No.: **13/141,926**

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

(86) PCT No.: **PCT/JP2009/007308**

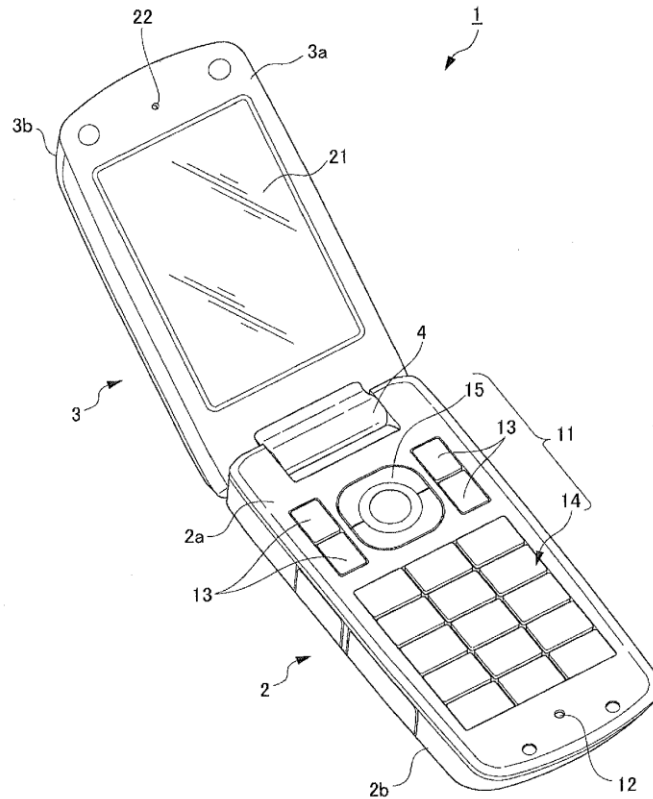
§ 371 (c)(1),
(2), (4) Date: **Jun. 23, 2011**

(30) **Foreign Application Priority Data**

Dec. 25, 2008 (JP) 2008-331584

Publication Classification

(51) **Int. Cl.**
H01Q 3/24 (2006.01)





US 20110273361A1

(19) **United States**

(12) **Patent Application Publication**
Autti

(10) **Pub. No.: US 2011/0273361 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **ANTENNA ARRANGEMENT**

(76) Inventor: **Marko Tapio Autti, Oulu (FI)**

(21) Appl. No.: **12/775,653**

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

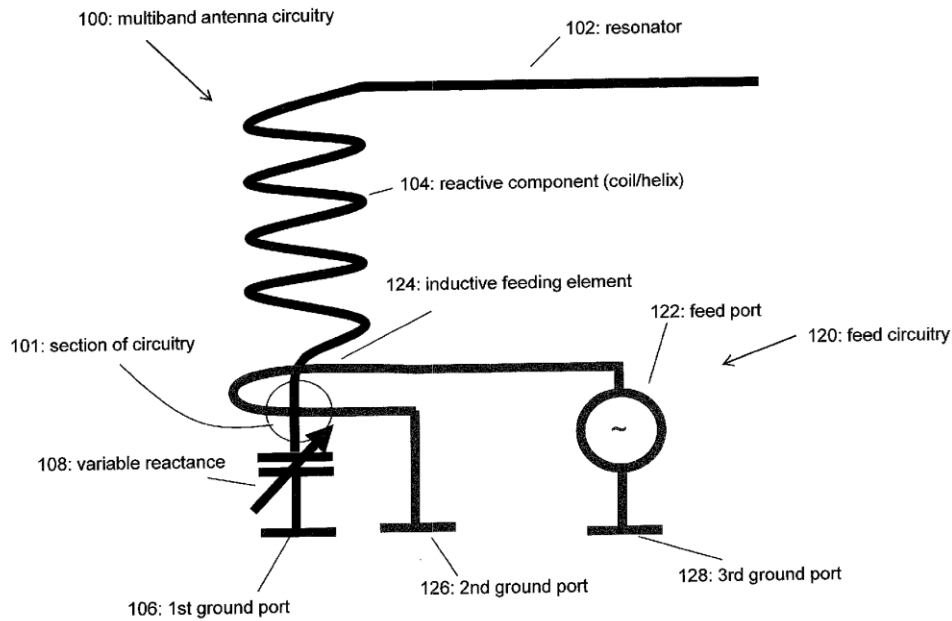
Publication Classification

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

(52) **U.S. Cl.** **343/904**

(57) **ABSTRACT**

An apparatus such as for example an antenna sub-assembly includes a multiband antenna circuitry and feed circuitry. The multiband antenna circuitry includes a resonator; a first ground port configured to couple the resonator to a common voltage potential; and at least one reactive component disposed between the resonator and the first ground port. The feed circuitry includes: a signal feed port configured to couple to a radio; a second ground port configured to couple the feed circuitry to the common voltage potential; and a feeding element disposed between the signal feed port and the second ground port, the feeding element configured to inductively couple the feed circuitry to the antenna circuitry between the resonator and the first ground port. In some example embodiments there is a variable reactance to enable the resonator to be tunable. In those and/or other embodiments there is a second and even a third resonator for multi-band operation.





US 20110273382A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0273382 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **TOUCH SCREEN HAVING ANTENNA PATTERN**

(30) **Foreign Application Priority Data**

May 7, 2010 (KR) 10-2010-0043018

(75) Inventors: **Dong Sik YOO**, Seoul (KR); **Hee Bum LEE**, Gyeonggi-do (KR); **Kyoung Soo CHAE**, Gyeonggi-do (KR); **Yun Ki HONG**, Gyeonggi-do (KR); **Yong Soo OH**, Gyeonggi-do (KR); **Jong Young LEE**, Gyeonggi-do (KR)

Publication Classification

(51) **Int. Cl.**
G06F 3/045 (2006.01)

(52) **U.S. Cl.** **345/173**

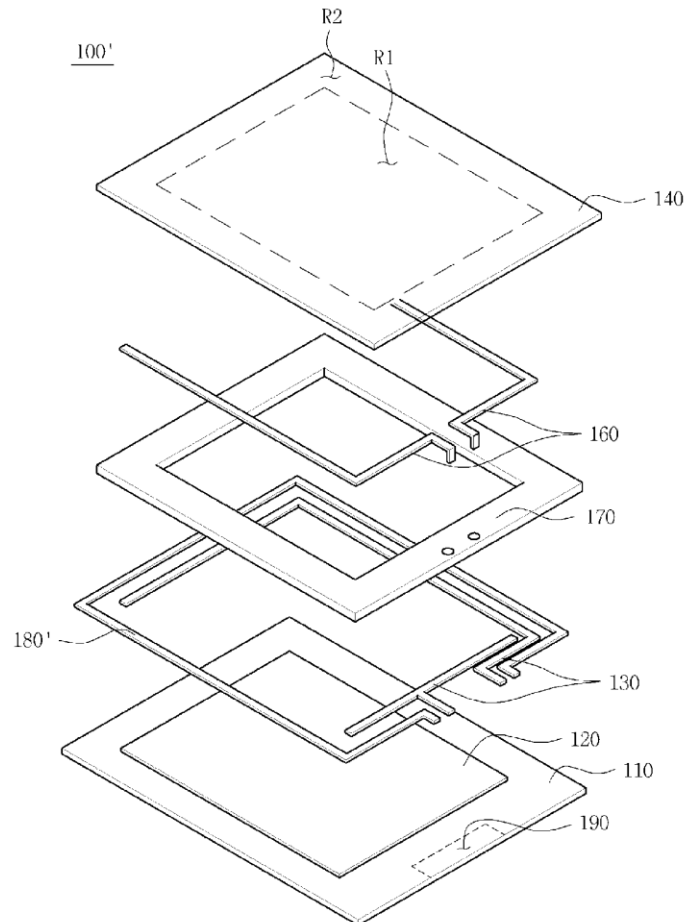
(57) **ABSTRACT**

Disclosed herein is a touch screen having an antenna, including: a first substrate that includes a first electrode pattern formed in an active region and a first electrode wiring formed in an inactive region disposed outside the active region and connected to the first electrode pattern; a second substrate that includes a second electrode pattern opposite to the first electrode pattern and a second electrode wiring connected to the second electrode pattern; a spacer that is formed between the first substrate and the second substrate to space the first electrode pattern from the second electrode pattern; and an antenna pattern that is formed in the inactive region.

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

(21) Appl. No.: **12/833,636**

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





US 20110274146A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0274146 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **ANTENNA AND MULTI-INPUT
MULTI-OUTPUT COMMUNICATION DEVICE
USING THE SAME**

Publication Classification

(51) **Int. Cl.**
H04B 1/38 (2006.01)
H01Q 19/10 (2006.01)
(52) **U.S. Cl.** **375/219; 343/837**

(76) **Inventors:** **Hsiao-Ting Huang**, Taichung
County (TW); **Shao-Chin Lo**,
Hsinchu County (TW)

(57) **ABSTRACT**

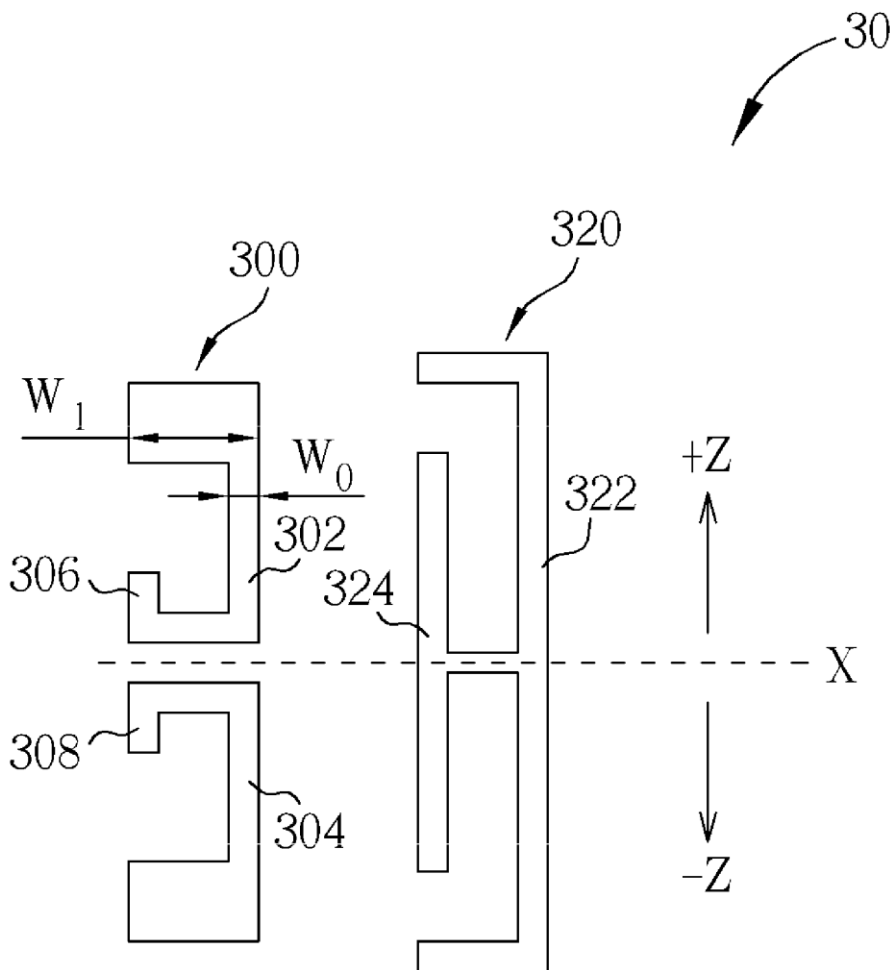
(21) **Appl. No.:** **12/983,861**

A antenna for transmitting radio signals of a lower frequency and a higher frequency includes a driven element comprising two first radiating units for a lower frequency band and two radiating units for a higher frequency band, and a reflector element comprising a first reflecting unit for the lower frequency band and a second reflecting unit for the higher frequency band. The second radiating units are disposed at a side of the first radiating units and respectively coupled to a corresponding first radiating unit. The first reflecting unit is disposed at the other side of the first radiating units, and the second reflecting unit is disposed between the first radiating units and the first reflecting unit.

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

Related U.S. Application Data

(60) Provisional application No. 61/332,783, filed on May 9, 2010.





US 20110275318A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0275318 A1**

(43) **Pub. Date: Nov. 10, 2011**

(54) **CONTACTLESS COMMUNICATION MEDIUM, ANTENNA PATTERN-PLACED MEDIUM, COMMUNICATION APPARATUS, AND ANTENNA ADJUSTING METHOD**

Publication Classification

(51) **Int. Cl.**
H04B 5/00 (2006.01)
H01P 11/00 (2006.01)
H01Q 7/00 (2006.01)

(75) **Inventors:** Keisuke Sato, Miyagi (JP); Sachio Saitoh, Miyagi (JP)

(52) **U.S. Cl.** 455/41.1; 343/748; 29/600

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

(57) **ABSTRACT**

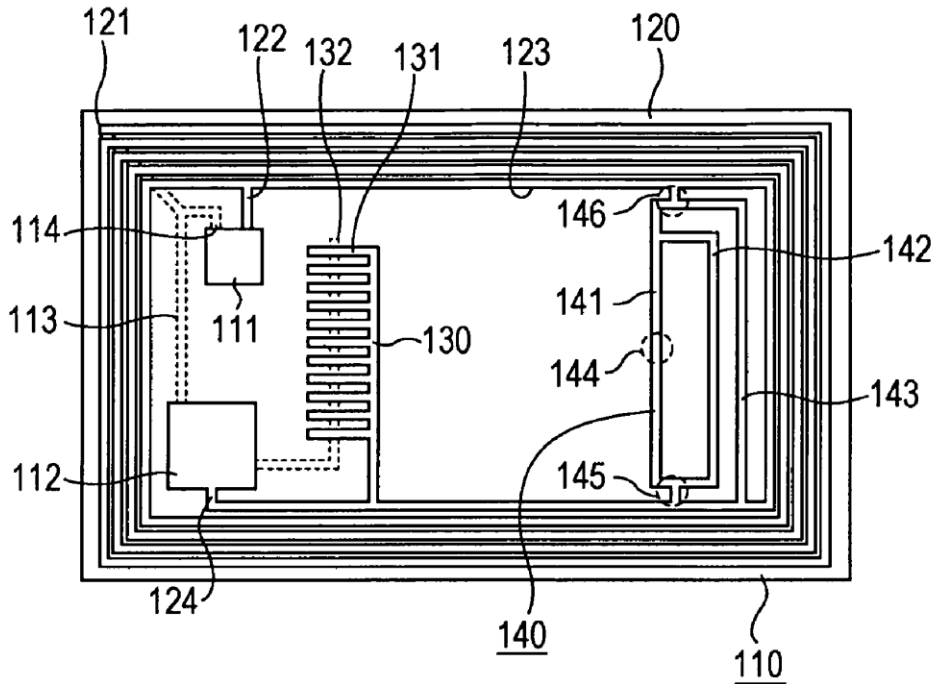
(21) **Appl. No.:** 13/066,842

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

(30) **Foreign Application Priority Data**

May 10, 2010 (JP) P2010-108804

A contactless communication medium includes a base made of an insulating material, an antenna coil section including a conductor wound in a planar shape on the base, an inductance adjusting conductor pattern that is connected in parallel to a part of the conductor in the antenna coil section, and is placed on the base, a capacitor connected to the antenna coil section, and a communication processing section that is connected to the antenna coil section and the capacitor to perform contactless communication processing.





US 20110275333A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0275333 A1**

(43) **Pub. Date: Nov. 10, 2011**

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

Publication Classification

(75) Inventors: **Jin-U KIM**, Seoul (KR); **Austin KIM**, Seongnam-si (KR); **Dong-Hwan KIM**, Hwaseong-si (KR); **Jae-Ho LEE**, Yongin-si (KR); **Jung-Ho PARK**, Hwaseong-si (KR)

(51) **Int. Cl.**
H01Q 1/48 (2006.01)
H04W 88/02 (2009.01)

(52) **U.S. Cl.** **455/77; 343/845**

(57) **ABSTRACT**

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

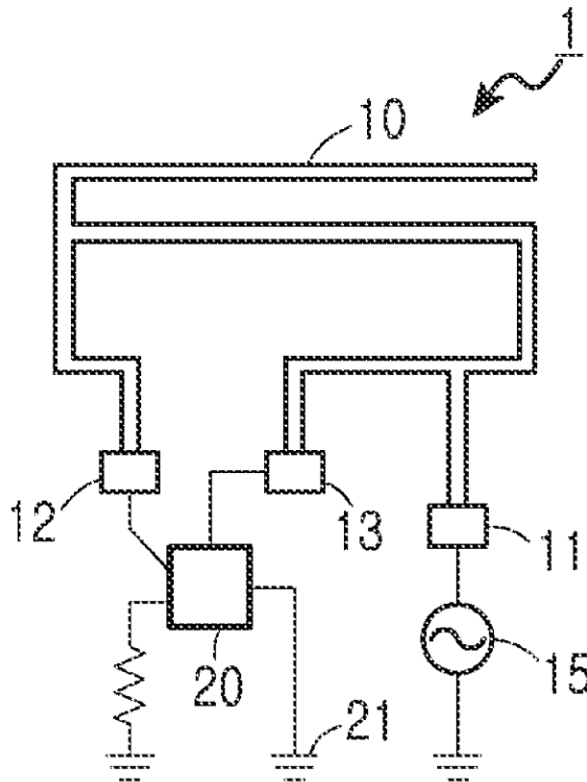
A re-reconfigurable built-in antenna of a portable terminal is provided. The antenna includes an antenna radiator having a feeding pad electrically connected to a feeding portion of a main board of the terminal and at least one ground pad disposed in a position different from that of the feeding pad for selectively establishing an electrical connection to a ground portion of the terminal, and a switching element, commonly connected to the at least one ground pad of the antenna radiator, for selectively establishing an electrical connection to the ground portion by a switching operation. The antenna radiator changes a shape of the antenna radiator by using the selective electrical connection of the ground portion so as to have various operational frequency bands and radiation properties.

(21) Appl. No.: **13/100,445**

(22) Filed: **May 4, 2011**

(30) **Foreign Application Priority Data**

May 10, 2010 (KR) 10-2010-0043519





US 20110279327A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0279327 A1**

(43) **Pub. Date: Nov. 17, 2011**

(54) **PLANAR INVERTED-F ANTENNA**

Publication Classification

(75) Inventors: **Jesus Alfonso CASTANEDA**, Los Angeles, CA (US); **Seow-Eng MCILROY**, Westchester, CA (US)

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

(73) Assignee: **Broadcom Corporation**, Irvine, CA (US)

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

(21) Appl. No.: **13/169,698**

(57) **ABSTRACT**

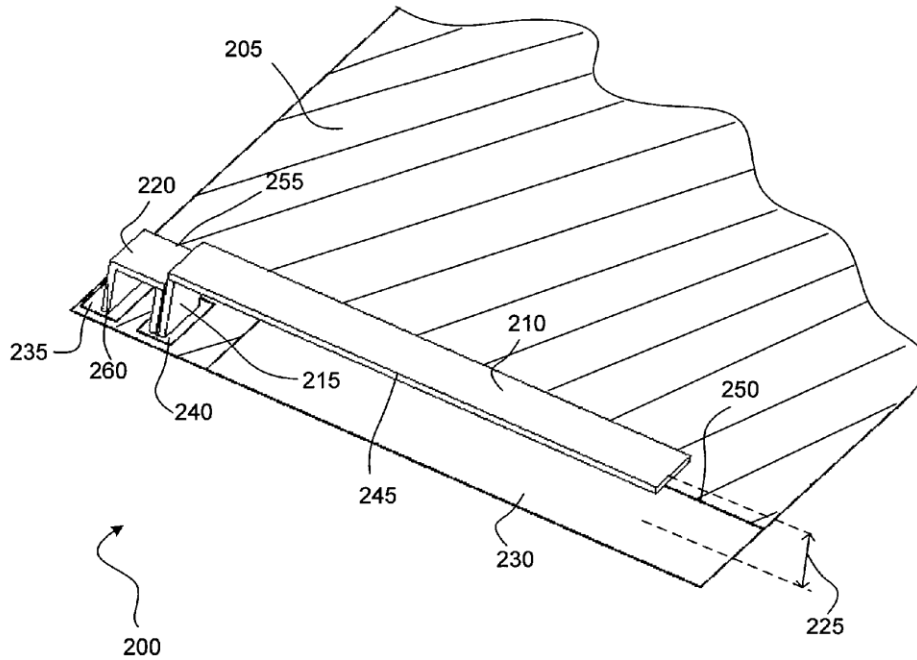
(22) Filed: **Jun. 27, 2011**

Related U.S. Application Data

(63) Continuation of application No. 11/679,659, filed on Feb. 27, 2007, now Pat. No. 7,969,361.

(60) Provisional application No. 60/781,739, filed on Mar. 14, 2006.

A low profile Planar Inverted-F Antenna (PIFA) comprises a radiating strip, an inductive tuning portion, a vertical feed portion, and a retracted ground plane. The radiating strip is approximately parallel to the ground plane and is suspended above the ground plane by the feed element at a certain distance. Further, the radiating strip, in part or entirely, overhangs the ground plane. In this way, the radiating strip may be suspended very close to the ground plane, but yet exhibits a large bandwidth.





US 20110279328A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0279328 A1**

(43) **Pub. Date: Nov. 17, 2011**

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE INCLUDING ELECTRICALLY
CONDUCTIVE, ELECTRICALLY FLOATING
BEAM SHAPING ELEMENTS AND RELATED
METHODS**

Continuation of application No. 11/766,339, filed on Jun. 21, 2007, now Pat. No. 7,573,427.

Publication Classification

(51) **Int. Cl.**
H01Q 9/44 (2006.01)

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

(57) **ABSTRACT**

A mobile wireless communications device may include a portable housing, a printed circuit board (PCB) carried within the portable housing, wireless transceiver circuitry carried by the PCB within the portable housing, and an antenna carried by the PCB within the portable housing and connected to the wireless transceiver circuitry. The device may further include a first pair of electrically floating, electrically conductive, spaced apart, antenna beam shaping elements adjacent the antenna and spaced apart therefrom. A second pair of electrically floating, electrically conductive, spaced apart, antenna beam shaping elements may be adjacent the antenna and spaced apart therefrom. The first pair of antenna beam shaping elements may be positioned in an offset relationship relative to the second pair of antenna beam shaping elements.

(75) **Inventors:** **Yihong Qi**, St. Agatha (CA); **Ying Tong Man**, Waterloo (CA); **Perry Jarmuszewski**, Waterloo (CA); **Dietmar Wennemer**, Waterloo (CA)

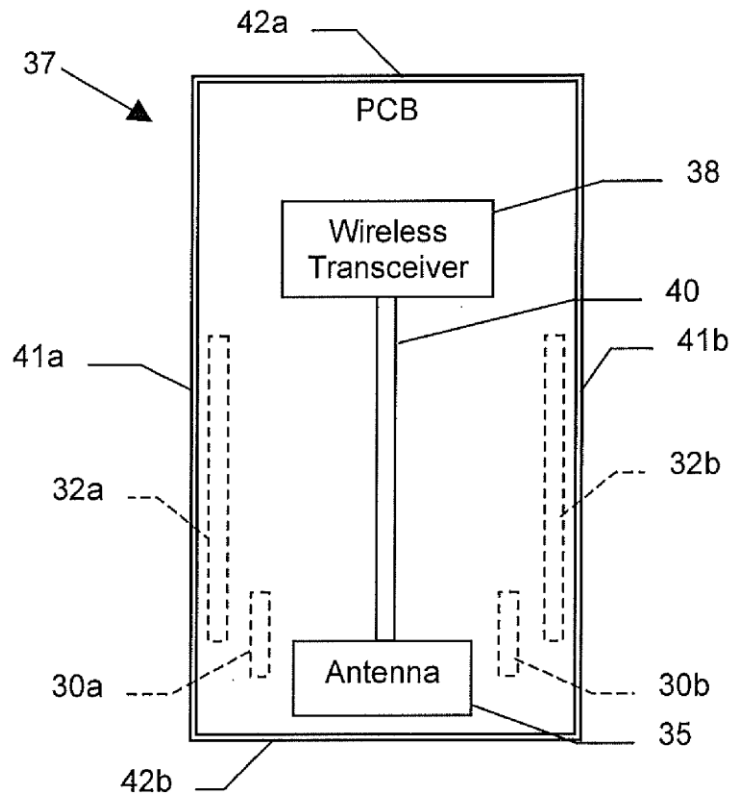
(73) **Assignee:** **Research In Motion Limited**, Waterloo (CA)

(21) **Appl. No.:** **13/189,729**

(22) **Filed:** **Jul. 25, 2011**

Related U.S. Application Data

(63) Continuation of application No. 12/499,143, filed on Jul. 8, 2009, now Pat. No. 7,990,323, which is a con-





US 20110279330A1

(19) **United States**

(12) **Patent Application Publication**
Huynh

(10) **Pub. No.: US 2011/0279330 A1**

(43) **Pub. Date: Nov. 17, 2011**

(54) **ANTENNA ARRAY WITH CAPACITIVE
COUPLED UPPER AND LOWER ANTENNA
ELEMENTS AND A PEAK RADIATION
PATTERN DIRECTED TOWARD THE LOWER
ANTENNA ELEMENT**

Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 9/04 (2006.01)
H01Q 1/24 (2006.01)
(52) **U.S. Cl.** **343/702; 343/700 MS**

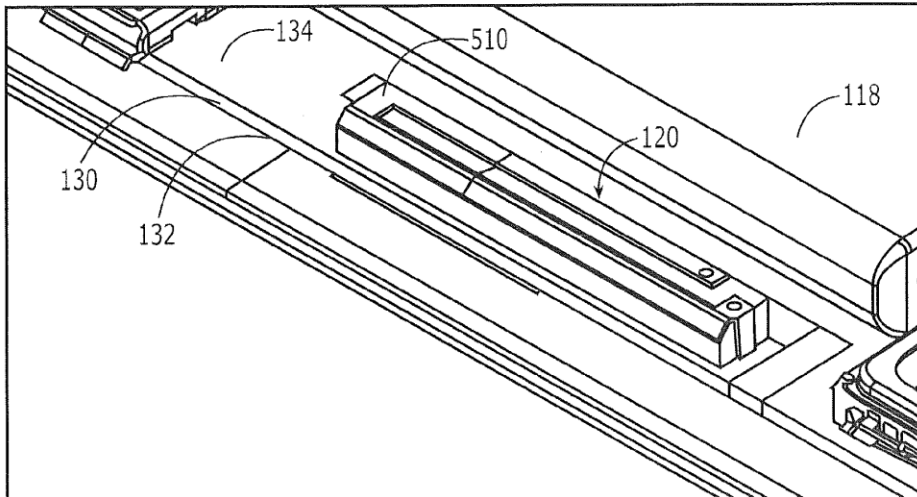
(57) **ABSTRACT**
An antenna system includes a planar substrate, a conductive ground plane, and an upper antenna element. The conductive ground plane is on the substrate. A slot that is free of conductive material extends through the ground plane to define a lower antenna element from a portion of the ground plane. The upper antenna element is spaced apart and overlies at least a portion of the lower antenna element. A first location of the upper antenna element is electrically connected to the ground plane and a spaced apart second location of the upper antenna element is electrically connected to an antenna feed element. The upper antenna element is configured to electrically resonate responsive to a defined RF signal. The lower antenna element is configured to resonate through capacitive coupling to the resonating upper antenna element.

(75) **Inventor: Minh-Chau Huynh**, Foster City, CA (US)

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

(21) **Appl. No.: 12/777,718**

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





US 20110279332A1

(19) **United States**

(12) **Patent Application Publication**
Wu

(10) **Pub. No.: US 2011/0279332 A1**

(43) **Pub. Date: Nov. 17, 2011**

(54) **PORTABLE ELECTRONIC DEVICE**

Publication Classification

(76) Inventor: **Hsiao-Wen Wu, TAIPEI CITY**
(TW)

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

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

(21) Appl. No.: **13/034,715**

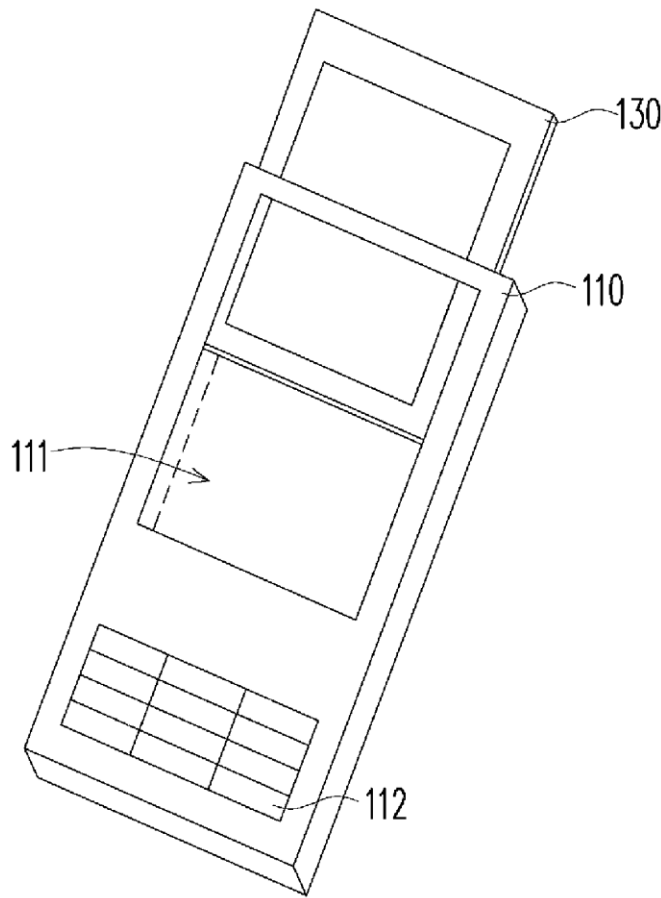
(57) **ABSTRACT**

(22) Filed: **Feb. 25, 2011**

(30) **Foreign Application Priority Data**

May 14, 2010 (TW) 099115517

A portable electronic device includes a detachable first casing, an antenna, and a first coupling element. The antenna is disposed in the detachable first casing, and the first coupling element is disposed at an inner wall of the detachable first casing. In addition, the first coupling element does not contact the antenna and overlaps the antenna in a vertical projection plane.





US 20110279340A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0279340 A1**

(43) **Pub. Date: Nov. 17, 2011**

(54) **ANTENNA AND WIRELESS IC DEVICE**

Publication Classification

(75) Inventors: **Noboru KATO**, Nagaokakyo-shi (JP); **Jun SASAKI**, Nagaokakyo-shi (JP); **Tepppei MIURA**, Nagaokakyo-shi (JP); **Naoki GOUCHI**, Nagaokakyo-shi (JP)

(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H01Q 21/00 (2006.01)
H01Q 9/16 (2006.01)
H01Q 7/00 (2006.01)
(52) **U.S. Cl.** **343/793**; 343/870; 343/867; 343/850; 343/906

(73) Assignee: **Murata Manufacturing Co., Ltd.**, Nagaokakyo-shi (JP)

(57) **ABSTRACT**

(21) Appl. No.: **13/190,670**

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

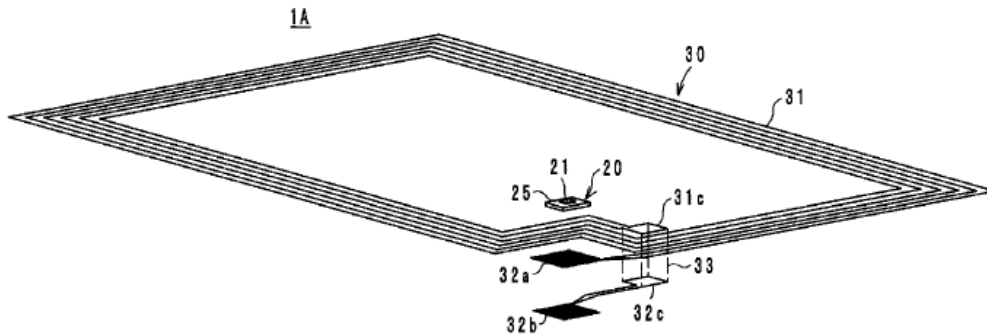
An antenna for a wireless IC device having improved energy transfer efficiency with a wireless IC, and a wireless IC device equipped with the antenna are constructed such that the antenna includes a coil pattern and spiral coupling patterns provided at the ends of the coil pattern and disposed so as to face each other. A coupling module including a wireless IC chip and a feeder circuit substrate including a feeder circuit arranged to be coupled to the wireless IC chip is mounted on the coupling pattern so as to define a wireless IC device. The coil pattern is an open type coil pattern. The coupling patterns are arranged close to each other to define a single LC resonator. Thus, energy is concentrated in the coupling patterns, thereby improving the energy transfer efficiency between the antenna and the wireless IC chip.

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2010/051205, filed on Jan. 29, 2010.

Foreign Application Priority Data

(30) Jan. 30, 2009 (JP) 2009-020934





US 20110279341A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0279341 A1**

(43) **Pub. Date: Nov. 17, 2011**

(54) **DIPOLE ANTENNA ASSEMBLY**

Publication Classification

(75) Inventors: **SHENG-CHE CHANG**, Tu-Cheng (TW); **CHANG-CHING LIN**, Tu-Cheng (TW); **CHUN-CHIEH TSENG**, Tu-Cheng (TW); **YUN-CHENG HOU**, Tu-Cheng (TW); **JOHN CHOW**, Saratoga, CA (US)

(51) **Int. Cl.**
H01Q 9/16 (2006.01)
H01Q 5/01 (2006.01)

(52) **U.S. Cl.** **343/822**

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

(57) **ABSTRACT**

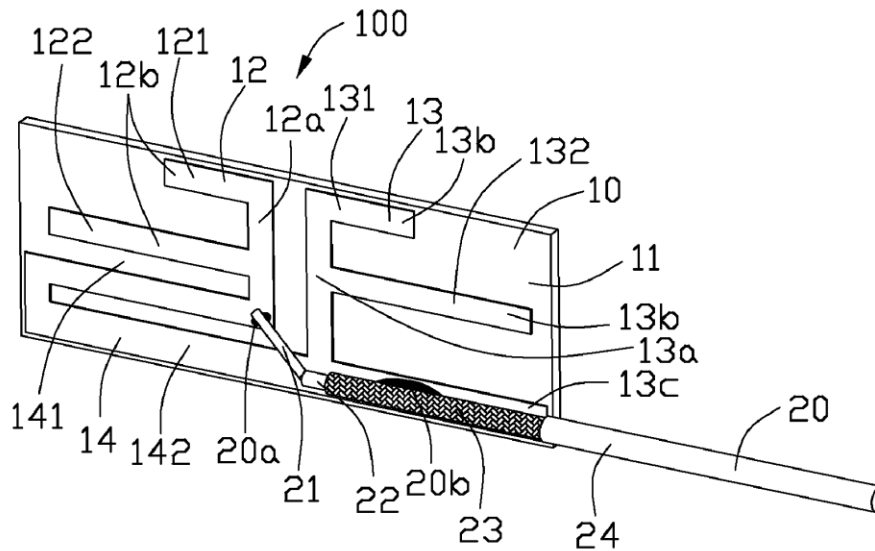
(21) Appl. No.: **12/906,180**

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

(30) **Foreign Application Priority Data**

May 12, 2010 (TW) 99208859

A dipole antenna assembly (100, 200) includes a dipole antenna (10, 30) and a feeding element (20, 40) connecting with the dipole antenna. The dipole antenna includes a radiation portion (12, 32), a ground portion (13, 33) and a circuit (14, 34). The feeding element includes a central conductor (21, 41) soldered on the radiation portion at a first position, and a shielding layer (23, 43) soldered on the ground portion at a second position. The circuit includes one end connecting with the radiation portion at the first position, and another end connecting with the ground position at the second position for impedance matching.





US 20110279348A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0279348 A1**

(43) **Pub. Date: Nov. 17, 2011**

(54) **ANTENNA DEVICE**

(30) **Foreign Application Priority Data**

(75) Inventors: **Golam Sorwar HOSSAIN,**
Hawasaki (JP); **Takashi Yamagajo,**
Kawasaki (JP)

May 12, 2010 (JP) 2010-110572

Publication Classification

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

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

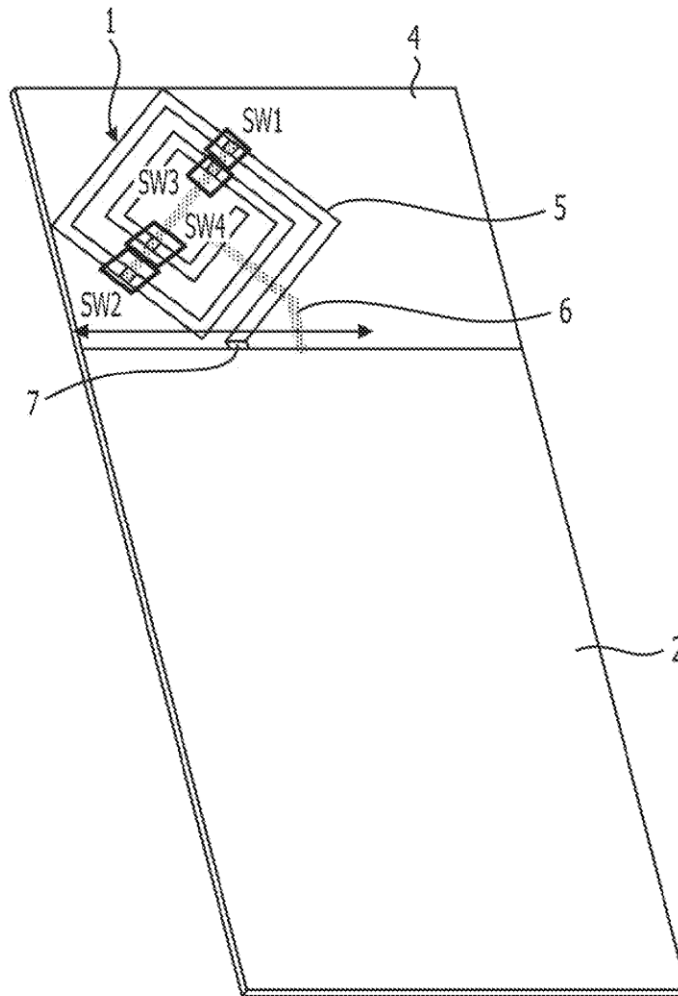
(52) **U.S. Cl.** **343/895**

(21) Appl. No.: **13/076,710**

(57) **ABSTRACT**

(22) Filed: **Mar. 31, 2011**

An antenna device includes an antenna element having an external form shaped into a substantially rectangular-shaped planar spiral coil and a switch provided to the antenna element.





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(19) **United States**

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TANAKA et al.

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(54) **CHIP ANTENNA AND ANTENNA APPARATUS**

Publication Classification

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(51) **Int. Cl.**
H01Q 1/50 (2006.01)
(52) **U.S. Cl.** 343/906
(57) **ABSTRACT**

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

A chip antenna and an antenna apparatus, which allow the resonance frequency of the antenna to be set with a high degree of freedom, include a feeding electrode formed on the bottom surface, fourth side surface, and top surface of a dielectric substrate, a non-feeding electrode formed on the bottom surface, third side surface, and top surface of the dielectric substrate, wherein the leading ends of the feeding electrode and the non-feeding electrode are facing each other with a predetermined distance therebetween on the top surface of the dielectric substrate. The chip antenna and antenna apparatus further include a frequency adjusting electrode formed on the first side surface of the dielectric substrate, and ground electrodes connected to ground electrodes of a circuit substrate on which the chip antenna is mounted, wherein the ground electrodes are electrically connected to the frequency adjusting electrode and are formed on the bottom surface of the dielectric substrate.

(21) Appl. No.: **13/193,291**

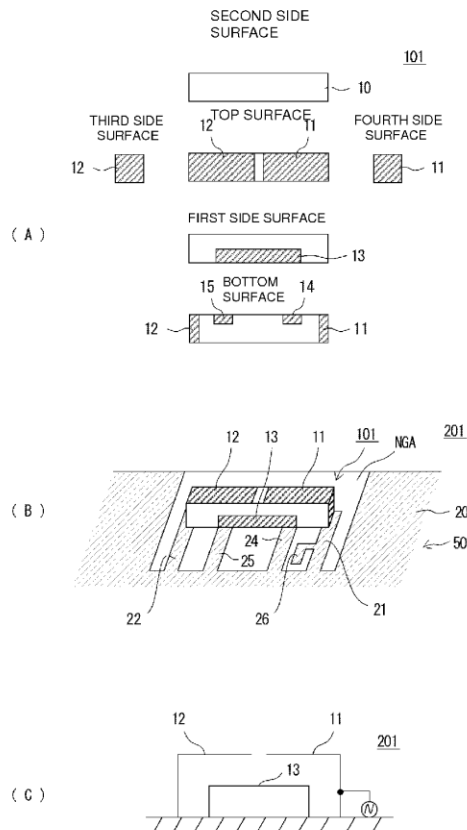
(22) Filed: **Jul. 28, 2011**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2009/063658, filed on Jul. 31, 2009.

Foreign Application Priority Data

Jan. 29, 2009 (JP) 2009-017854





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(19) **United States**

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Krupa

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(43) **Pub. Date: Nov. 24, 2011**

(54) **INDUCTIVELY COUPLED BAND
SELECTABLE AND TUNABLE ANTENNA**

(30) **Foreign Application Priority Data**

Dec. 15, 2008 (US) 61/201,862

(75) Inventor: **Steve Krupa, Haifa (IL)**

Publication Classification

(73) Assignee: **GALTRONICS CORPORATION
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(51) **Int. Cl.**
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H01Q 1/36 (2006.01)

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(52) **U.S. Cl.** **343/748; 343/745**

(22) PCT Filed: **Dec. 13, 2009**

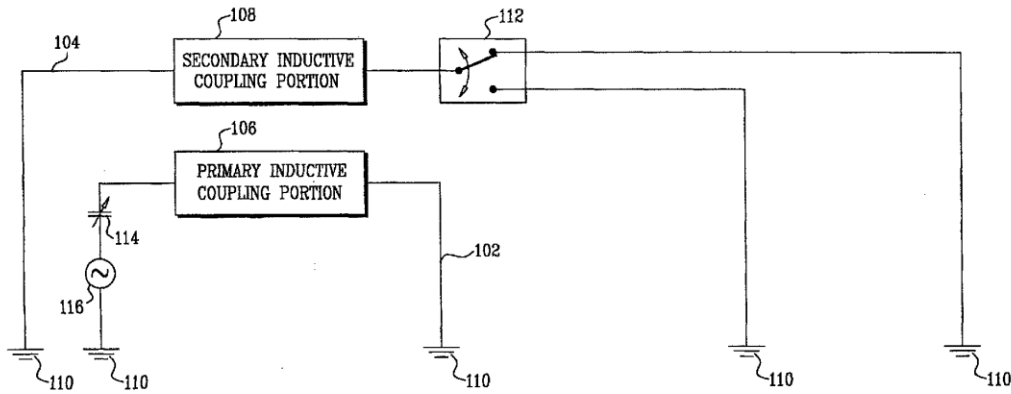
(57) **ABSTRACT**

(86) PCT No.: **PCT/IL09/01180**

§ 371 (c)(1),
(2), (4) Date:

Aug. 12, 2011

An inductively coupled band selectable and tunable antenna, the antenna including a first conductive segment, a second conductive segment interleaved with the first conductive segment and inductively coupled to the first conductive segment, band selection hardware located along the first conductive segment and tuning hardware located along the second conductive segment.





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Ryou et al.

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(43) **Pub. Date: Nov. 24, 2011**

(54) **CRLH-TL META MATERIAL ANTENNA**

(30) **Foreign Application Priority Data**

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

Nov. 13, 2008 (KR) 10-2008-0112576

Publication Classification

(21) Appl. No.: **13/129,392**

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

(22) PCT Filed: **Nov. 11, 2009**

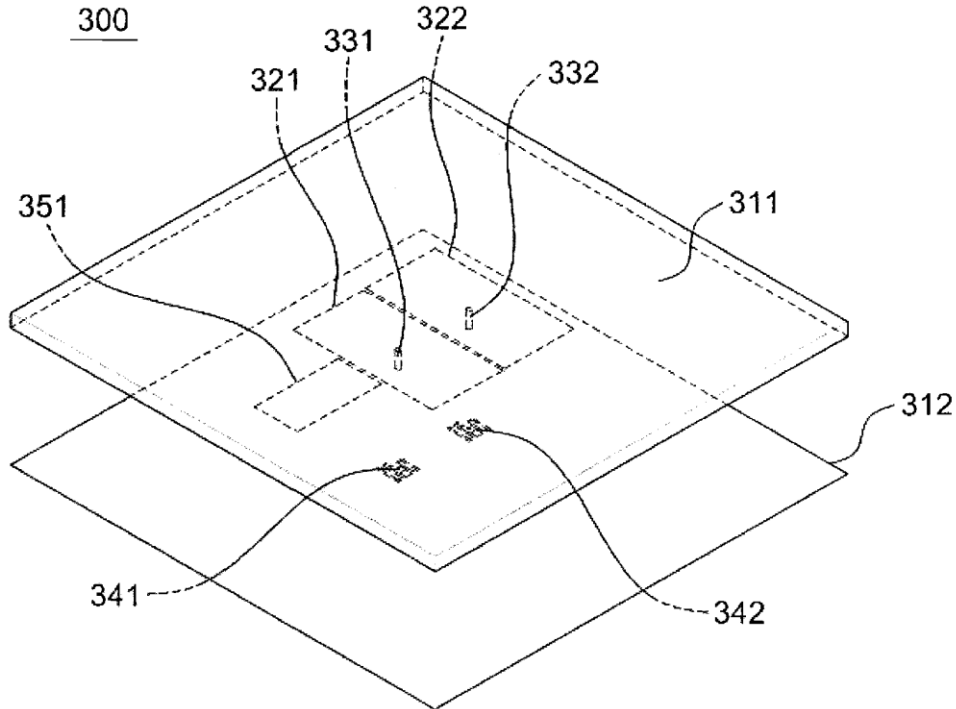
(52) **U.S. Cl.** **343/848**

(86) PCT No.: **PCT/KR2009/006606**

(57) **ABSTRACT**

§ 371 (c)(1),
(2), (4) Date: **Aug. 5, 2011**

There is provided an antenna having a spiral-shaped loading formed on the ground plane, in which a resonant frequency is lowered as the reactance component of a CRLH-TL structure is adjusted.





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(19) **United States**

(12) **Patent Application Publication**
Ikuta

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(43) **Pub. Date: Nov. 24, 2011**

(54) **MOBILE COMMUNICATION HANDSET**

Publication Classification

(75) Inventor: **Shoichi Ikuta, Kanagawa (JP)**

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

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

(73) Assignee: **NEC CASIO Mobile Communications, Ltd., Kawasaki-shi (JP)**

(57) **ABSTRACT**

(21) Appl. No.: **13/067,178**

An antenna module (5) is such that an antenna and two power supply points for that antenna are formed on a thin substrate. A substrate module (7) has a substrate, two power supply point contact units that respectively electrically contact the two power supply points attached to the substrate, and electronic components, and processes signals received via the power supply point contact units through a circuit formed by electronic components and the power supply contact units. A pressure plate (6) is positioned between the antenna module (5) and the substrate and anchors the antenna module (5) by pressing the entire surface of such against an outside case (20), excluding the power supply points, by the outside case (20) and an inside case (21) being fastened together.

(22) Filed: **May 13, 2011**

(30) **Foreign Application Priority Data**

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