



US 20090273418A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273418 A1**

(43) **Pub. Date: Nov. 5, 2009**

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

(30) **Foreign Application Priority Data**

Apr. 30, 2008 (JP) 2008-118412

(75) Inventors: **Tatsuo Shimizu**, Chiba (JP);
Takeyuki Fujii, Tokyo (JP); **Satoru Ooshima**, Tokyo (JP); **Hidenobu Kakioka**, Fukuoka (JP); **Katsunori Ishii**, Chiba (JP)

Publication Classification

(51) **Int. Cl.**
H01P 3/00 (2006.01)
H01Q 13/12 (2006.01)

(52) **U.S. Cl.** **333/24 R; 343/769**

Correspondence Address:

OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.
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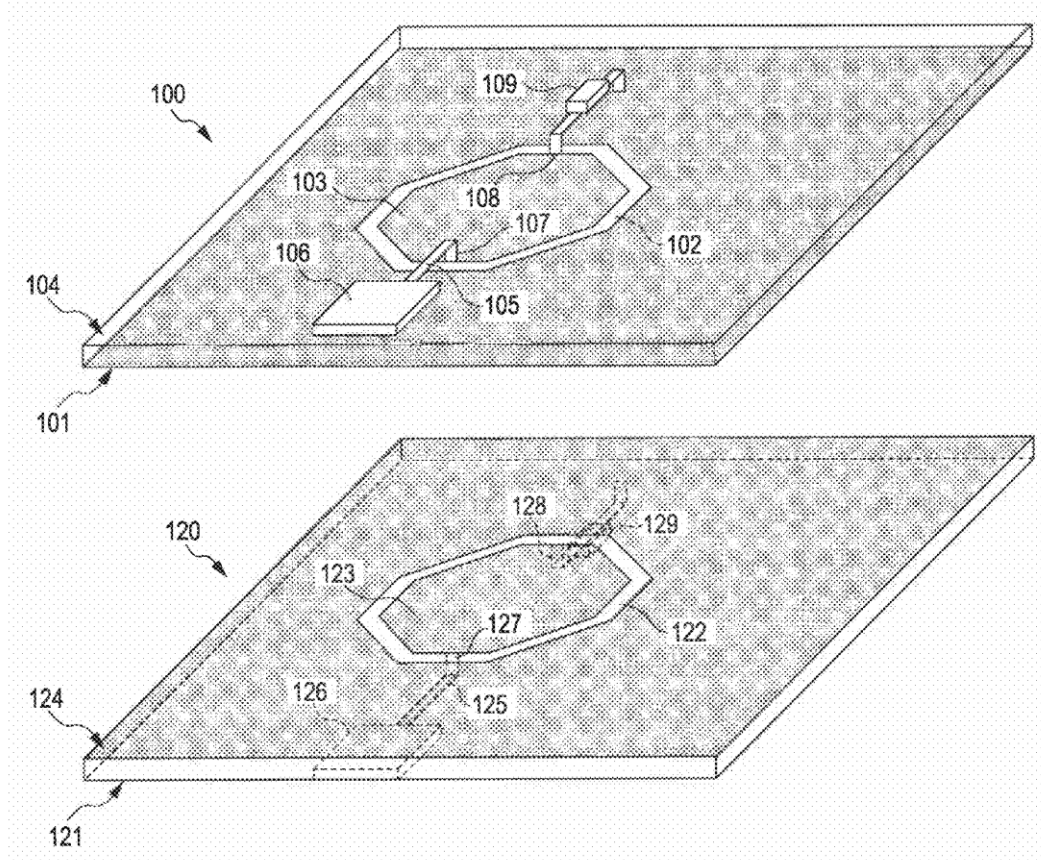
(57) **ABSTRACT**

An antenna apparatus for use in a transmitter or a receiver in a communication system. The antenna apparatus includes: a dielectric substrate having a conductor layer on one of surfaces; and a slot antenna including an antenna electrode formed on the one surface and disposed substantially at the center, a grounded conductive surface surrounding the antenna electrode, and a slot transmission line made by a gap between the antenna electrode and the grounded conductive surface.

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

(21) Appl. No.: **12/427,246**

(22) Filed: **Apr. 21, 2009**





US 20090273521A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273521 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **COPLANAR COUPLED-FED MULTIBAND ANTENNA FOR THE MOBILE DEVICE**

Publication Classification

(75) Inventors: **Kin-Lu Wong**, Kaohsiung (TW);
Chih-Hung Huang, Taipei (TW)

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

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

(57) **ABSTRACT**

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The present invention is related to a coplanar coupled-fed multiband antenna for the mobile communication device. The antenna mainly comprises a dielectric substrate, a ground plane located on one surface of the dielectric substrate, and a radiating portion, a shorting metal portion, and a feeding portion, which are all on the same surface of the dielectric substrate near one edge of the ground plane. One end of the shorting metal portion is connected to the radiating portion, and the other end is connected to the ground plane. The feeding portion comprises a first feeding metal portion and a second feeding metal portion. The first feeding metal portion has a feeding point for the antenna. One end of the second feeding metal portion is connected to the radiating portion, and there is a gap between the second feeding metal portion and the first feeding metal portion.

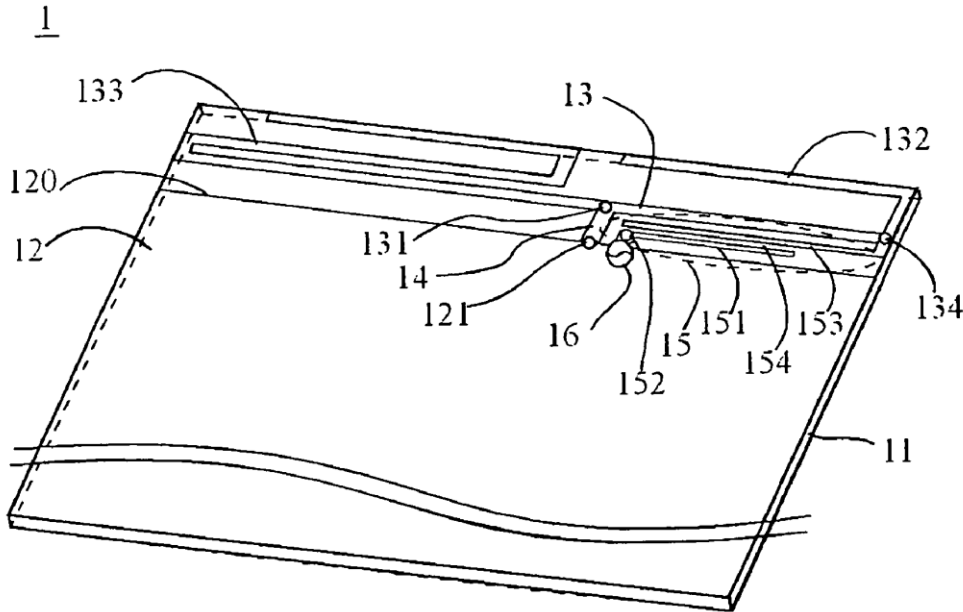
(73) Assignee: **ACER INCORPORATED**,
SILICON CITY (TW)

(21) Appl. No.: **12/232,587**

(22) Filed: **Sep. 19, 2008**

(30) **Foreign Application Priority Data**

May 5, 2008 (TW) 097116539





US 20090273523A1

(19) **United States**

(12) **Patent Application Publication**
SAKUMA

(10) **Pub. No.: US 2009/0273523 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **ANTENNA AND COMMUNICATION DEVICE HAVING SAME**

(30) **Foreign Application Priority Data**

(75) Inventor: **Masao SAKUMA, Shinjuku (JP)**

Apr. 30, 2008 (JP) 2008-118893

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Publication Classification

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

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

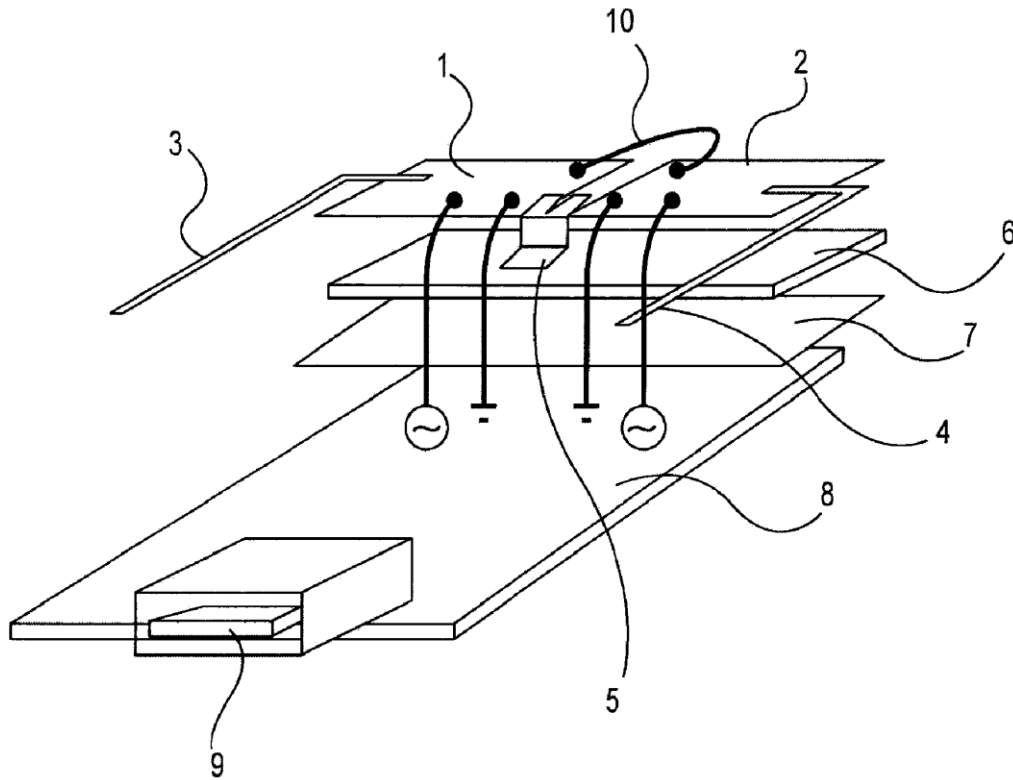
(73) Assignee: **FUJITSU MICROELECTRONICS LIMITED, Tokyo (JP)**

(57) **ABSTRACT**

(21) Appl. No.: **12/423,557**

An antenna device, including a radiating element having a feed portion and a floating conduction member, which is provided between the radiating element and a conduction board having a high-frequency signal source which generates high-frequency signals for supplying to the feed portion, and which is electrically floated.

(22) Filed: **Apr. 14, 2009**





US 20090273524A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273524 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **ANTENNA AND ELECTRONIC APPARATUS**

(86) **PCT No.: PCT/JP2007/066664**

(75) **Inventors: Hirotaka Furuya, Chiba-shi (JP);
Ning Guan, Chiba-shi (JP)**

§ 371 (c)(1),
(2), (4) **Date: Mar. 2, 2009**

Publication Classification

Correspondence Address:
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2100 PENNSYLVANIA AVENUE, N.W., SUITE
800
WASHINGTON, DC 20037 (US)

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

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

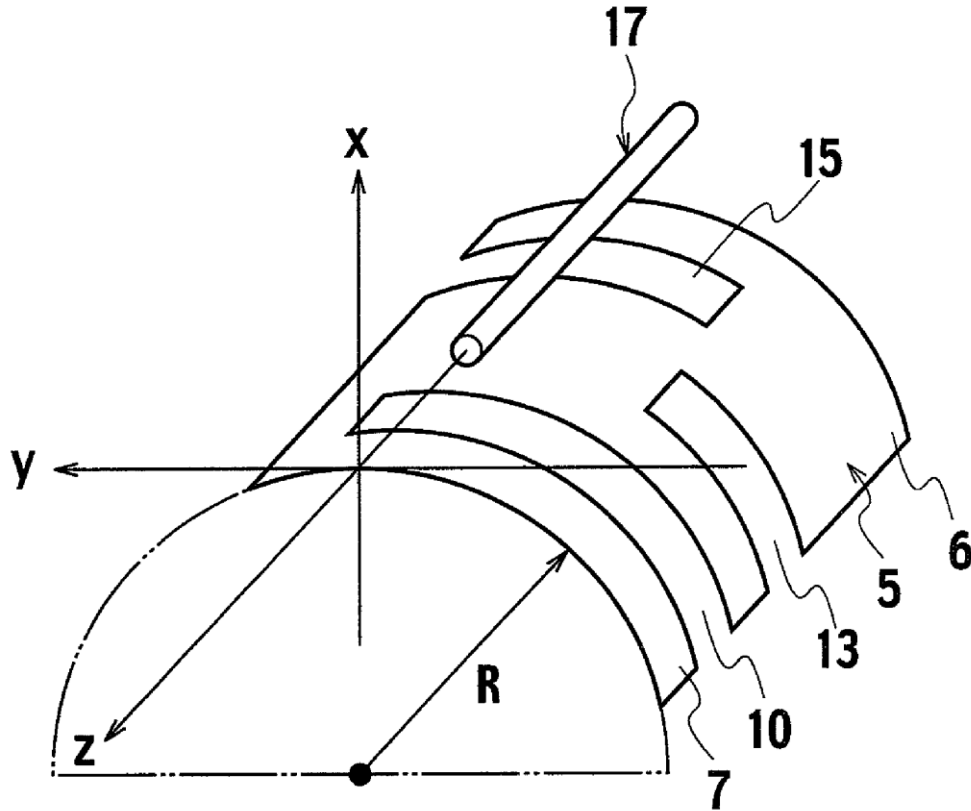
(57) **ABSTRACT**

(73) **Assignee: FUJIKURA LTD., Koto-ku, Tokyo (JP)**

An antenna 1 includes: a plate-like base 3 made of an insulating material; and a conductor 5 in a predetermined shape, which has multiple cut-out portions 10, 13, 15 and which is provided at a predetermined position of the base 3 to obtain predetermined antenna characteristics. The antenna 1 is configured so that the antenna characteristics can be mostly maintained even when the base 3 is deformed into a predetermined curved-surface shape.

(21) **Appl. No.: 12/439,611**

(22) **PCT Filed: Aug. 28, 2007**





US 20090273525A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273525 A1**

(43) **Pub. Date: Nov. 5, 2009**

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

Related U.S. Application Data

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

Publication Classification

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

(52) **U.S. Cl.** **343/702; 29/428**

(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.

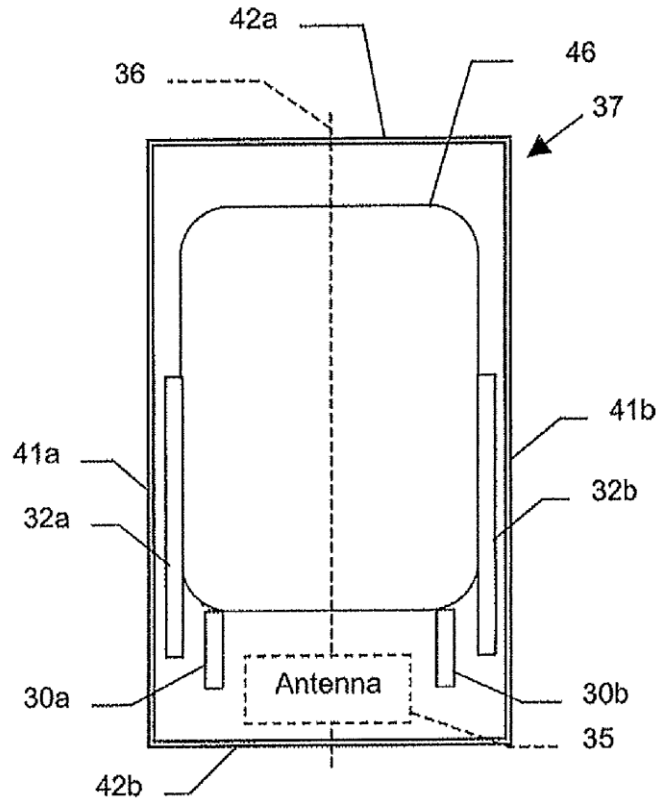
(75) Inventors: **Yihong Qi**, St. Agatha (CA); **Ying Tong Man**, Waterloo (CA); **Perry Jarmuszewski**, Waterloo (CA); **Dietmar Wennemer**, Waterloo (CA)

Correspondence Address:
Allen, Dyer, Doppelt, Milbrath & Gilchrist - RIM
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(73) Assignee: **Research In Motion Limited**,
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(21) Appl. No.: **12/499,143**

(22) Filed: **Jul. 8, 2009**





US 20090273526A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273526 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **HANDHELD ELECTRONIC DEVICES WITH ISOLATED ANTENNAS**

Publication Classification

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

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

(57) **ABSTRACT**

Handheld electronic devices are provided that contain wireless communications circuitry having at least first and second antennas. An antenna isolation element reduces signal interference between the antennas, so that the antennas may be used in close proximity to each other. A planar ground element may be used as a ground by the first and second antennas. The first antenna may be formed using a hybrid planar-inverted-F and slot arrangement in which a planar resonating element is located above a rectangular slot in the planar ground element. The second antenna may be formed from an L-shaped strip. The planar resonating element of the first antenna may have first and second arms. The first arm may resonate at a common frequency with the second antenna and may serve as the isolation element. The second arm may resonate at approximately the same frequency as the slot portion of the hybrid antenna.

Correspondence Address:

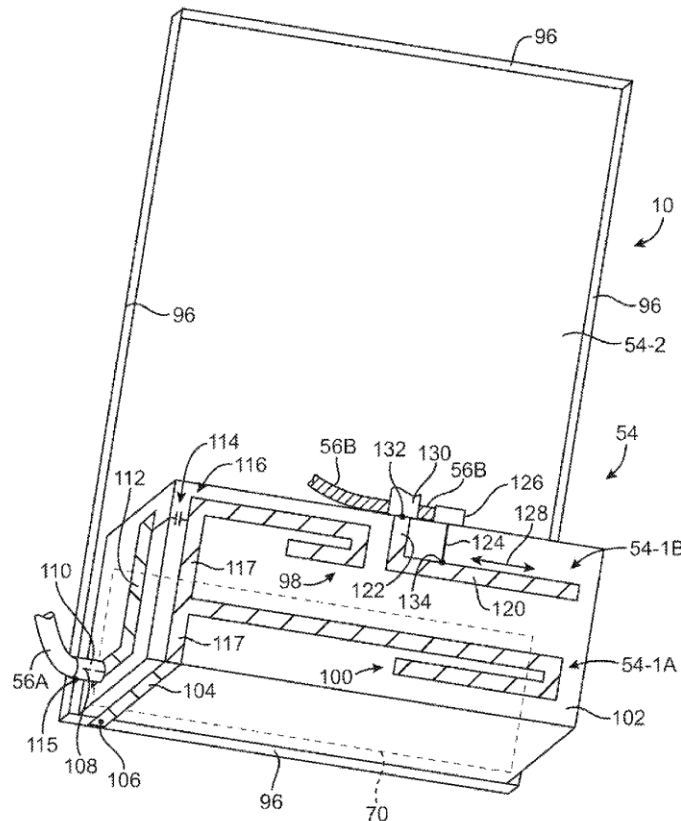
Treyz Law Group
870 Market Street, Suite 984
SAN FRANCISCO, CA 94102 (US)

(21) Appl. No.: **12/504,375**

(22) Filed: **Jul. 16, 2009**

Related U.S. Application Data

(62) Division of application No. 11/650,071, filed on Jan. 4, 2007.





US 20090273528A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273528 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **POLARIZATION DIVERSITY
MULTI-ANTENNA SYSTEM**

(86) PCT No.: **PCT/EP07/59197**

§ 371 (c)(1),
(2), (4) Date: **Mar. 6, 2009**

(75) Inventors: **Lionel Rudant**, Grenoble (FR);
Christophe Delaveaud, Saint Jean
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(30) **Foreign Application Priority Data**

Sep. 4, 2006 (FR) 06/53562

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Publication Classification

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

(52) **U.S. Cl.** **343/725**

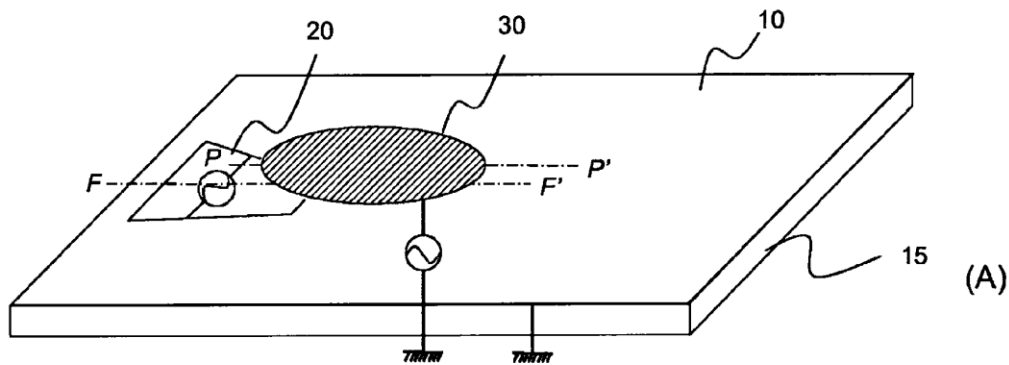
(73) Assignee: **COMMISSARIAT A
L'ENERGIE ATOMIQUE**, Paris
(FR)

(57) **ABSTRACT**

The invention relates to a polarization diversity multi-antenna system comprising a first slot type antenna (20) and at least one second patch type antenna (30), said first and second antennas sharing the same ground plane (10), the slot of the first antenna being laid out in said ground plane and the patch of the second antenna being at least partly plumb with said slot.

(21) Appl. No.: **12/439,750**

(22) PCT Filed: **Sep. 3, 2007**





US 20090273529A1

(19) **United States**

(12) **Patent Application Publication**
Liu

(10) **Pub. No.: US 2009/0273529 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **MULTIPLE ANTENNA ARRANGEMENT**

(30) **Foreign Application Priority Data**

(75) Inventor: **Zidong Liu, Poole (GB)**

Sep. 12, 2006 (EP) 06120534.0

Publication Classification

Correspondence Address:

NXP, B.V.
NXP INTELLECTUAL PROPERTY & LICENSING
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SAN JOSE, CA 95131 (US)

(51) **Int. Cl.**
H01Q 21/00 (2006.01)
H01Q 9/04 (2006.01)
H01Q 13/10 (2006.01)

(52) **U.S. Cl.** **343/725; 343/700 MS**

(57) **ABSTRACT**

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

An antenna arrangement having a ground plane (30, 212) a PIFA antenna (15, 240) arranged parallel to the ground plane, and a quarter wave slot antenna (220), arranged to radiate or receive with orthogonal polarisations, the ground plane being rectangular and having higher and lower E field regions (25), caused by use of either of the antennas. The feed (205, 218) of at least one of the antennas is located in the lower E field region caused by the other of the antennas, to provide improved isolation for a compact size. This can be useful for diversity or dual band use, for mobile handset devices.

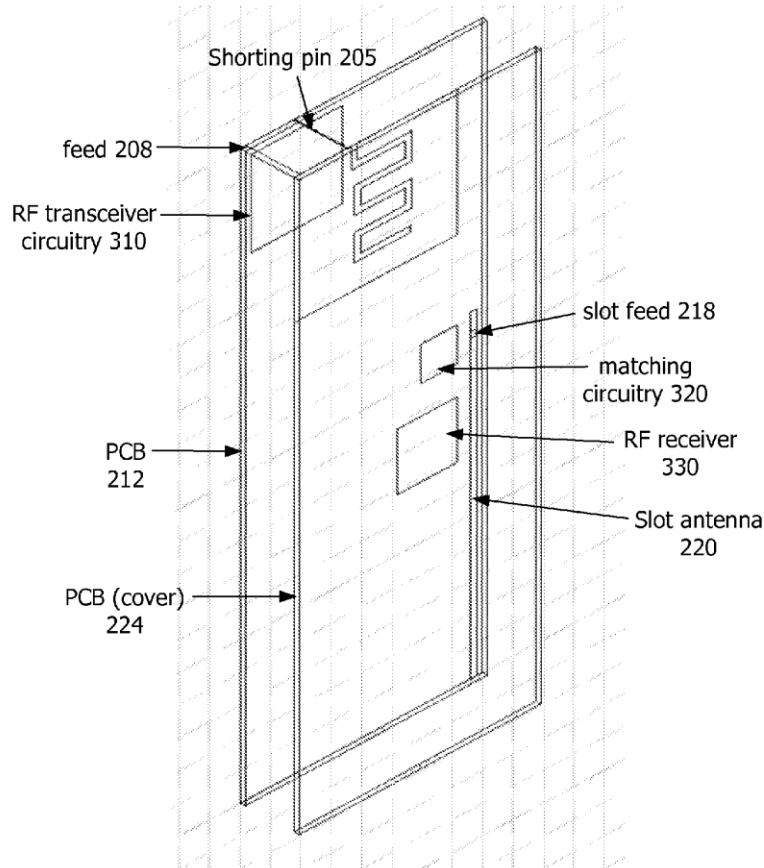
(21) Appl. No.: **12/440,983**

(22) PCT Filed: **Sep. 10, 2007**

(86) PCT No.: **PCT/IB2007/053646**

§ 371 (c)(1),
(2), (4) Date:

Mar. 12, 2009





US 20090273530A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273530 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **COUPLE-FED MULTI-BAND LOOP ANTENNA**

Publication Classification

(75) Inventors: **Yun-Wen Chi**, Sinjhuang City (TW); **Kin-Lu Wong**, Kaohsiung city (TW)

(51) **Int. Cl.**
H01Q 11/12 (2006.01)
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/741; 343/700 MS**
(57) **ABSTRACT**

Correspondence Address:
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CUYAHOGA FALLS, OH 44221 (US)

The present invention is related to a coupled-fed multi-band loop antenna. The antenna comprises a dielectric substrate, a ground plane located on the dielectric substrate and has a grounding point, a radiating portion which comprise a supporter, a coupling trip and a loop strip, and a matching circuit. The coupling strip and loop strip are both located on the supporter, with the coupling strip surrounded by the loop strip. The length of loop strip is about 0.25 wavelength of the antenna's first resonant mode. The loop strip has a first end paralleling with the coupling loop, a second end and a shorting point near the second end and electrically connected to the grounding point on the ground plane. The matching circuit is on the dielectric substrate. One terminal of the matching circuit is connected to the coupling strip, and the other is connected to a signal source.

(73) Assignee: **ACER INCORPORATED**, Taipei Hsien (TW)

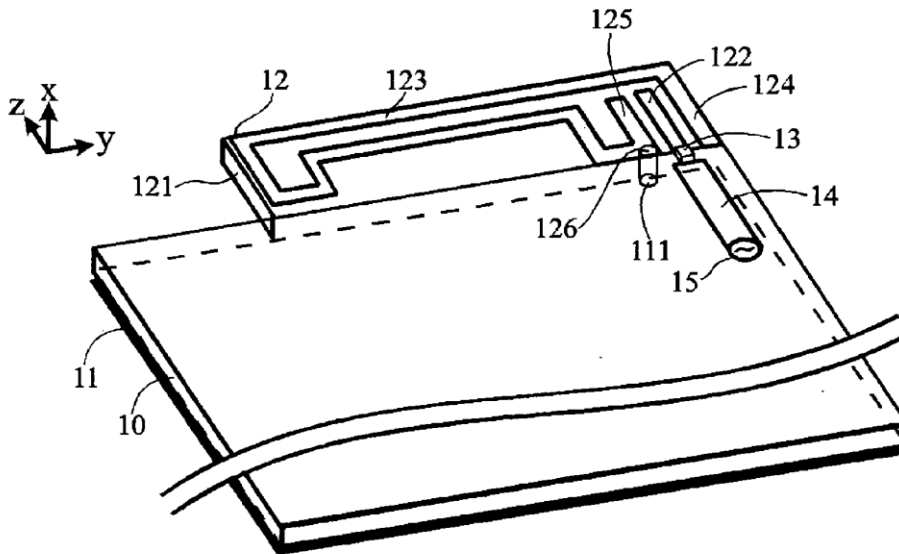
(21) Appl. No.: **12/286,254**

(22) Filed: **Sep. 29, 2008**

(30) **Foreign Application Priority Data**

May 5, 2008 (TW) 097116537

1





US 20090273531A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273531 A1**

(43) **Pub. Date: Nov. 5, 2009**

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

(30) **Foreign Application Priority Data**

Jan. 19, 2007 (JP) 2007-010139

(75) Inventors: **Kenichi Ishizuka**, Yokohama-shi (JP); **Kazunari Kawahata**, Yokohama-shi (JP); **Nobuhito Tsubaki**, Yokohama-shi (JP); **Shigeyuki Fujieda**, Hakusan-shi (JP); **Shinichi Nakano**, Sagamihara-shi (JP)

Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 9/00 (2006.01)

(52) **U.S. Cl.** **343/750; 343/700 MS**

(57) **ABSTRACT**

A compact and low-cost antenna device in which no interference occurs even when many antenna units corresponding to various systems are mounted close together in a small area, and a wireless communication apparatus including the antenna device. An antenna device includes plural antenna units mounted on a single dielectric base. A first antenna unit having a lowest fundamental frequency is disposed at a left end of a non-ground region, a second antenna unit having a highest fundamental frequency of the plurality of the antenna units is disposed at a right end of the non-ground region, and a third antenna unit having a fundamental frequency between those of the first antenna unit and the second antenna unit is disposed between the first and second antenna units. A current-density control coil is connected between a first radiation electrode and a power feeder of the first antenna unit, while a reactance circuit is disposed in the middle of the first radiation electrode. Notches may be disposed between the first radiation electrode and a second radiation electrode and between the first radiation electrode and a third radiation electrode.

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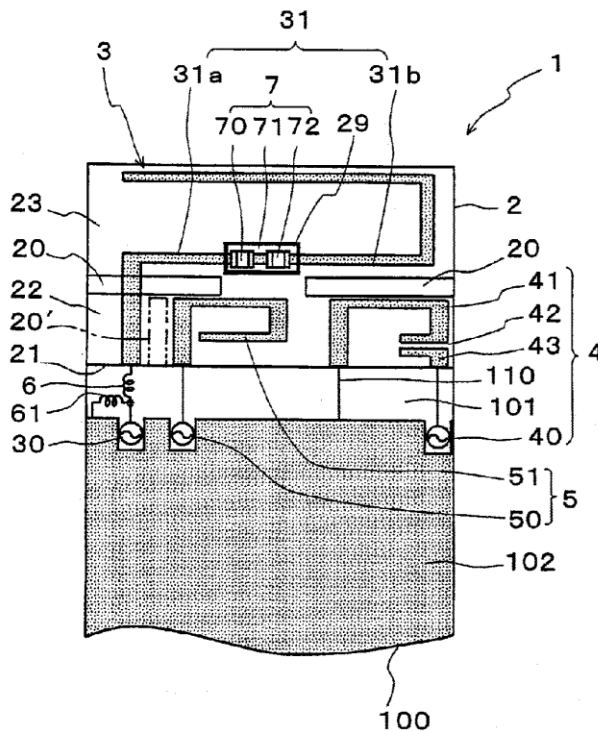
(73) Assignee: **Murata Manufacturing Co.,Ltd.**

(21) Appl. No.: **12/504,367**

(22) Filed: **Jul. 16, 2009**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2007/071427, filed on Nov. 2, 2007.





US 20090273533A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273533 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **HIGH GAIN STEERABLE PHASED-ARRAY ANTENNA WITH SELECTABLE CHARACTERISTICS**

Publication Classification

(75) Inventors: **Forrest Wolf, Reno, NV (US); Debashis Bagchi, Reno, NV (US)**

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

(52) **U.S. Cl.** **343/770; 343/700 MS**

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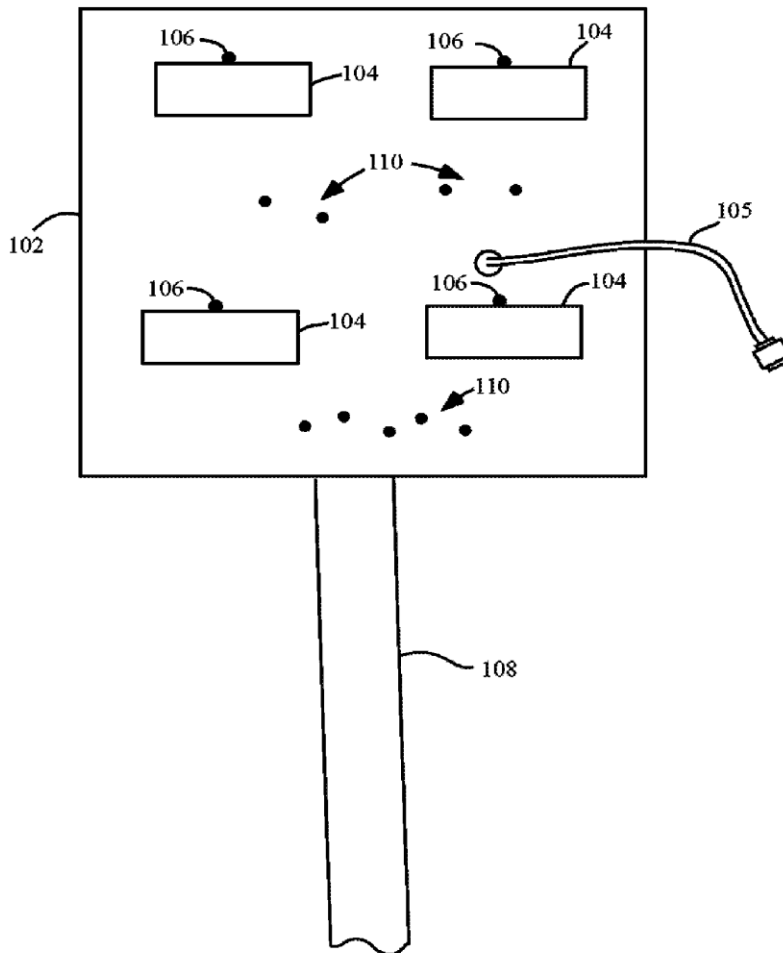
(57) **ABSTRACT**

A high gain, phased array antenna includes a conducting sheet having a number of one or more slots defined therein. For each slot, an electrical microstrip feed line is electronically coupled with a corresponding slot to form a magnetically-coupled LC resonance element. A main feed line couples with the one or more microstrip feed lines. A specific azimuth pattern, antenna frequency, and/or beam direction is/are selectable in accordance with specific structural or electrical characteristics of the antenna.

(73) Assignee: **PINYON TECHNOLOGIES, INC., Reno, NV (US)**

(21) Appl. No.: **12/115,537**

(22) Filed: **May 5, 2008**





US 20090273535A1

(19) **United States**

(12) **Patent Application Publication**

Lee et al.

(10) **Pub. No.: US 2009/0273535 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **ANTENNA APPARATUS**

(30) **Foreign Application Priority Data**

(76) Inventors: **Sung-Gyoo Lee**, Tokyo (JP);
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Hirose, Chichibu-gun (JP); **Koji**
Yanao, Chichibu-gun (JP)

Jun. 29, 2006 (JP) 2006-180513

Publication Classification

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

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

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DARBY & DARBY P.C.
P.O. BOX 770, Church Street Station
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(21) Appl. No.: **12/306,614**

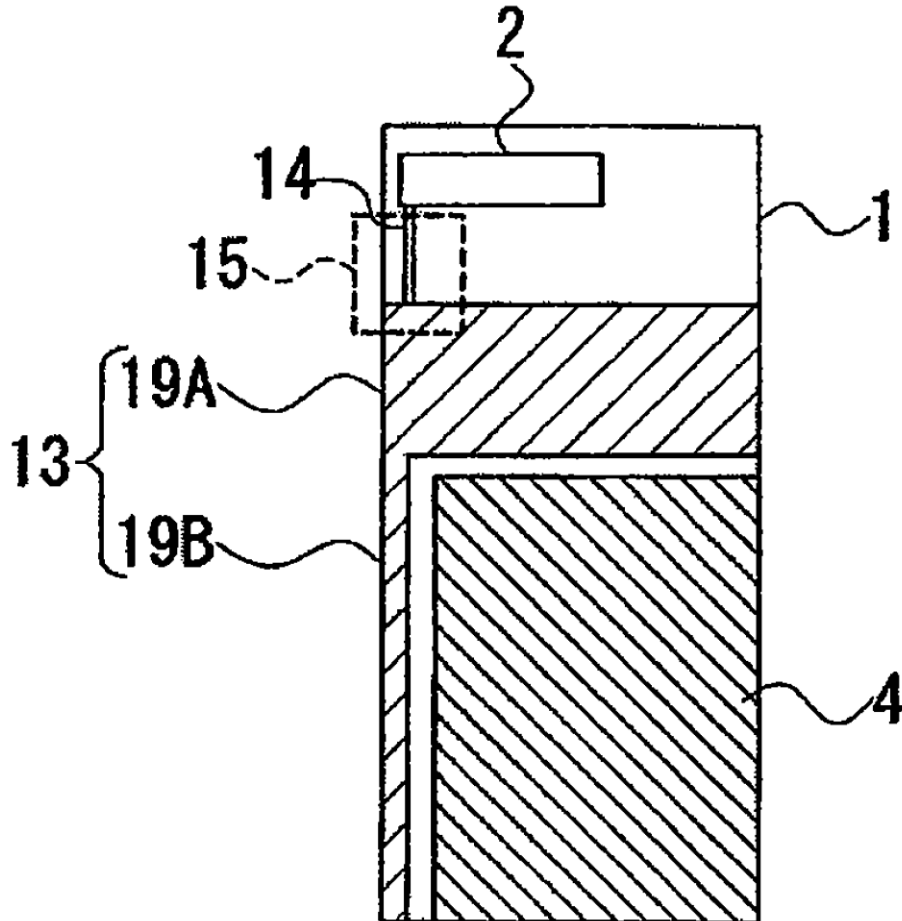
(57) **ABSTRACT**

(22) PCT Filed: **Jun. 29, 2007**

An antenna apparatus includes: a substrate; an RF ground conductor which is branched to extend in at least two directions and at least a part of which is formed on a surface of the substrate, the RF ground conductor functioning as an antenna ground plane; and an antenna portion, one end of which is connected to the RF ground conductor.

(86) PCT No.: **PCT/JP2007/063142**

§ 371 (c)(1),
(2), (4) Date: **Dec. 24, 2008**





US 20090273536A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273536 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **LOW-PROFILE WIDE-BANDWIDTH RADIO FREQUENCY ANTENNA**

Publication Classification

(75) Inventors: **Dean Kitchener**, Brentwood (GB);
Andrew Urquhart, Hertfordshire (GB)

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/50 (2006.01)
H01Q 5/00 (2006.01)
(52) **U.S. Cl.** **343/860; 343/848**

Correspondence Address:
WITHROW & TERRANOVA, P.L.L.C.
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CARY, NC 27518 (US)

(57) **ABSTRACT**

The present invention relates to an RF antenna structure that includes a planar structure and a loading plate, such that the planar structure is mounted between a ground plane and the loading plate to form an RF antenna. The loading plate may be about parallel to the ground plane and the planar structure may be about perpendicular to the loading plate and the ground plane. The loading plate may allow the height of the RF antenna structure above the ground plane to be relatively small. For example, the height may be significantly less than one-quarter of a wavelength of RF signals of interest. The planar structure may include two conductive matching elements to help increase the bandwidth of the RF antenna structure.

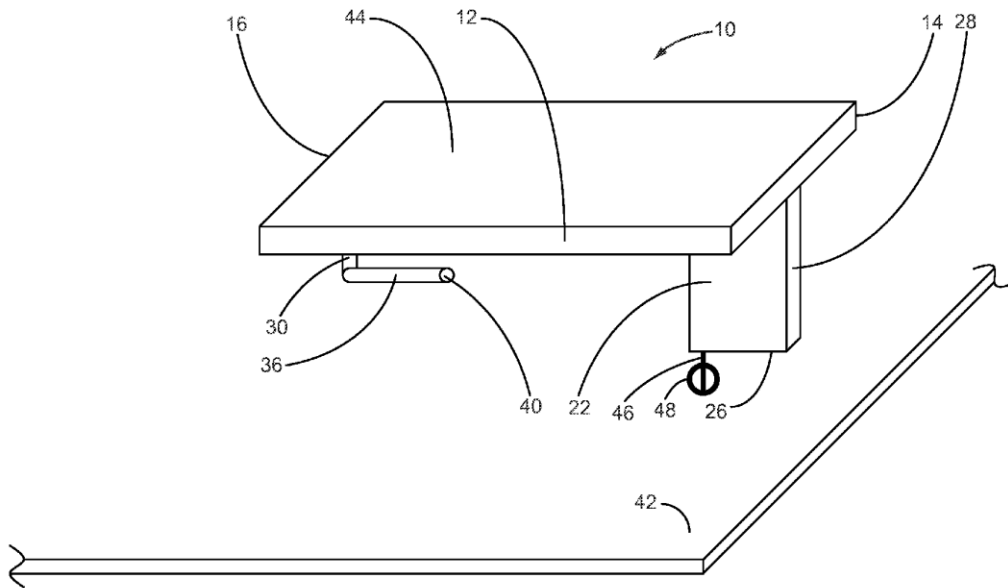
(73) Assignee: **Nortel Networks Limited**, St. Laurent (CA)

(21) Appl. No.: **12/415,604**

(22) Filed: **Mar. 31, 2009**

Related U.S. Application Data

(60) Provisional application No. 61/050,028, filed on May 2, 2008.





US 20090273537A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0273537 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **FM CHIP ANTENNA**

Publication Classification

(76) Inventors: **Chia-Lun TANG**, Pa-Te City (TW); **Sheng-Hong Wang**, Pa-Te City (TW)

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

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

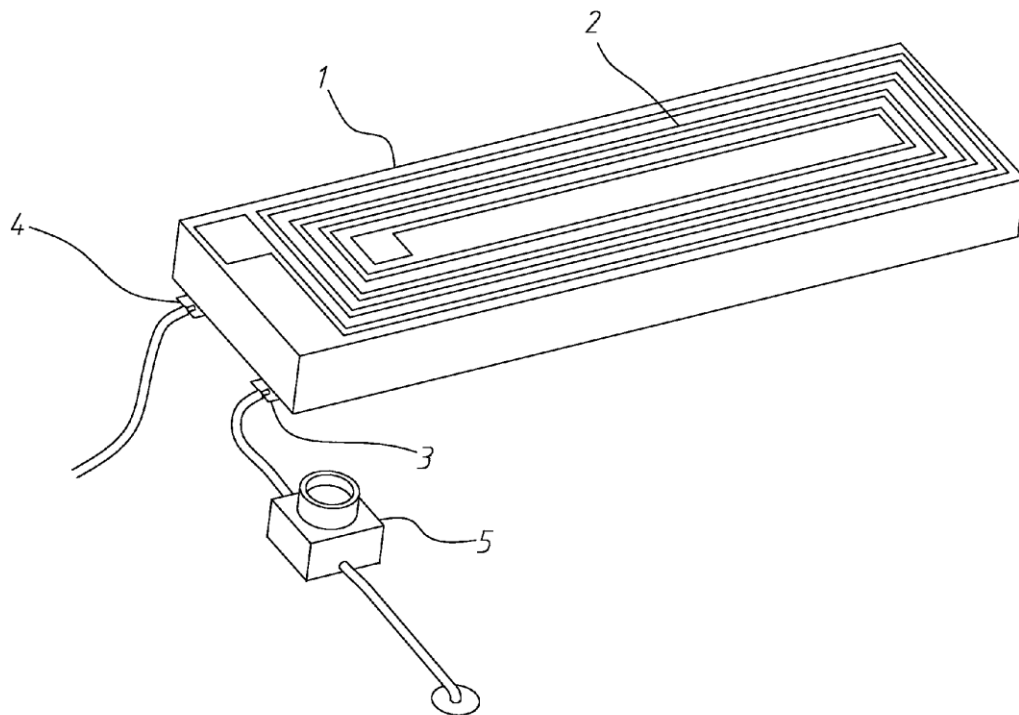
Correspondence Address:
Guice Patents PLLC
12647 Galveston Court #302
Manassas, VA 20112 (US)

(57) **ABSTRACT**

A frequency modulation (FM) chip antenna having a microwave base board printed thereon with a helical radiation metallic member of a single layer or multiple layers, the microwave base board is provided with a feeding point and a grounding point to receive energy in the mode of electromagnetic wave coupling.

(21) Appl. No.: **12/113,370**

(22) Filed: **May 1, 2008**





US 20090275370A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0275370 A1**

(43) **Pub. Date: Nov. 5, 2009**

(54) **HANDHELD ELECTRONIC DEVICES WITH ISOLATED ANTENNAS**

Publication Classification

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

(51) **Int. Cl.**
H04M 1/00 (2006.01)
H01Q 1/24 (2006.01)
(52) **U.S. Cl.** **455/575.7; 343/702**

(57) **ABSTRACT**

Handheld electronic devices are provided that contain wireless communications circuitry having at least first and second antennas. An antenna isolation element reduces signal interference between the antennas, so that the antennas may be used in close proximity to each other. A planar ground element may be used as a ground by the first and second antennas. The first antenna may be formed using a hybrid planar-inverted-F and slot arrangement in which a planar resonating element is located above a rectangular slot in the planar ground element. The second antenna may be formed from an L-shaped strip. The planar resonating element of the first antenna may have first and second arms. The first arm may resonate at a common frequency with the second antenna and may serve as the isolation element. The second arm may resonate at approximately the same frequency as the slot portion of the hybrid antenna.

Correspondence Address:

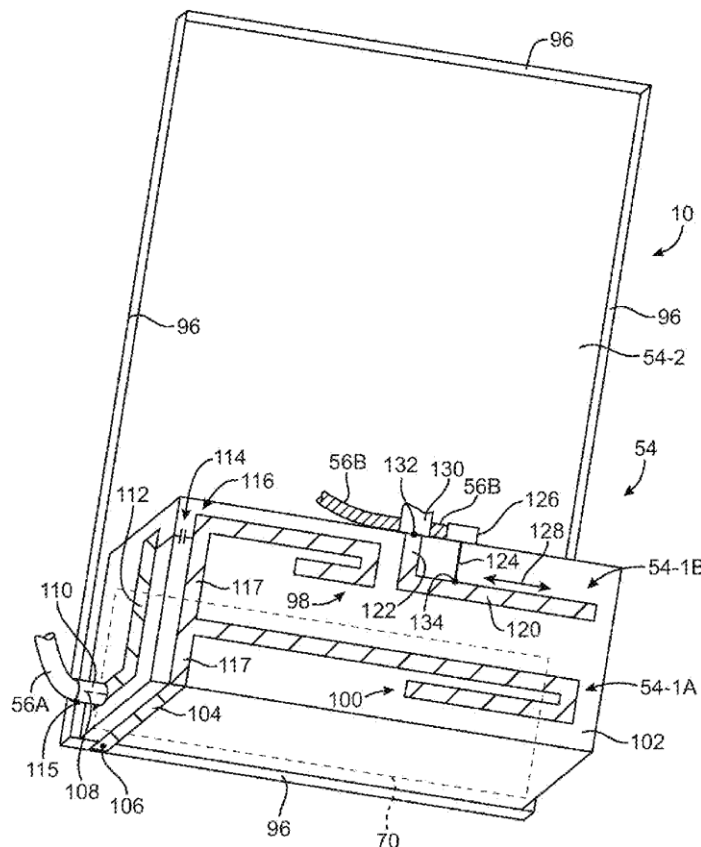
Treyz Law Group
870 Market Street, Suite 984
SAN FRANCISCO, CA 94102 (US)

(21) Appl. No.: **12/504,246**

(22) Filed: **Jul. 16, 2009**

Related U.S. Application Data

(62) Division of application No. 11/650,071, filed on Jan. 4, 2007.





US 20090278745A1

(19) **United States**

(12) **Patent Application Publication**
HUANG

(10) **Pub. No.: US 2009/0278745 A1**

(43) **Pub. Date: Nov. 12, 2009**

(54) **DUAL-BAND INVERTED-F ANTENNA**

Publication Classification

(75) Inventor: **Li-Ju HUANG**, Fongshan City
(TW)

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

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

Correspondence Address:

Workman Nydegger
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111 (US)

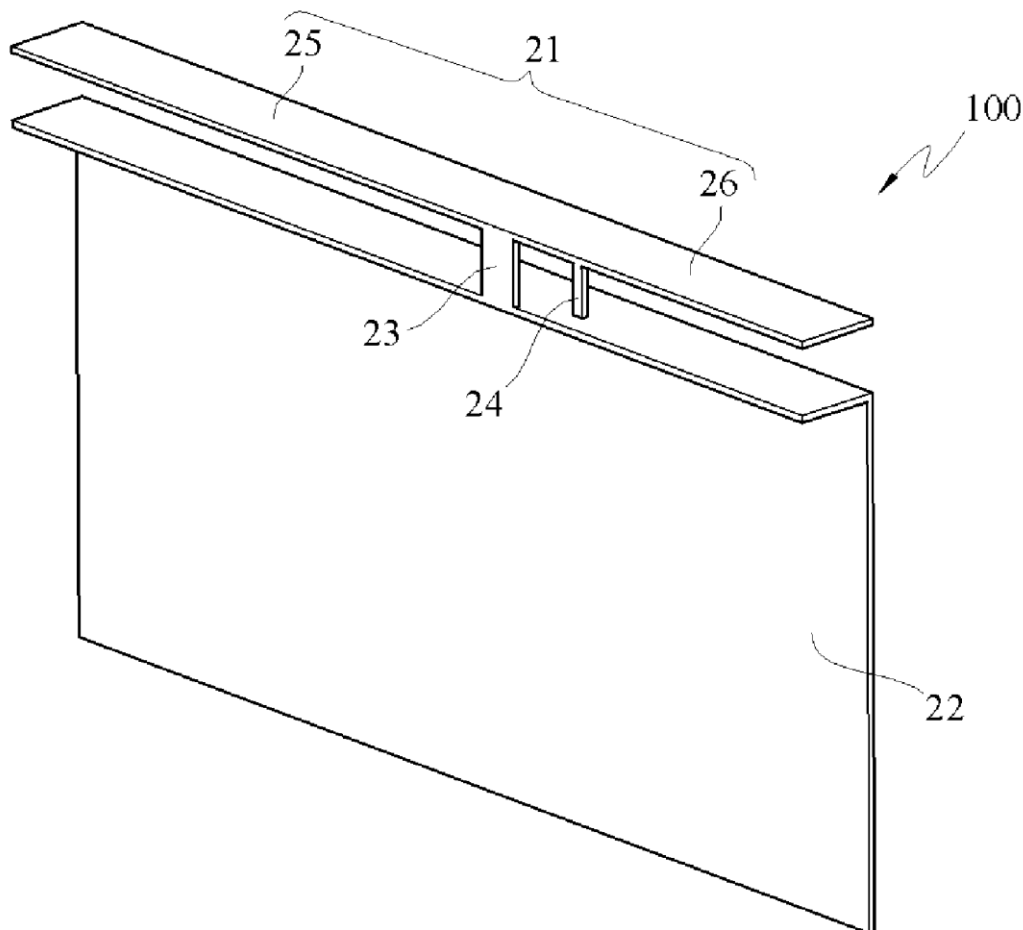
(57) **ABSTRACT**

A dual-band inverted-F antenna is described. After being fed in by a signal feed-in portion, a first band signal and a second band signal are wirelessly sent from a first radiation portion and a second radiation portion of a radiation element in one aspect, and transmitted to a ground element through a short-circuit pin in another aspect, so as to achieve the dual-band effect. Meanwhile, a bent structure is designed on the short-circuit pin, such that when the short-circuit pin is employed by the dual-band inverted-F antenna to transmit signals, the interference on the signal transmission/reception of the radiation element will be reduced.

(73) Assignee: **Smart Approach CO., LTD.**,
Hsinchu (TW)

(21) Appl. No.: **12/118,331**

(22) Filed: **May 9, 2008**





US 20090278751A1

(19) **United States**

(12) **Patent Application Publication**
Nebashi

(10) **Pub. No.: US 2009/0278751 A1**

(43) **Pub. Date: Nov. 12, 2009**

(54) **ANTENNA DEVICE AND PORTABLE
TERMINAL DEVICE**

(30) **Foreign Application Priority Data**

Jun. 29, 2006 (JP) 2006-179616

(75) Inventor: **Takayuki Nebashi, Kanagawa (JP)**

Publication Classification

Correspondence Address:
HOGAN & HARTSON L.L.P.
1999 AVENUE OF THE STARS, SUITE 1400
LOS ANGELES, CA 90067 (US)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/12 (2006.01)

(52) **U.S. Cl.** **343/702; 343/878**

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

(57) **ABSTRACT**

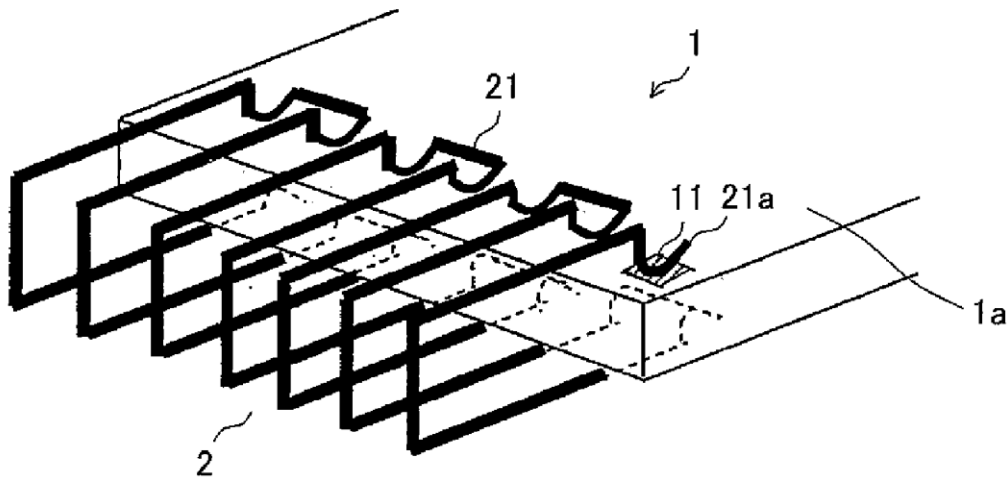
(21) Appl. No.: **12/306,905**

An antenna device and a portable terminal device bringing only part of an antenna conductor into contact with a board so as to keep loss due to a dielectric material to a minimum and to achieve smaller size and lighter weight, including a planar circuit board (1) on which a high frequency transmitting/receiving circuit is mounted and a strip-shaped or wire-shaped antenna conductor (2) which is partly supported over an end portion of the circuit board (1) and has a necessary wavelength for the frequency used.

(22) PCT Filed: **Jun. 29, 2007**

(86) PCT No.: **PCT/JP2007/063140**

§ 371 (c)(1),
(2), (4) Date: **Dec. 29, 2008**





US 20090278752A1

(19) **United States**

(12) **Patent Application Publication**
Oh

(10) **Pub. No.: US 2009/0278752 A1**

(43) **Pub. Date: Nov. 12, 2009**

(54) **MOBILE TERMINAL HAVING ANTENNA MOUNTED IN FLEXIBLE PCB OF SIDE KEY**

Publication Classification

(75) Inventor: **Hyun Jong Oh**, Daegu Metropolitan City (KR)

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

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

Correspondence Address:
DOCKET CLERK
P.O. DRAWER 800889
DALLAS, TX 75380 (US)

(57) **ABSTRACT**

A mobile terminal wherein a second antenna is mounted in a flexible PCB of a side key positioned at a location separated from a first antenna is provided. The mobile terminal includes: a main body; the first antenna and a printed circuit board (PCB) positioned on the inside of the main body; a side key positioned at a side surface of the outside of the main body; and a flexible PCB of the side key positioned on the inside of the main body. The flexible PCB of the side key including the second antenna. Therefore, by mounting a second antenna in a flexible PCB of a side key positioned at a location separated from a first antenna, an emission and reception performance of the first antenna and the second antenna can be improved.

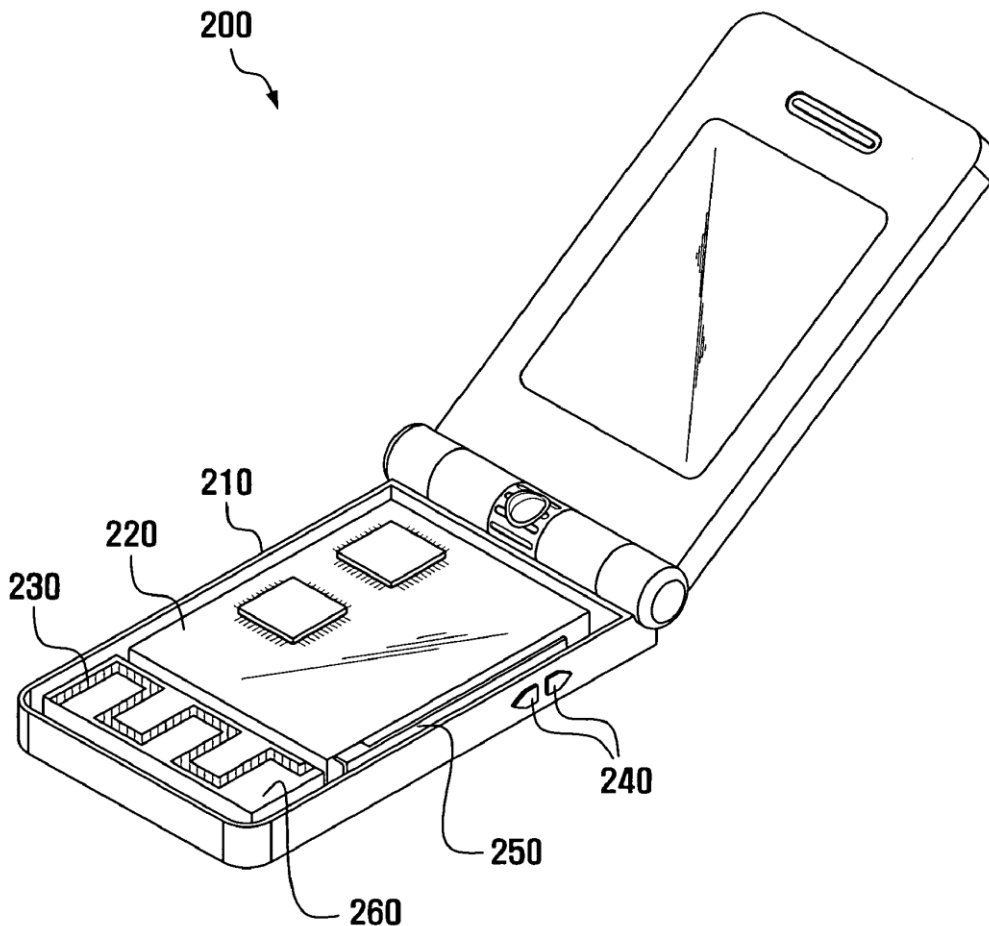
(73) Assignee: **Samsung Electronics Co., Ltd.**, Suwon-si (KR)

(21) Appl. No.: **12/386,283**

(22) Filed: **Apr. 16, 2009**

(30) **Foreign Application Priority Data**

May 8, 2008 (KR) 10-2008-0042656





US 20090278753A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0278753 A1**

(43) **Pub. Date: Nov. 12, 2009**

(54) **HANDHELD ELECTRONIC DEVICES WITH ISOLATED ANTENNAS**

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

Correspondence Address:
Treyz Law Group
870 Market Street, Suite 984
SAN FRANCISCO, CA 94102 (US)

(21) Appl. No.: **12/504,443**

(22) Filed: **Jul. 16, 2009**

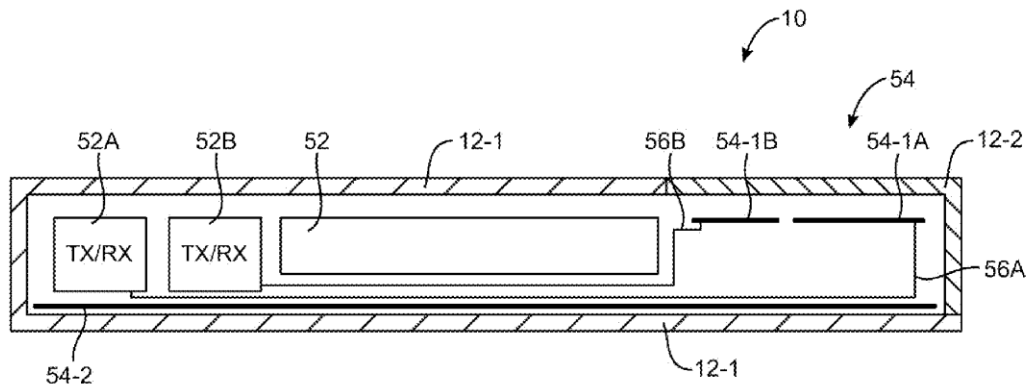
Related U.S. Application Data

(62) Division of application No. 11/650,071, filed on Jan. 4, 2007, now Pat. No. 7,595,759.

Publication Classification

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

(57) **ABSTRACT**
Handheld electronic devices are provided that contain wireless communications circuitry having at least first and second antennas. An antenna isolation element reduces signal interference between the antennas, so that the antennas may be used in close proximity to each other. A planar ground element may be used as a ground by the first and second antennas. The first antenna may be formed using a hybrid planar-inverted-F and slot arrangement in which a planar resonating element is located above a rectangular slot in the planar ground element. The second antenna may be formed from an L-shaped strip. The planar resonating element of the first antenna may have first and second arms. The first arm may resonate at a common frequency with the second antenna and may serve as the isolation element. The second arm may resonate at approximately the same frequency as the slot portion of the hybrid antenna.





US 20090278756A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0278756 A1**

(43) **Pub. Date: Nov. 12, 2009**

(54) **ACTIVE TUNED LOOP-COUPLED ANTENNA**

Publication Classification

(75) Inventors: **Alf Friman**, Vaxjo (SE); **Sverker
Pettersson**, Nybro (SE); **Laurent
Desclos**, San Diego, CA (US);
Jeffrey Shamblin, San Marcos, CA
(US)

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

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

(57) **ABSTRACT**

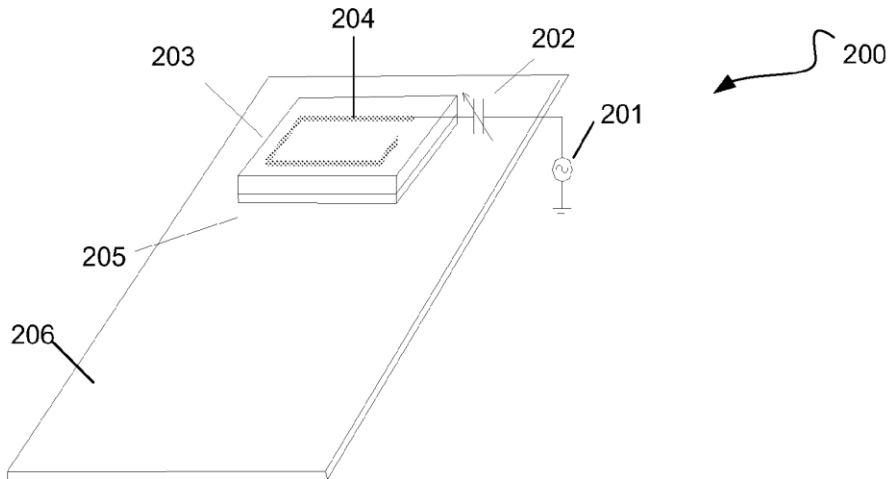
Correspondence Address:
Coastal Patent, LLC
P.O.BOX 232340
San Diego, CA 92193 (US)

An active tuned loop-coupled antenna capable of optimizing performance over incremental bandwidths and capable of tuning over a large total bandwidth to be used in wireless communications. The active loop is capable of serving as the radiating element or a radiating element can be coupled to this active loop. Multiple active tuned loops can be coupled together to extend the total bandwidth of the antenna. Active components can be incorporated into the antenna structure to provide yet additional extension of the bandwidth along with increased optimization of antenna performance over the frequency range of the antenna.

(73) Assignee: **ETHERTRONICS, INC.**

(21) Appl. No.: **12/117,669**

(22) Filed: **May 8, 2008**





US 20090278757A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0278757 A1**

(43) **Pub. Date: Nov. 12, 2009**

(54) **MOBILE TERMINAL HAVING METAL CASE AND ANTENNA STRUCTURE**

(30) **Foreign Application Priority Data**

May 6, 2008 (KR) 10-2008-0041704

(75) Inventors: **Jung Ho AHN**, Seoul (KR); **Yong Jin KIM**, Seoul (KR); **Dong Hwan KIM**, Hwaseong-si (KR); **Jae Ho LEE**, Yongin-si (KR); **Seung Hwan KIM**, Suwon-si (KR)

Publication Classification

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

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

(57) **ABSTRACT**

A mobile terminal including a metal case and an antenna structure that can exhibit optimum radiation performance is provided. The antenna structure includes an antenna having a radiation unit for transmitting and for receiving electric waves, a Printed Circuit Board (PCB) to which the antenna is mechanically coupled at one surface thereof and having a power supply unit electrically coupled to the radiation unit, and a case constructed using a metal material within which the PCB is disposed, wherein the case has at least one slot formed in a surface thereof opposite to the surface to which the PCB is fastened and adjacent to the radiation unit.

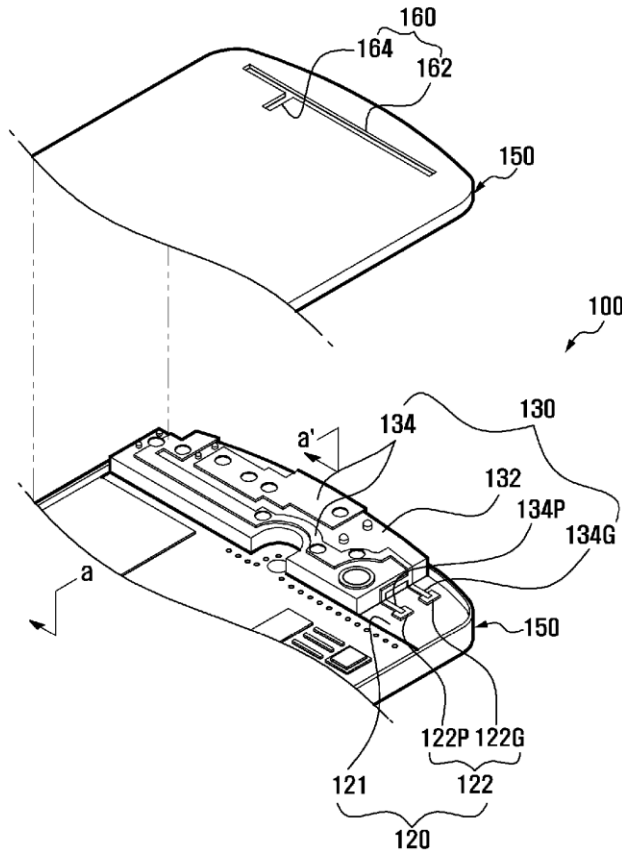
Correspondence Address:

Jefferson IP Law, LLP
1130 Connecticut Ave., NW, Suite 420
Washington, DC 20036 (US)

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

(21) Appl. No.: **12/419,503**

(22) Filed: **Apr. 7, 2009**





US 20090278758A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0278758 A1**

(43) **Pub. Date: Nov. 12, 2009**

(54) **DIPOLE ANTENNA CAPABLE OF SUPPORTING MULTI-BAND COMMUNICATIONS**

(22) Filed: **May 7, 2008**

Publication Classification

(75) Inventors: **Shi-Ming Zhao**, Taipei City (TW); **Ding-Bing Lin**, Taipei County (TW); **Chao-Hsiung Tseng**, Miaoli County (TW); **Jui-Hsien Chien**, Kaohsiung City (TW); **Shiao-Ting Wu**, Kaohsiung County (TW)

(51) **Int. Cl.**
H01Q 9/26 (2006.01)

(52) **U.S. Cl.** **343/803; 343/793**

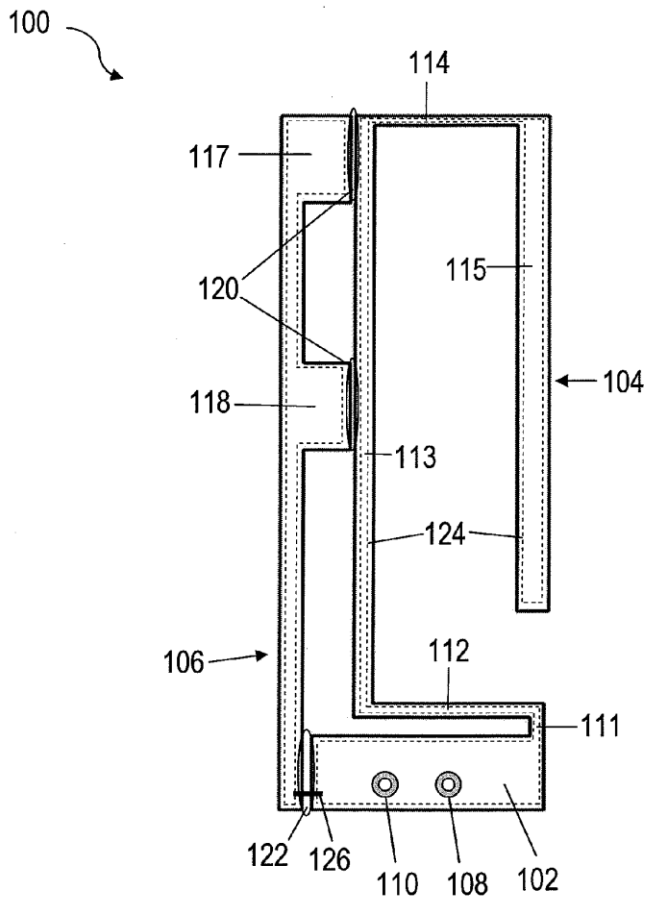
(57) **ABSTRACT**

According to one embodiment of the present invention, a dipole antenna capable of supporting multi-band communications, includes a first portion of the antenna in a folded structure, a second portion of the antenna that includes a first coupling pad and a second coupling pad physically separated by a distance, and a current path along the first portion of the antenna and the second portion of the antenna, wherein a first portion of the current path that includes the first coupling pad and the second coupling pad is configured to introduce a slow wave effect if electric current flows through the first portion of the current path.

Correspondence Address:
GENE I. SU
17F-1, No. 151, SEC. 4, XINYI ROAD
TAIPEI (TW)

(73) Assignee: **SUMWINTEK CORP.**, Hsinchu County (TW)

(21) Appl. No.: **12/116,224**





US 20090284418A1

(19) **United States**

(12) **Patent Application Publication**
SHIH

(10) **Pub. No.: US 2009/0284418 A1**

(43) **Pub. Date: Nov. 19, 2009**

(54) **MULTIBAND ANTENNA**

Publication Classification

(75) Inventor: **YEN-YI SHIH**, Tu-Cheng (TW)

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

Correspondence Address:
PCE INDUSTRY, INC.
ATT. Steven Reiss
288 SOUTH MAYO AVENUE
CITY OF INDUSTRY, CA 91789 (US)

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

(57) **ABSTRACT**

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

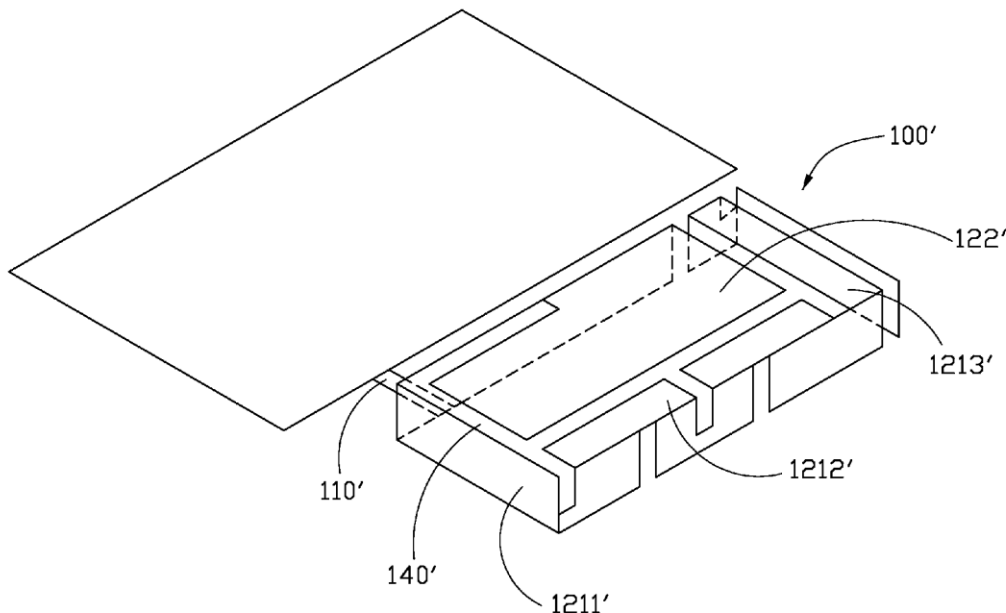
A multiband antenna is positioned on a substrate and includes a feeding portion, a grounding portion, and a radiating portion. The feeding portion is configured for feeding electromagnetic signals. The grounding portion is positioned on the substrate. The radiating portion electrically connects to the feeding portion for transceiving the electromagnetic signals. The radiation portion includes a first radiator and a second radiator. The first radiator includes a first radiating section that electrically connects to the feeding portion, a second radiating section, and a third radiating section, all of which electrically connects one another one-by-one in sequence and cooperatively defines a receiving space. The second radiator is housed in the receiving space and electrically connects to the feeding portion.

(21) Appl. No.: **12/211,032**

(22) Filed: **Sep. 15, 2008**

(30) **Foreign Application Priority Data**

May 16, 2008 (TW) 97118011





US 20090284428A1

(19) **United States**

(12) **Patent Application Publication**
WU

(10) **Pub. No.: US 2009/0284428 A1**

(43) **Pub. Date: Nov. 19, 2009**

(54) **SLOT ANTENNA**

(30) **Foreign Application Priority Data**

(75) **Inventor:** SUENG-CHIEN WU, Tu-Cheng (TW)

May 16, 2008 (TW) 97208529

Publication Classification

Correspondence Address:

PCE INDUSTRY, INC.

ATT. Steven Reiss

288 SOUTH MAYO AVENUE

CITY OF INDUSTRY, CA 91789 (US)

(51) **Int. Cl.**

H01Q 13/10 (2006.01)

(52) **U.S. Cl.**

343/767

(57)

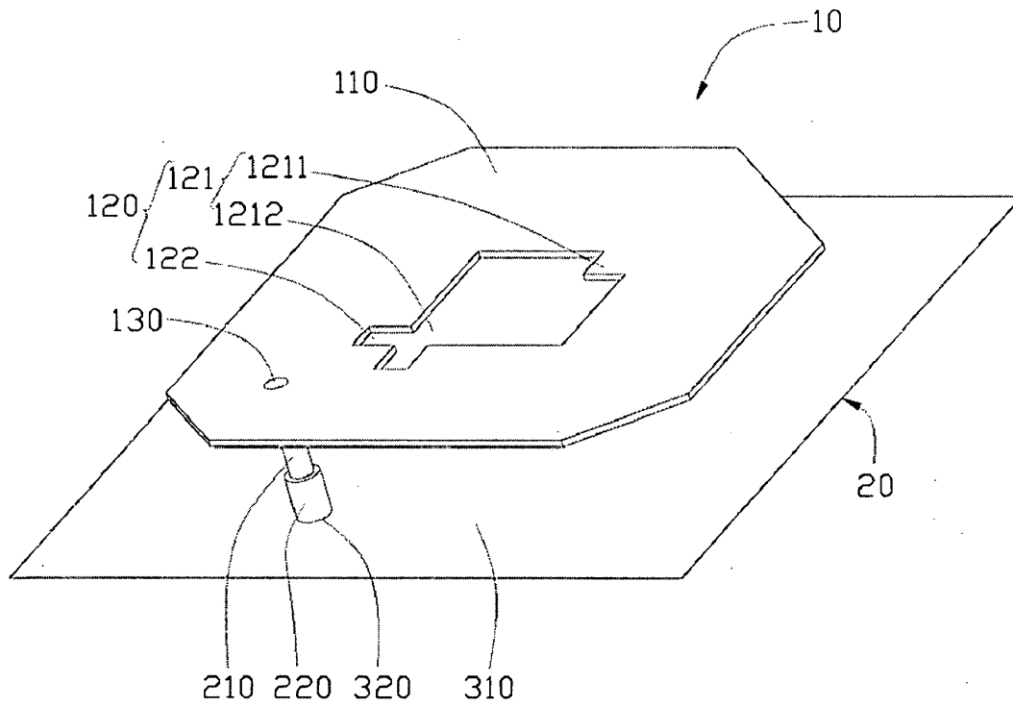
ABSTRACT

A slot antenna positioned on a substrate includes a grounding portion, a radiating portion, and a feeding portion. The grounding portion is positioned on the substrate. The radiating portion is parallel to the grounding portion and shaped like an irregular octagon. The radiating portion includes an irregular slot that is defined substantially in the center of the irregular octagon. The feeding portion electrically connects the radiating portion to the grounding portion for feeding electromagnetic signals.

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

(21) **Appl. No.:** 12/211,039

(22) **Filed:** Sep. 15, 2008





US 20090284432A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0284432 A1**

(43) **Pub. Date: Nov. 19, 2009**

(54) **CONFORMABLE ANTENNA**

Publication Classification

(75) Inventors: **Randell Cozzolino**, Phoenix, AZ
(US); **Gary Wannagot**, Gilbert, AZ
(US); **Snir Azulay**, Tiberias (IL)

(51) **Int. Cl.**
H01Q 9/16 (2006.01)
H01P 11/00 (2006.01)
H01Q 9/04 (2006.01)

Correspondence Address:
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W., SUITE
800
WASHINGTON, DC 20037 (US)

(52) **U.S. Cl.** **343/821; 29/601; 343/700 MS**

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

(57) **ABSTRACT**

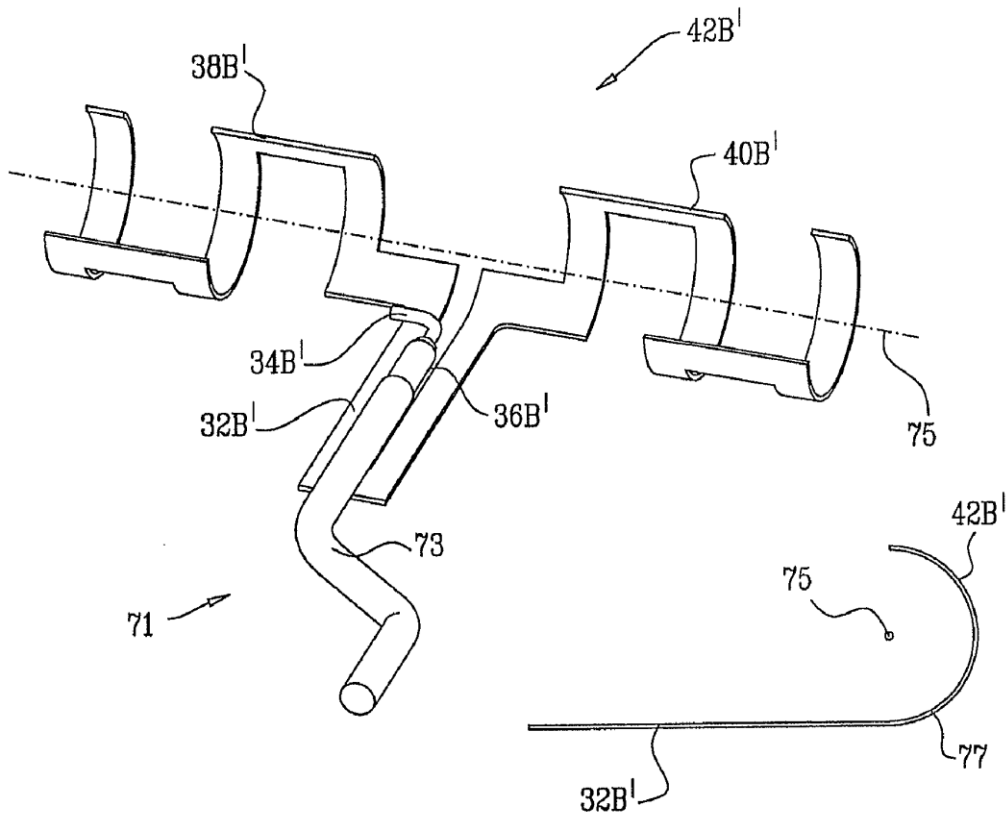
(21) Appl. No.: **12/468,579**

A polymorphic antenna, including a metallic template configurable in at least first and second possible different three-dimensional shapes, the antenna, when configured in the at least first and second different three-dimensional shapes, having a common antenna feed point, a common balun coupled to the common antenna feed point; and a common dipole coupled to the common antenna feed point and to the common balun. The antenna operates in a common frequency band when configured in either of the at least first and second different three-dimensional shapes when fed via the common antenna feed point.

(22) Filed: **May 19, 2009**

Related U.S. Application Data

(60) Provisional application No. 61/128,284, filed on May 19, 2008.





US 20090284433A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0284433 A1**

(43) **Pub. Date: Nov. 19, 2009**

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

Publication Classification

(75) Inventors: **Yukako Tsutsumi**, Yokohama-Shi
(JP); **Masaki Nishio**, Tokyo (JP)

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/50 (2006.01)
H01Q 1/36 (2006.01)

Correspondence Address:
TUROC & WATSON, LLP
127 Public Square, 57th Floor, Key Tower
CLEVELAND, OH 44114 (US)

(52) **U.S. Cl. 343/825; 343/850; 343/700 MS**

(73) Assignee: **KABUSHIKI KAISHA
TOSHIBA**, Tokyo (JP)

(57) **ABSTRACT**

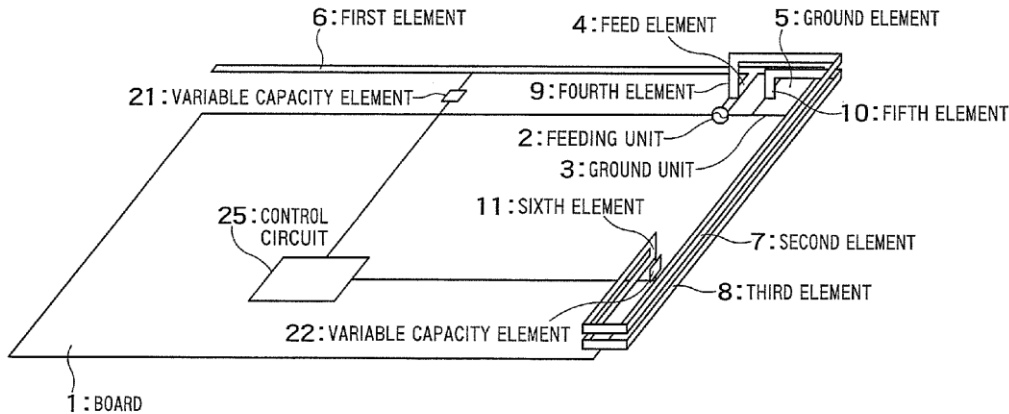
(21) Appl. No.: **12/465,075**

(22) Filed: **May 13, 2009**

There is provided with an antenna device provided on a board, which includes: a first linear element 6; a feed element 4; a ground element 5; a second linear element 7 and a third linear element 8 arranged in parallel with each other; a fourth linear element 9; a fifth linear element 10; and a sixth linear element 11. A first radiating element is formed of the first linear element 6 and the feed element 4, and the second radiating element is formed of a portion of the feed element 4, a portion of the ground element 5, and the second, third, fourth, fifth, and sixth linear elements 7-11.

(30) **Foreign Application Priority Data**

May 16, 2008 (JP) 2008-129786





US 20090289858A1

(19) **United States**

(12) **Patent Application Publication**
Olsson

(10) **Pub. No.: US 2009/0289858 A1**

(43) **Pub. Date: Nov. 26, 2009**

(54) **ANTENNA DEVICE, A PORTABLE RADIO COMMUNICATION DEVICE COMPRISING SUCH ANTENNA DEVICE, AND A BATTERY PACKAGE FOR A PORTABLE RADIO COMMUNICATION DEVICE**

(75) Inventor: **Rikard Olsson, Stockholm (SE)**

Correspondence Address:
HOLLAND & HART, LLP
P.O BOX 8749
DENVER, CO 80201 (US)

(73) Assignee: **Laird Technologies AB,**
Akersberga (SE)

(21) Appl. No.: **12/278,248**

(22) PCT Filed: **Feb. 19, 2007**

(86) PCT No.: **PCT/SE07/00147**

§ 371 (c)(1),
(2), (4) Date: **Nov. 26, 2008**

(30) **Foreign Application Priority Data**

Feb. 24, 2006 (SE) 0600417-0

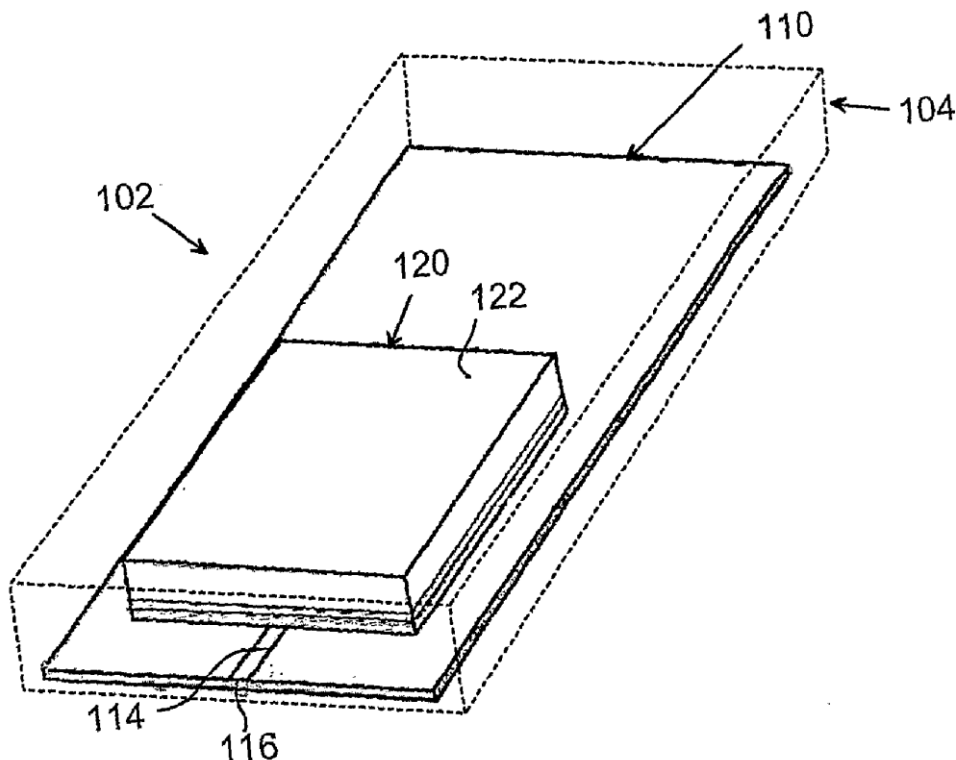
Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 1/24 (2006.01)
H01Q 13/10 (2006.01)

(52) **U.S. Cl.** **343/702; 343/700 MS; 343/767**

(57) **ABSTRACT**

An antenna device for use in a portable radio communication device comprises a ground plane (110), a microstrip line (114) connected to a feed point (116) for feeding and/or receiving radio frequency signals. A package (120) having an electrically conductive housing (122) is provided in the radio communication device, wherein the housing is provided above the ground plane and the microstrip line, wherein the housing is galvanically insulated from the microstrip line, and wherein the housing is capacitively coupled to the microstrip line. The antenna device thus has a large radiating area and thus providing better performance of the device. Also, an already existing part in the radio communication device, e.g., a battery package, can be used also as radiating element, saving space and costs.





US 20090289859A1

(19) **United States**

(12) **Patent Application Publication**
PAN

(10) **Pub. No.: US 2009/0289859 A1**

(43) **Pub. Date: Nov. 26, 2009**

(54) **HYPERBAND ANTENNA AND PORTABLE WIRELESS COMMUNICATION DEVICE USING THE SAME**

(30) **Foreign Application Priority Data**

May 21, 2008 (CN) 200810301695.1

Publication Classification

(75) Inventor: **JUN-LIANG PAN, Tu-Cheng (TW)**

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

Correspondence Address:
PCE INDUSTRY, INC.
ATT. Steven Reiss
288 SOUTH MAYO AVENUE
CITY OF INDUSTRY, CA 91789 (US)

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

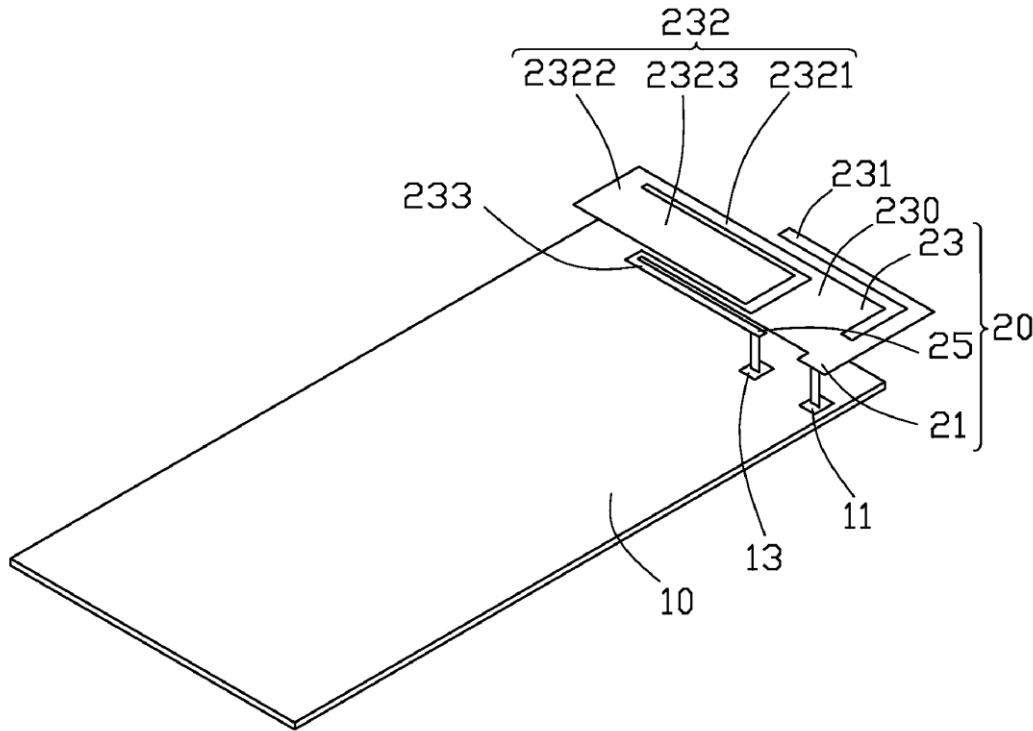
(57) **ABSTRACT**

A planar hyperband antenna includes a feed end, a radiating body and a grounding end. The radiating body includes a main body, a first radiating arm, a second radiating arm and a third radiating arm. The first radiating arm, the second radiating arm, and the third radiating arm extend from the main body and share the feed end cooperatively. The radiating body generates three resonant frequencies according to the radio frequency signals received by the feed end to make the first radiating arm, the second radiating arm and the third radiating arm form three different operating frequencies.

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

(21) Appl. No.: **12/347,206**

(22) Filed: **Dec. 31, 2008**





US 20090289867A1

(19) **United States**

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

(10) **Pub. No.: US 2009/0289867 A1**

(43) **Pub. Date: Nov. 26, 2009**

(54) **WIDEBAND PRINTED DIPOLE ANTENNA FOR WIRELESS APPLICATIONS**

Publication Classification

(75) Inventors: **WEN-SHAN CHEN,**
KAOHSIUNG CITY (TW);
YEN-HAO YU, TAIPEI CITY
(TW)

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

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

Correspondence Address:
ROSENBERG, KLEIN & LEE
3458 ELLICOTT CENTER DRIVE-SUITE 101
ELLICOTT CITY, MD 21043 (US)

(57) **ABSTRACT**

In a broadband printed dipole antenna for wireless applications, metal plates of a radiation portion, a feed-in portion and a bandwidth modulation portion are formed on a substrate. Two radiation portions come with a specific shape and have an interval between the two radiation portions. The feed-in portion is composed of two separated long bars and coupled to one of the specific shaped radiation portions. The bandwidth modulation portion is disposed symmetrically adjacent to the feed-in portion, such that the impedance matching can be adjusted to form a broadband dipole antenna for WiMAX applications.

(73) Assignee: **SOUTHERN TAIWAN UNIVERSITY,** TAINAN COUNTY (TW)

(21) Appl. No.: **12/126,960**

(22) Filed: **May 26, 2008**

