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(19) United States

(12) Patent Application Publication

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(43) Pub. Date: Jun. 4, 2009

Maeda et al.

(54) MICROSTRIP ANTENNA

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(21) Appl. No.: **11/948,628**

(22) Filed: **Nov. 30, 2007**

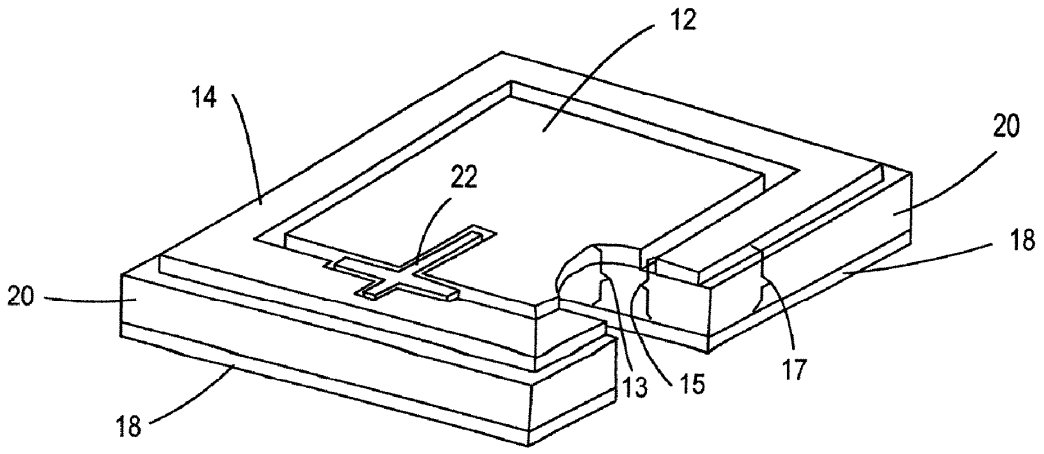
Publication Classification

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

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

(57) **ABSTRACT**

A microstrip antenna that can be linear, co-circular, or dual-circularly polarized having co-planar radiating elements and operating at dual frequency bands wherein an inner radiating element is surrounded by and spaced from an outer radiating element. Each radiating element resonates at a different frequency. In one embodiment of the invention a feed network has a single, cross-shaped, feed line that is positioned between the inner and outer radiating elements and capacitively coupled to the inner and outer radiating elements. In another embodiment of the present invention, the radiating elements are fed separately by first and second feed networks each having a plurality of feed points. The radiating elements each have one active feed point that is either directly or indirectly coupled to its respective feed network.



US 20090140930A1

(19) **United States**

(12) **Patent Application Publication**

Tatarnikov et al.

(10) **Pub. No.: US 2009/0140930 A1**

(43) **Pub. Date: Jun. 4, 2009**

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

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(21) Appl. No.: **12/275,761**

(22) Filed: **Nov. 21, 2008**

Related U.S. Application Data

(60) Provisional application No. 61/004,744, filed on Nov. 29, 2007.

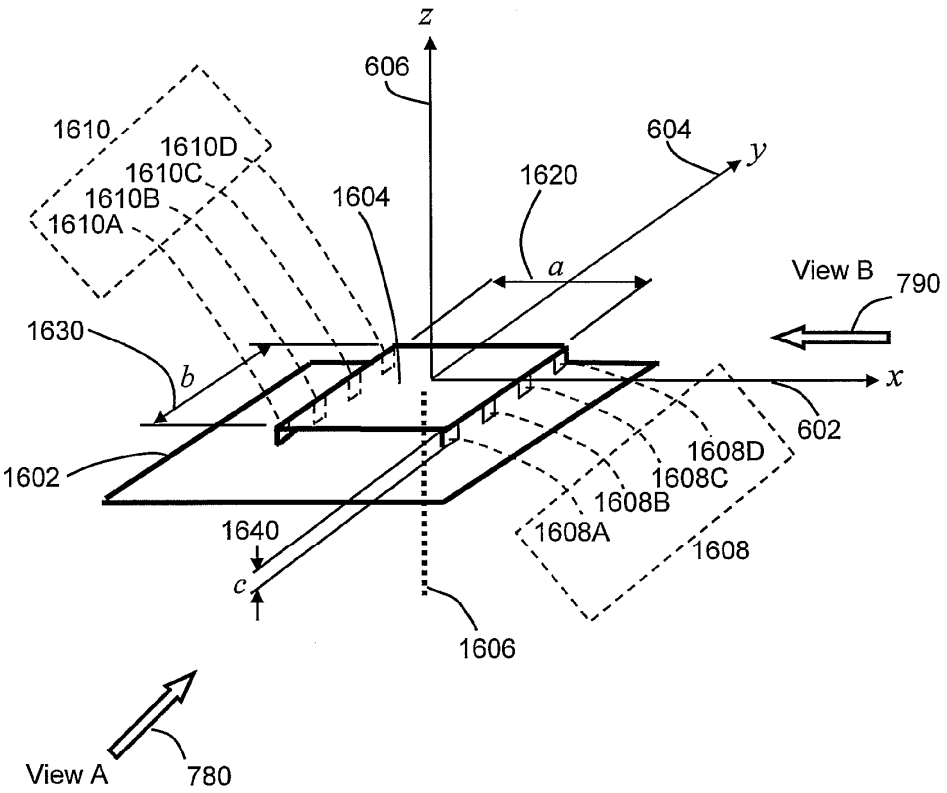
Publication Classification

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

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

(57) **ABSTRACT**

Disclosed is a micropatch antenna comprising a radiating element and a ground plane separated by an air gap. Small size, light weight, wide bandwidth, and wide directional pattern are achieved without the introduction of a high-permittivity dielectric substrate. Capacitive elements are configured along the perimeter of at least one of the radiating element and ground plane. Capacitive elements may comprise extended continuous structures or a series of localized structures. The geometry of the radiating element, ground plane, and capacitive elements may be varied to suit specific applications, such as linearly-polarized or circularly-polarized electromagnetic radiation.



US 20090140931A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0140931 A1

(43) Pub. Date: Jun. 4, 2009

Cho et al.

(54) **PRINTED CIRCUIT BOARD HAVING BUILT-IN ANTENNA**

(75) Inventors: **Won-Woo Cho**, Busanjin-gu (KR); **Jae-Suk Sung**, Yongin-si (KR); **Jae-Youb Jung**, Daegu (KR); **Dek-Gin Yang**, Chungcheongbuk-do (KR); **Ju-Hyung Kim**, Seoul (KR)

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(21) Appl. No.: **12/285,315**

(22) Filed: **Oct. 1, 2008**

(30) **Foreign Application Priority Data**

Dec. 4, 2007 (KR) 10-2007-0124796

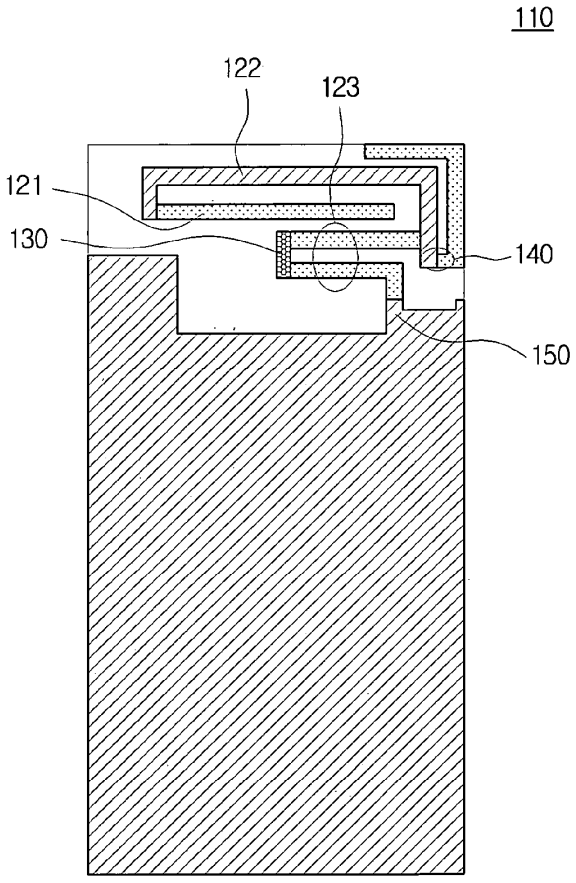
Publication Classification

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

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

(57) **ABSTRACT**

A printed circuit board having a built-in antenna may include a first unit substrate, in which a ground and a first radiator are formed; a second unit substrate, which is stacked over the first unit substrate, and in which a second radiator having a frequency band different from a frequency band of the first radiator is formed; a pair of striplines, formed in the first unit substrate and connected with the ground; a first via, which connects the first radiator with the second radiator; a pair of second vias, each of which has one end connected with the pair of strip lines respectively; and a connection pattern, which connects the other ends of the pair of second vias to each other. The printed circuit board having a built-in antenna can utilize multiple frequency bands, and can be implemented in a compact size, to be applicable in compact communication devices.



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(19) **United States**

(12) **Patent Application Publication**

Ito et al.

(10) **Pub. No.: US 2009/0140933 A1**

(43) **Pub. Date: Jun. 4, 2009**

(54) **RADIO APPARATUS AND ANTENNA DEVICE INCLUDING MAGNETIC MATERIAL FOR ISOLATION**

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(21) Appl. No.: **12/185,376**

(22) Filed: **Aug. 4, 2008**

(30) **Foreign Application Priority Data**

Nov. 29, 2007 (JP) 2007-309452

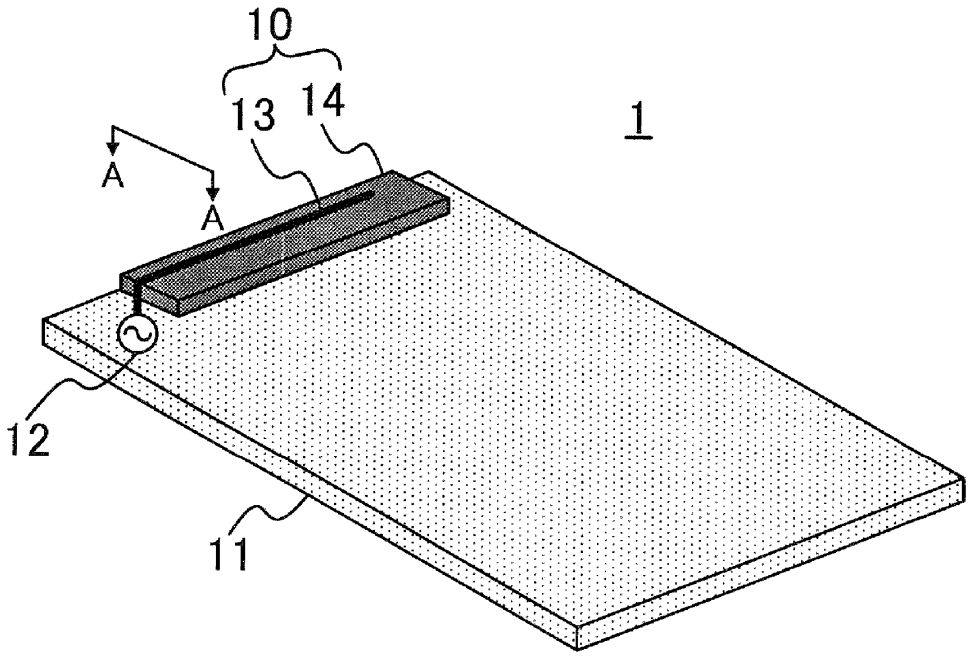
Publication Classification

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

(52) **U.S. Cl.** **343/702**; 343/787

(57) **ABSTRACT**

A radio apparatus having a printed board, an antenna element and an isolating member is provided. The antenna element is connected to the printed board. The isolating member is formed by layering a magnetic layer made of magnetic material and a dielectric layer made of dielectric material. The isolating member is folded and arranged in such a way that the magnetic layer is placed no less than twice between the printed board and the antenna element.



US 20090140934A1

(19) **United States**

(12) **Patent Application Publication**

YAMAZAKI et al.

(10) **Pub. No.: US 2009/0140934 A1**

(43) **Pub. Date: Jun. 4, 2009**

(54) **ELECTRONIC DEVICE**

(75) Inventors: **Fuminori YAMAZAKI**, Tokyo (JP); **Kentaro TOMIOKA**, Sayama-shi (JP); **Tomomi MURAYAMA**, Tokyo (JP); **Toshio OOE**, Tokyo (JP); **Satoshi YOKOTE**, Tokyo (JP)

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(21) Appl. No.: **12/233,365**

(22) Filed: **Sep. 18, 2008**

(30) **Foreign Application Priority Data**

Nov. 29, 2007 (JP) 2007-309231

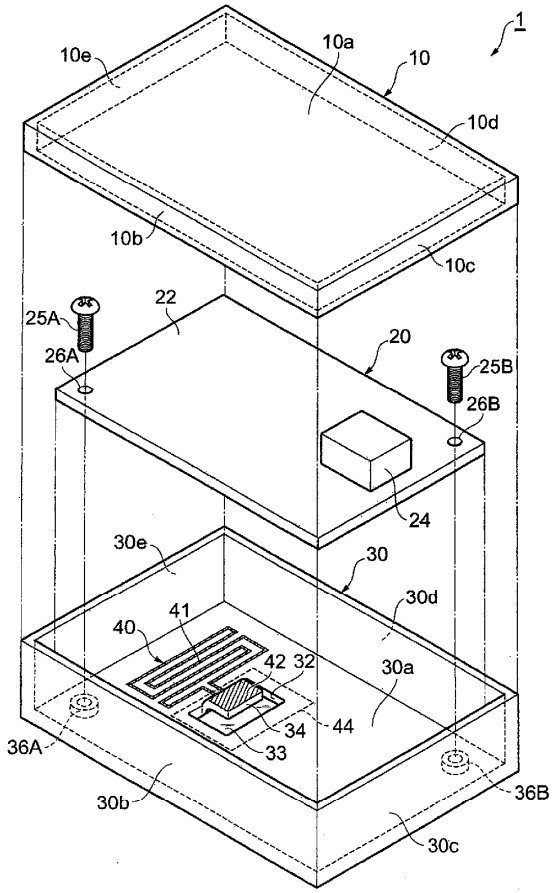
Publication Classification

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

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

(57) **ABSTRACT**

An electronic device includes: a circuit board that has a wireless communication module that is mounted thereon and a feed line that is formed on the circuit board and electrically connected to the wireless communication module; a planar member that is formed with an opening and has a flexible planar piece that is formed to protrude toward the circuit board from an edge of the opening; and an antenna pattern that includes an antenna part that is formed on the planar member and a feeder part that is formed on the flexible planar piece, wherein circuit board and the planar member are arranged to be in positions to flexibly bend the flexible planar piece by the circuit board to electrically connect the feeder part of the antenna pattern and the feed line formed on the circuit board.



US 20090140936A1

(19) **United States**

(12) **Patent Application Publication**

CHO et al.

(10) **Pub. No.: US 2009/0140936 A1**

(43) **Pub. Date: Jun. 4, 2009**

(54) **ANTENNA DEVICE OF PORTABLE WIRELESS TERMINAL**

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

(21) Appl. No.: **12/275,984**

(22) Filed: **Nov. 21, 2008**

(30) **Foreign Application Priority Data**

Nov. 29, 2007 (KR) 10-2007-0122600

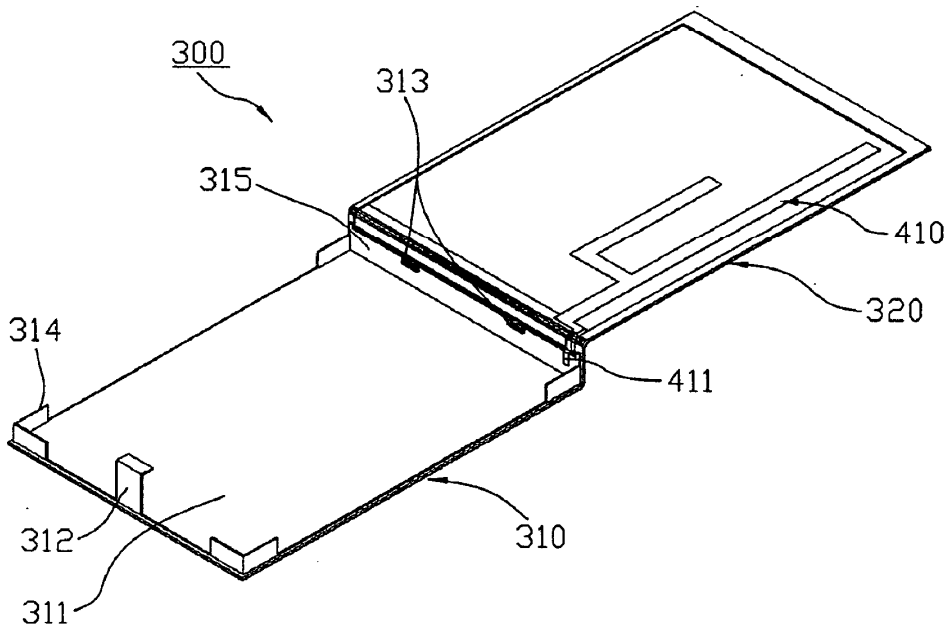
Publication Classification

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

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

(57) **ABSTRACT**

An antenna device for a portable wireless terminal including a main built-in antenna for transmitting and receiving signals of one and more frequency bands is provided. The antenna device includes an external case on which a wireless terminal is disposed. The external case comprises an antenna radiator of at least one. In addition, the antenna device includes a control part for selectively controlling use of at least one of the at least one antenna radiator and a main built-in antenna of the wireless terminal.



US 20090140937A1

(19) **United States**

(12) **Patent Application Publication**

Chow et al.

(10) **Pub. No.: US 2009/0140937 A1**

(43) **Pub. Date: Jun. 4, 2009**

(54) **SLOT ANTENNA USED IN A DESKTOP COMPUTER**

(75) Inventors: **John Chow**, Saratoga, CA (US); **Li-Chun Wu**, Tu-cheng (TW); **Der-Chung Hwang**, Tu-cheng (TW); **Yun-Cheng Hou**, Tu-cheng (TW); **Wen-Zhao Huang**, Tu-cheng (TW)

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(21) Appl. No.: **12/315,394**

(22) Filed: **Dec. 3, 2008**

(30) **Foreign Application Priority Data**

Dec. 3, 2007 (CN) 200720131187.4

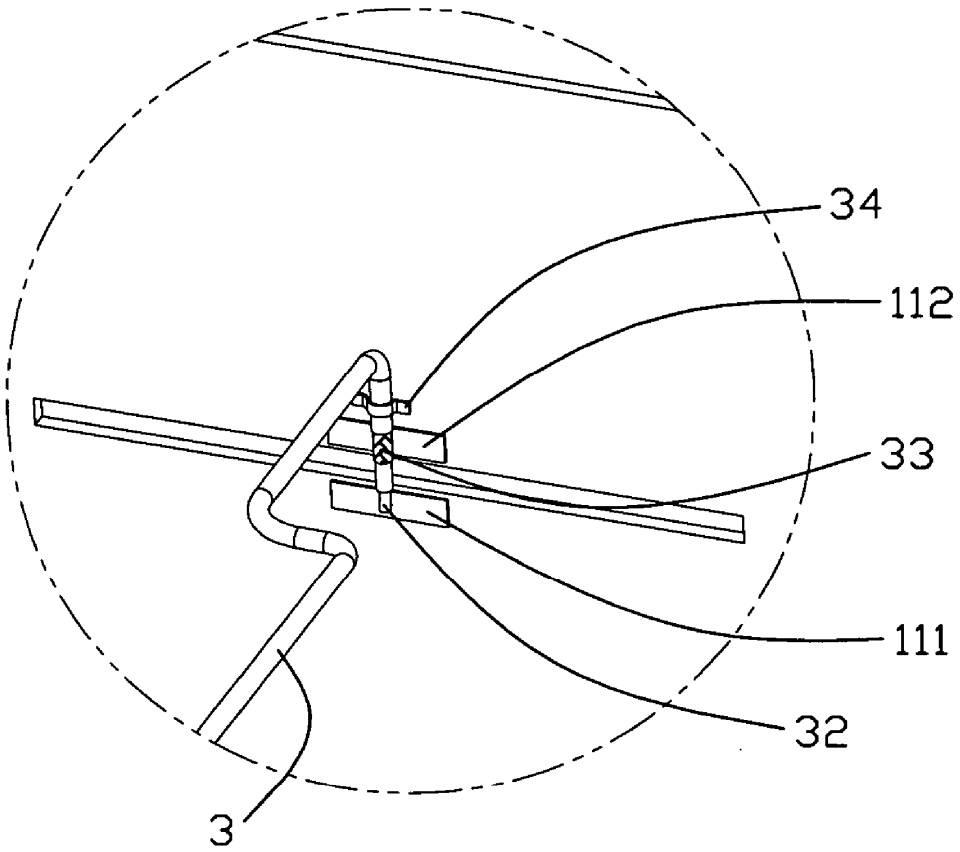
Publication Classification

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

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

(57) **ABSTRACT**

An antenna unit is used in a desktop computer (**100**) having a metal shell (**1**). The antenna unit includes a slot (**110**) defining on the metal shell, a coaxial cable (**3**) having an inner conductor (**32**) connected to a first side (**111**) of the slot and an outer braiding (**33**) connected to a second side (**112**) of the slot, and a fastening member (**34**) extending across the coaxial cable and securing the coaxial cable on the metal shell.



US 20090140942A1

(19) **United States**

(12) **Patent Application Publication**

Mikkola et al.

(10) **Pub. No.: US 2009/0140942 A1**

(43) **Pub. Date: Jun. 4, 2009**

(54) **INTERNAL ANTENNA AND METHODS**

(76) Inventors: **Jyrki Mikkola**, Evijarvi (FI); **Ari Raappana**, Kello (FI); **Pasi Keskitalo**, Oulu (FI); **Pertti Nissinen**, Kempele (FI)

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(21) Appl. No.: **12/082,514**

(22) Filed: **Apr. 11, 2008**

(30) **Foreign Application Priority Data**

Oct. 10, 2005 (FI) 20055545
Sep. 25, 2006 (FI) PCT/FI2006/050407

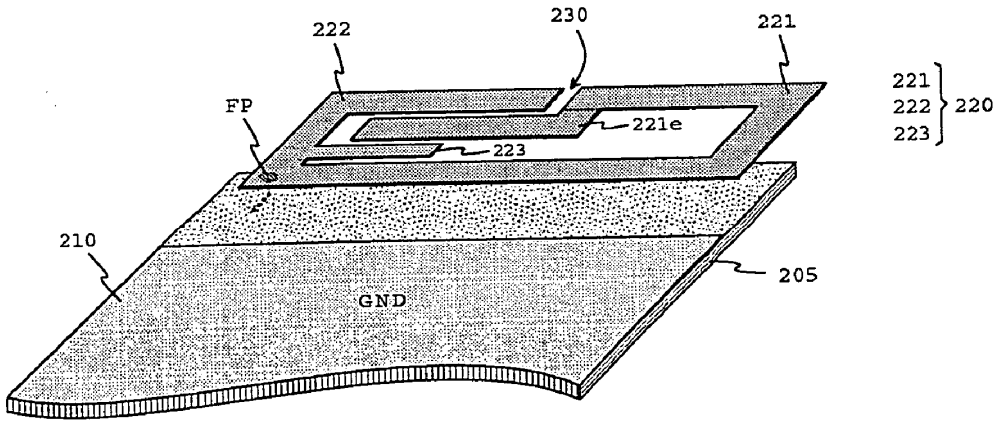
Publication Classification

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

(52) **U.S. Cl.** **343/767**; 343/845

(57) **ABSTRACT**

An internal antenna especially aimed at flat radio devices. The antenna (**200**) comprises a planar radiator (**220**) with a branch (**221**) for forming a lower operating band for the antenna and a second branch (**222**) for forming an upper operating band. The branches typically form a frame-like pattern. There remains a slot (**230**) between the branches, opening to the outer edge of the radiator approximately in the middle of the edge running in the direction of the end of the circuit board (**205**) and being outside the circuit board as seen from above. The omnidirectional radiation of the antenna on its upper operating band improves as compared to the corresponding, known antennas, and its efficiency improves, because the average antenna gain increases.



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(19) **United States**

(12) **Patent Application Publication**

Chang et al.

(10) **Pub. No.: US 2009/0140944 A1**

(43) **Pub. Date: Jun. 4, 2009**

(54) **ANTENNA AND RESONANT FREQUENCY TUNING METHOD THEREOF**

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(21) Appl. No.: **11/950,360**

(22) Filed: **Dec. 4, 2007**

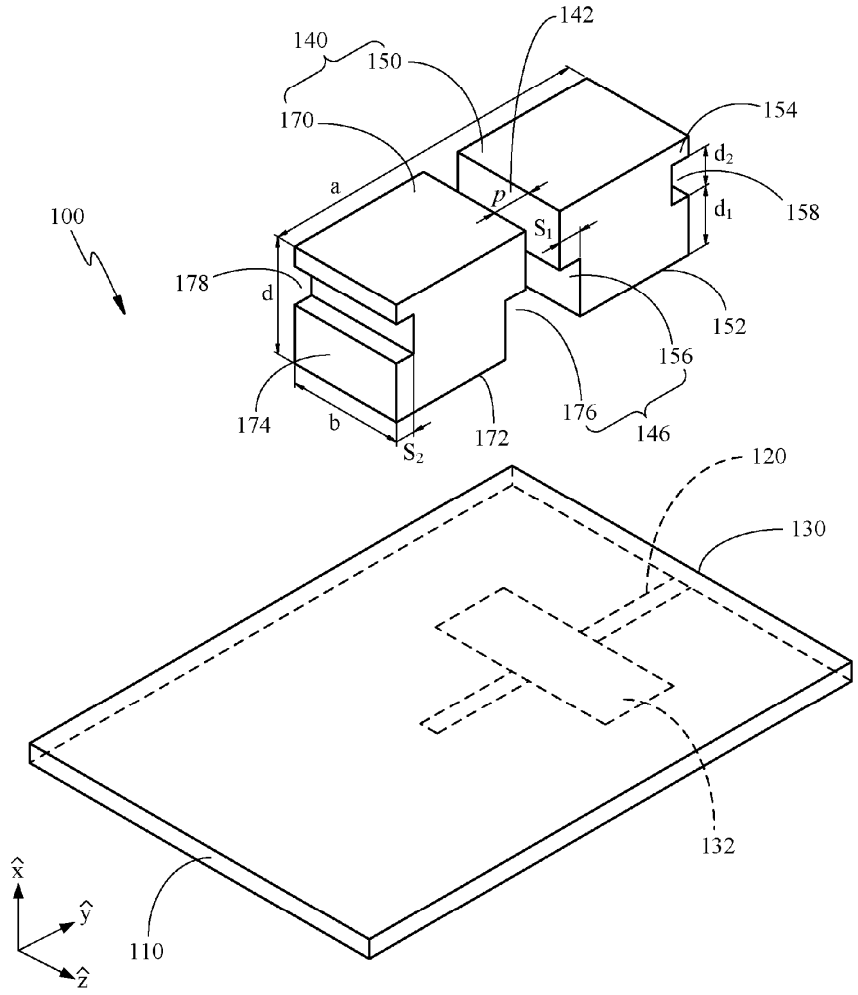
Publication Classification

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

(52) **U.S. Cl.** **343/785**

(57) **ABSTRACT**

A dual-band dielectric resonator antenna (DRA) is designed by splitting a rectilinear DR and carving notches and tunnels off the DR. The antenna comprises a substrate, a microstrip line, a ground plane and a resonant structure, wherein a first resonant part and a second resonant part of the resonant structure are separated by a gap. The proposed DRA can cover both the WiMAX (3.4-3.7 GHz) and the WLAN (5.15-5.35 GHz) bands by engraving notches and tunnels at different positions of the first resonant part and the second resonant part.



US 20090140948A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2009/0140948 A1**

(43) **Pub. Date: Jun. 4, 2009**

Yanagi et al.

(54) **ANTENNA DEVICE**

(75) Inventors: **Masahiro Yanagi**, Shinagawa (JP); **Shigemi Kurashima**, Shinagawa (JP); **Takashi Yuba**, Shinagawa (JP); **Satoshi Sakura**, Shinagawa (JP); **Takashi Arita**, Shinagawa (JP)

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

(21) Appl. No.: **12/216,376**

(22) Filed: **Jul. 2, 2008**

(30) **Foreign Application Priority Data**

Nov. 30, 2007 (JP) 2007-311451

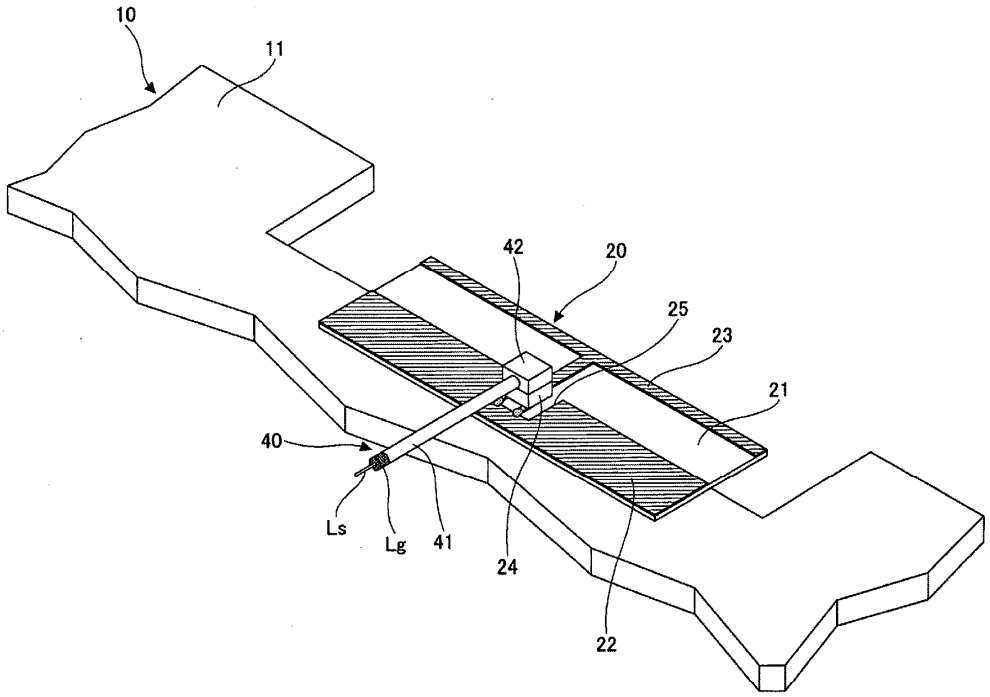
Publication Classification

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

(52) **U.S. Cl.** **343/846**

(57) **ABSTRACT**

A disclosed antenna device includes a ground section; and an element section projecting from the ground section. The length of the ground section in a direction orthogonal to a side of the ground section from which side the element section projects is less than approximately ¼ a corresponding wavelength. The ground section is configured to be disposed over and attached to a conductive section.



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(19) **United States**

(12) **Patent Application Publication**

Man et al.

(10) **Pub. No.: US 2009/0143040 A1**

(43) **Pub. Date: Jun. 4, 2009**

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

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(21) Appl. No.: **11/947,178**

(22) Filed: **Nov. 29, 2007**

Publication Classification

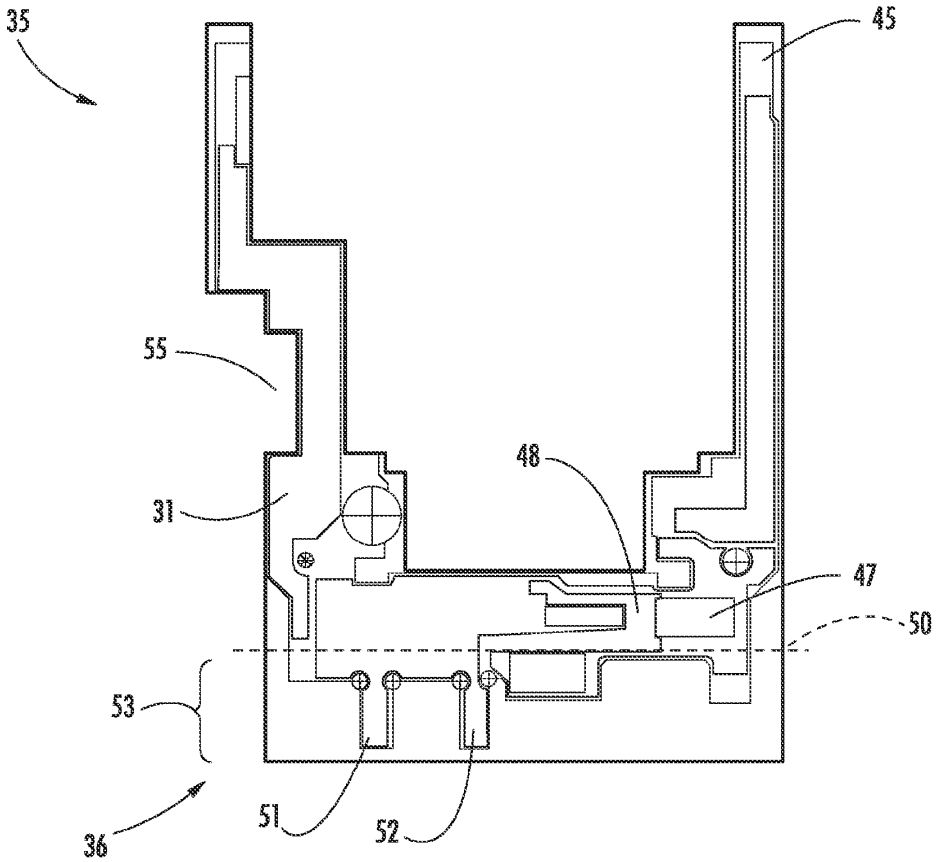
(51) **Int. Cl.**

H04B 1/40	(2006.01)
H01Q 1/38	(2006.01)
H01Q 1/24	(2006.01)
H01Q 17/00	(2006.01)
H01Q 9/04	(2006.01)

(52) **U.S. Cl.** ..... **455/274**; 343/702; 343/700 MS; 455/82; 29/601

(57) **ABSTRACT**

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



US 20090143118A1

(19) **United States**

(12) **Patent Application Publication**

Bae

(10) **Pub. No.: US 2009/0143118 A1**

(43) **Pub. Date: Jun. 4, 2009**

(54) **INTERNAL ANTENNA FOR MOBILE PHONE AND MANUFACTURING METHOD THEREOF**

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(21) Appl. No.: **10/599,626**

(22) PCT Filed: **Jun. 19, 2006**

(86) PCT No.: **PCT/KR06/02342**

§ 371 (c)(1),
(2), (4) Date: **Oct. 3, 2006**

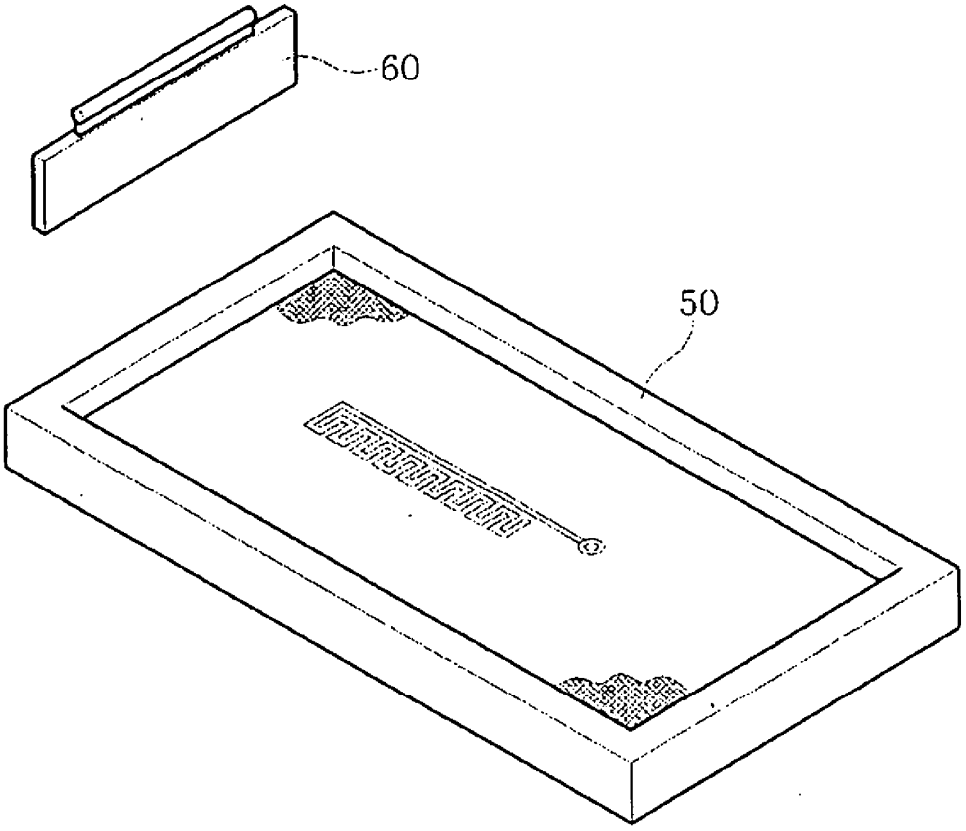
Publication Classification

(51) **Int. Cl.**
H04M 1/00 (2006.01)
H01P 11/00 (2006.01)

(52) **U.S. Cl.** **455/575.7**; 29/600

(57) **ABSTRACT**

A cellular phone antenna and a manufacturing method of the same are disclosed, in which a high frequency characteristic and a product safety are enhanced using a cellular phone antenna which is manufactured by preventing an antenna device from being transformed. The cellular phone antenna comprises an antenna base which is engaged in an interior of a cellular phone; an antenna which is installed at the antenna base; a connection terminal which is connected with the antenna; and a holder which is attached to the antenna base so that the antenna and the connection terminal are connected.



US 20090146820A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0146820 A1

(43) Pub. Date: Jun. 11, 2009

KIM et al.

(54) **RADIO FREQUENCY IDENTIFICATION TAG AND ANTENNA FOR RADIO FREQUENCY IDENTIFICATION TAG**

(75) Inventors: **Jeong Seok KIM**, Daejeon (KR); **Won Kyu CHOI**, Daejeon (KR); **Gil Young CHOI**, Daejeon (KR); **Cheol Sig PYO**, Daejeon (KR); **Jong-Suk CHAE**, Daejeon (KR)

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(73) Assignee: **Electronics and Telecommunications Research Institute**, Daejeon (KR)

(21) Appl. No.: **12/176,757**

(22) Filed: **Jul. 21, 2008**

(30) **Foreign Application Priority Data**

Dec. 6, 2007 (KR) 10-2007-0126292
Mar. 11, 2008 (KR) 10-2008-0022615

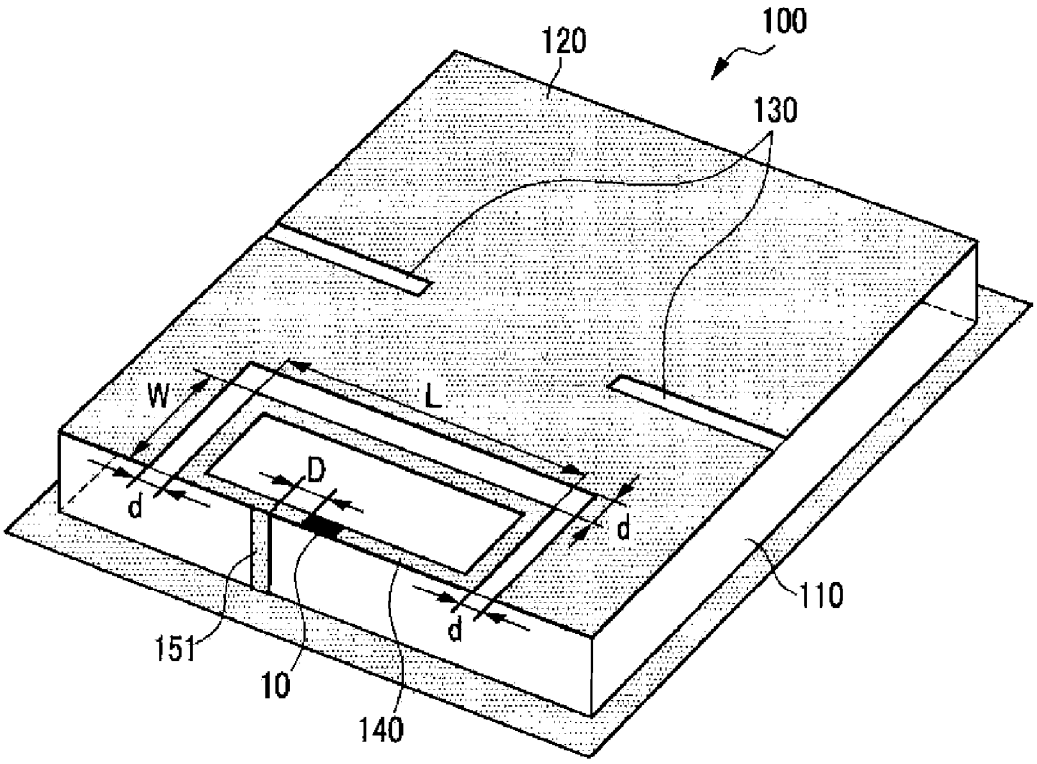
Publication Classification

(51) **Int. Cl.**
G08B 13/14 (2006.01)
H01Q 9/04 (2006.01)

(52) **U.S. Cl.** ..... **340/572.7**; 343/700 MS

(57) **ABSTRACT**

An RFID tag attached to an object and transmitting a signal that corresponds to identification information includes an RFID tag chip that modulates the signal according to the identification information and an RFID tag antenna that transmits the modulated signal. The RFID tag antenna includes a dielectric material, a radiating patch, and a slit. The dielectric material has a polyhedral shape and includes a first surface that contacts the object and a second surface that is parallel with the first surface, the radiating patch is formed on at least a part of the second surface and radiates electromagnetic to waves, and the slit is formed on at least a part of the radiating patch to expose the dielectric material.



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(19) **United States**

(12) **Patent Application Publication**

Chin et al.

(10) **Pub. No.: US 2009/0146883 A1**

(43) **Pub. Date: Jun. 11, 2009**

(54) **WIDEBAND PATCH ANTENNA**

(75) Inventors: **Ching Hong Chin**, Hong Kong SAR (CN); **Quan Xue**, Hong Kong SAR (CN); **Hang Wong**, Hong Kong SAR (CN); **Xiu Yin Zhang**, Hong Kong SAR (CN)

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(21) Appl. No.: **11/953,210**

(22) Filed: **Dec. 10, 2007**

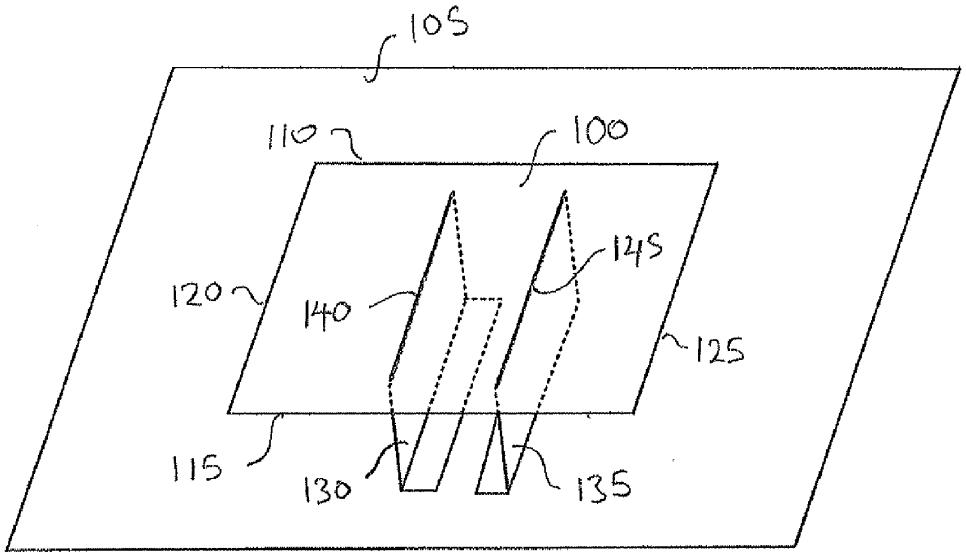
Publication Classification

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

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

(57) **ABSTRACT**

A patch antenna has a ground plane and a planar antenna plate that are parallel to and from each other. A pair of planar feed plates have feed edges electrically contacting a surface of the antenna plate to couple electromagnetic energy into and/or out of the antenna plate.



US 20090146884A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0146884 A1

(43) Pub. Date: Jun. 11, 2009

LEE et al.

(54) **INTEGRATED ANTENNA FOR WORLDWIDE INTEROPERABILITY FOR MICROWAVE ACCESS (WIMAX) AND WLAN**

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(21) Appl. No.: **12/020,695**

(22) Filed: **Jan. 28, 2008**

(30) **Foreign Application Priority Data**

Dec. 5, 2007 (TW) 096146225

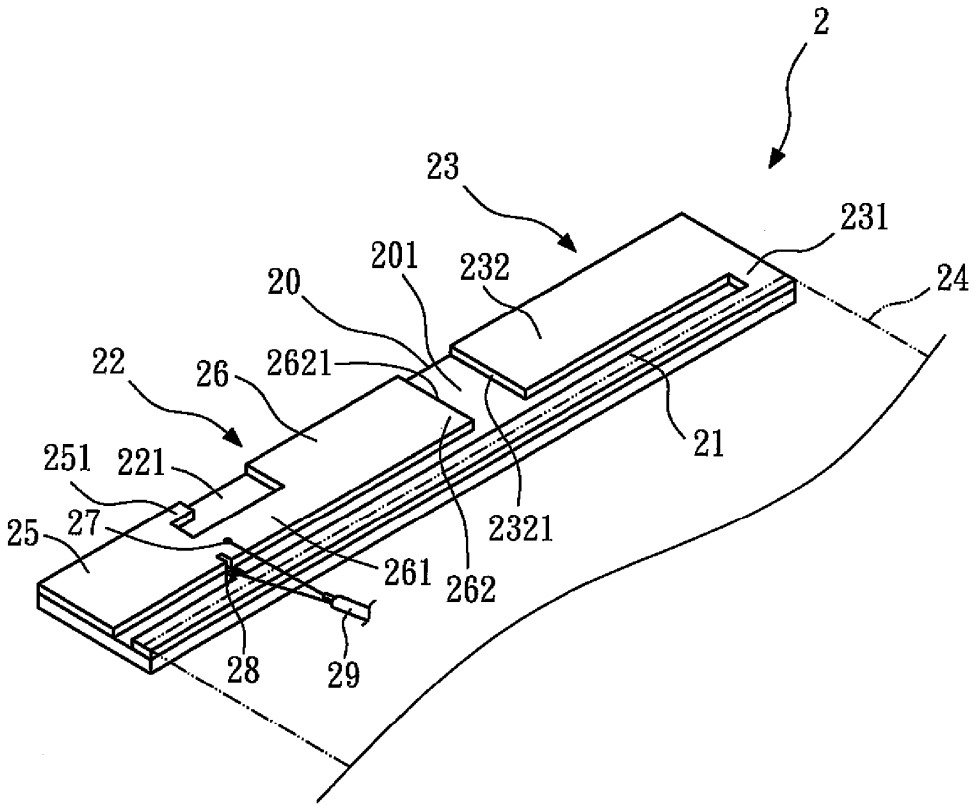
Publication Classification

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

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

(57) **ABSTRACT**

The invention relates to an integrated antenna for worldwide interoperability for microwave access (WiMax) and wireless local area network (WLAN), which comprises a substrate, a grounding metal strip, a first radiating metal strip, and a second radiating metal strip. The first radiating metal strip is disposed on the substrate and is not connected to the grounding metal strip. The first radiating metal strip has a first portion and a second portion on two ends thereof. The first portion and the second portion are used to induce a first resonance mode and a second resonance mode, respectively. The second radiating metal strip is disposed on the substrate and is connected to the grounding metal strip. The second radiating metal strip is not connected to the first radiating metal strip. The second radiating metal strip is coupled to the first radiating metal strip to induce a third resonance mode. Therefore, the integrated antenna of the present invention is adapted to the frequencies of WiMax and WLAN.



US 20090146885A1

(19) **United States**

(12) **Patent Application Publication**

Su et al.

(10) **Pub. No.: US 2009/0146885 A1**

(43) **Pub. Date: Jun. 11, 2009**

(54) **MULTI-FREQUENCY ANTENNA**

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(21) Appl. No.: **12/316,155**

(22) Filed: **Dec. 10, 2008**

(30) **Foreign Application Priority Data**

Dec. 10, 2007 (TW) 96146961

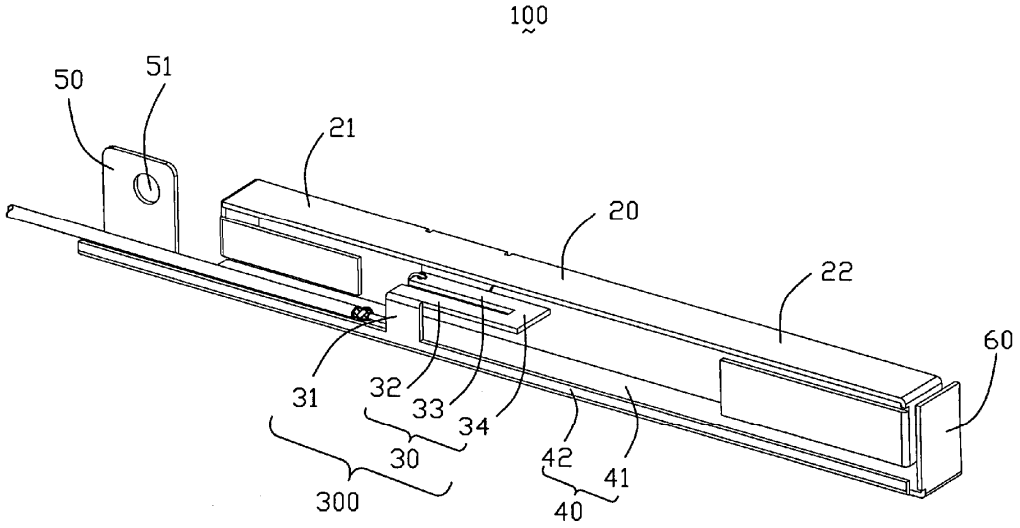
Publication Classification

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

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

(57) **ABSTRACT**

A multi-frequency antenna (**100**) comprises a grounding patch (**40**), a radiating patch (**20**), a connecting element (**300**). The grounding patch (**40**) lying in a first plane has opposite first and second sides. The radiating patch (**20**) lying in a second plane is spaced apart from the grounding patch. The connecting element (**300**) comprises a matched impedance element (**30**) lying in a third plane. The first plane is parallel to the third plane. The matched impedance element has "n" shape structure and comprises a first branch, a second branch paralleling to the first branch, and a third branch connecting the first branch and the second branch.



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(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0146886 A1

(43) Pub. Date: Jun. 11, 2009

YOSHIOKA et al.

(54) **ANTENNA DEVICE**

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(21) Appl. No.: **12/324,980**

(22) Filed: **Nov. 28, 2008**

(30) **Foreign Application Priority Data**

Dec. 11, 2007 (JP) 2007-319568

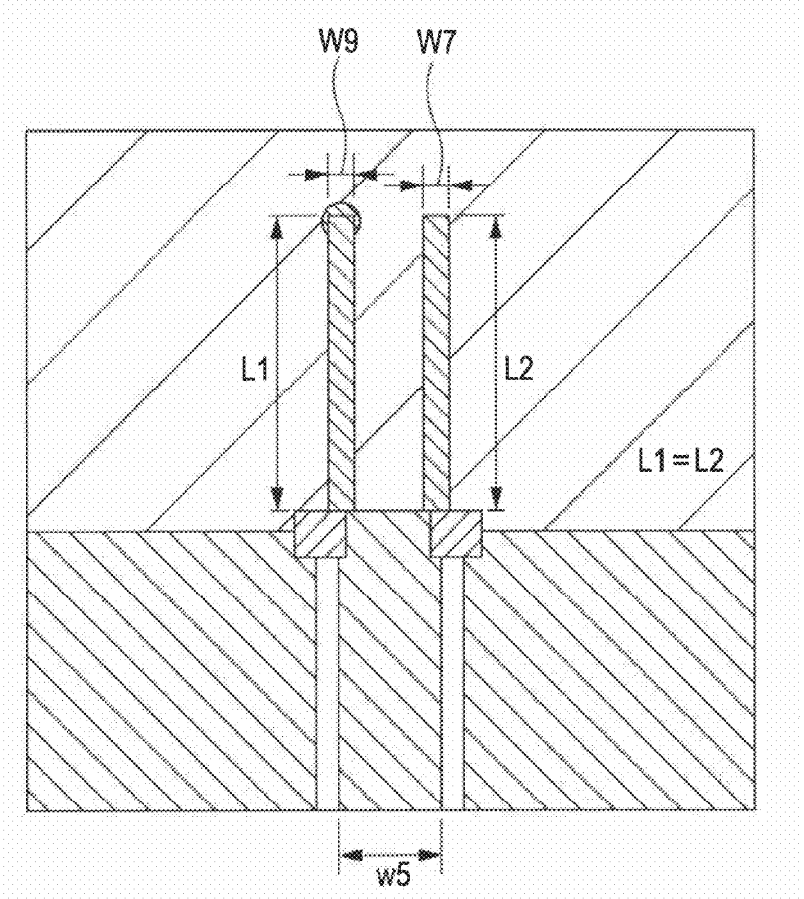
Publication Classification

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

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

(57) **ABSTRACT**

A planar antenna device is mounted on a board including a dielectric layer and two conductor layers vertically sandwiching the dielectric layer. The upper conductor layer includes a first radiating element having an end portion connected through a via hole to a ground formed by the lower conductor layer, a second radiating element having an open end portion, first and second ground conductors connected to respective base portions of the first and second radiating elements via resistors, and a feeder line configured to feed power to the first and second radiating elements.



US 20090146888A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0146888 A1

(43) Pub. Date: Jun. 11, 2009

Wu

(54) **MONOPOLE ANTENNA AND WIRELESS NETWORK DEVICE HAVING THE SAME**

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(21) Appl. No.: **12/001,119**

(22) Filed: **Dec. 10, 2007**

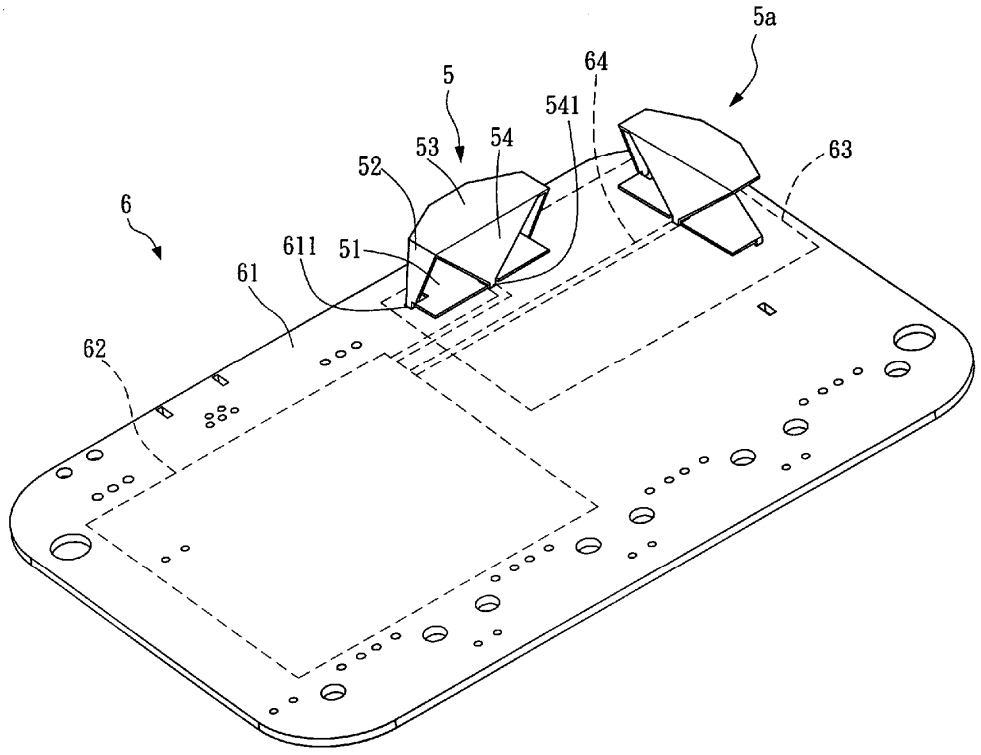
Publication Classification

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

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

(57) **ABSTRACT**

The present invention discloses a monopole antenna adapted for a wireless network device. The antenna includes a base portion, a ground portion, a radiating portion and a signal portion. The ground portion extends a predetermined height upwardly from the base portion. The radiating portion is connected to an end of the ground portion away from the base portion and is substantially perpendicular to the ground portion. The signal portion is connected to the radiating portion and is substantially and respectively perpendicular to the signal portion and the ground portion. The signal portion has a feed terminal formed on an end thereof away from the radiating portion. A connecting side, where the ground portion and the base portion are connected, has a width that is smaller than a width of another connecting side, where the ground portion and the radiating portion are connected; and a connecting side, where the signal portion and the radiating portion are connected, has a width that is larger than a width of the end of signal portion away from the radiating portion. The antenna is a single component integrally formed by stamping an electrically conductive thin metal plate, which facilitates not only fabrication thereof, but also the assembly of the antenna to a substrate of the wireless network device and increases the gain and bandwidth of the wireless network device along a vertical direction as well.



US 20090146889A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2009/0146889 A1**

(43) **Pub. Date: Jun. 11, 2009**

Qi et al.

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

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(21) Appl. No.: **12/337,690**

(22) Filed: **Dec. 18, 2008**

Related U.S. Application Data

(63) Continuation of application No. 11/014,287, filed on Dec. 16, 2004, now Pat. No. 7,486,241.

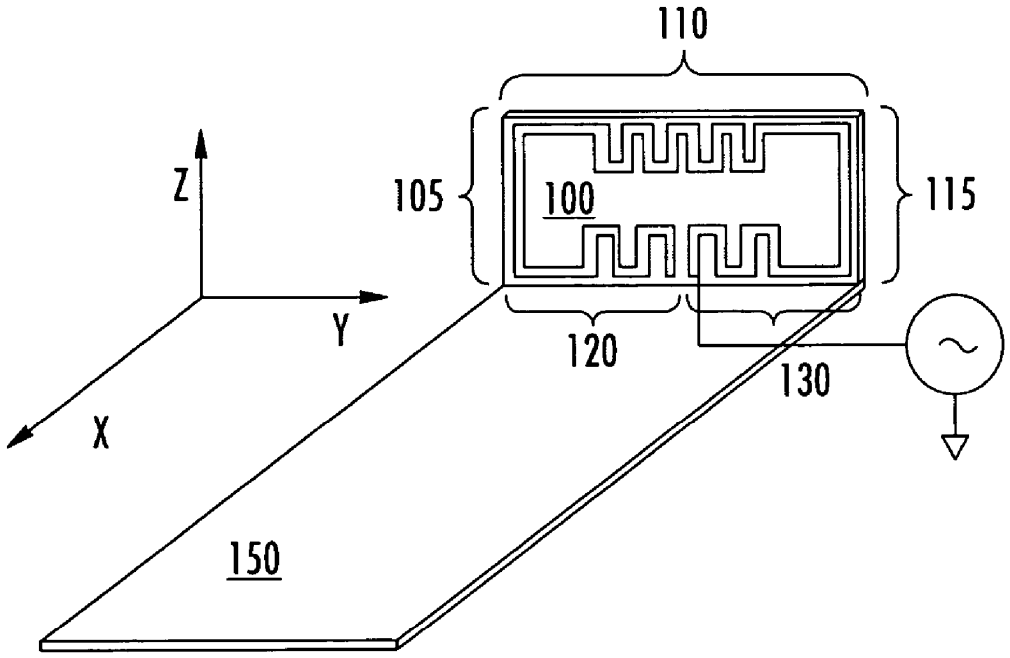
Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/36 (2006.01)

(52) **U.S. Cl.** **343/702**; 343/806; 343/828

(57) **ABSTRACT**

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



US 20090146902A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2009/0146902 A1**

(43) **Pub. Date: Jun. 11, 2009**

Li et al.

(54) **LOOP-TYPE ANTENNA AND ANTENNA ARRAY**

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(21) Appl. No.: **11/937,581**

(22) Filed: **Nov. 9, 2007**

Publication Classification

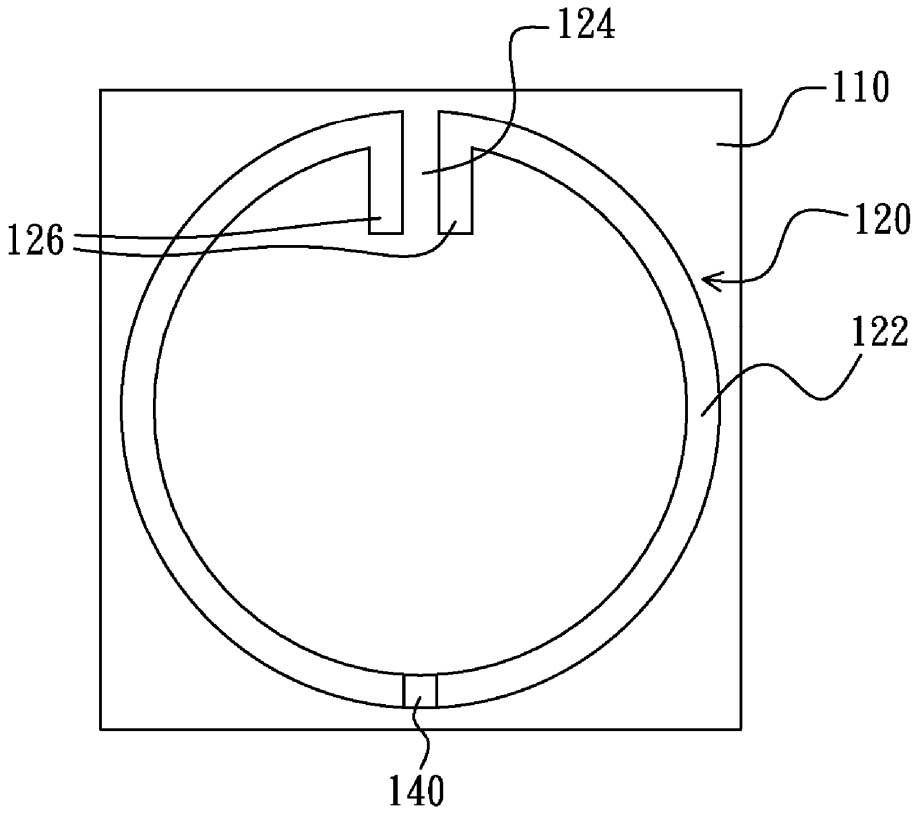
(51) **Int. Cl.**
H01Q 7/00 (2006.01)
H01Q 11/12 (2006.01)

(52) **U.S. Cl.** **343/867**; 343/742

(57) **ABSTRACT**

A loop-type antenna for radio frequency identification includes a main body and a feed portion. The main body includes a loop member and at least one pair of coupled sections. The loop member has at least one gap. Each of the coupled sections is connected with one end of corresponding one of the at least one gap. The pair has identical extension direction. The feed portion is electrically connected with the loop member in the manner that the loop member is symmetrical in terms of the feed portion. An antenna array for radio frequency identification also is provided.

100



US 20090146905A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0146905 A1

(43) Pub. Date: Jun. 11, 2009

Morita

(54) ANTENNA AND RADIO COMMUNICATION APPARATUS

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(21) Appl. No.: **12/369,149**

(22) Filed: **Feb. 11, 2009**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2008/052516, filed on Feb. 15, 2008.

(30) **Foreign Application Priority Data**

Mar. 29, 2007 (JP) 2007-087106

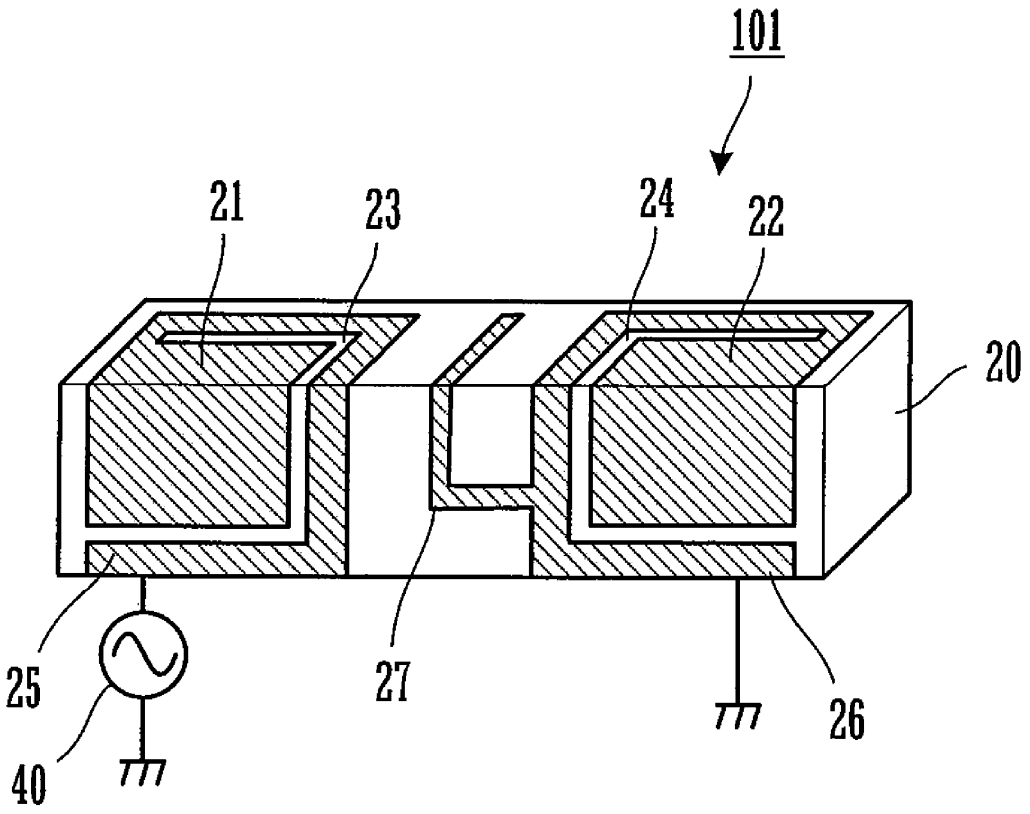
Publication Classification

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** ..... **343/895**; 343/700 MS

(57) **ABSTRACT**

A feeding radiation electrode and a non-feeding radiation electrode are provided extending from a front side surface to top surface of a dielectric base. In the feeding radiation electrode, a slit that extends from a feeding end in an inward direction is formed, and, in the non-feeding radiation electrode, a slit that extends from a ground end in an inward direction is formed. In addition, on the non-feeding radiation electrode, a branch electrode is formed so as to extend toward the side of the feeding radiation electrode. With this configuration, gain is obtained in two frequency bands by using a multi-resonance of fundamental wave resonances and harmonic resonances generated by the feeding radiation electrode and the non-feeding radiation electrode, and a good return loss characteristic caused by coupling of harmonic resonances is provided. In other embodiments, the feeding and non-feeding radiation electrodes may be formed on a flat substrate, or directly on a circuit board.



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(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0146906 A1

(43) Pub. Date: Jun. 11, 2009

Anguera Pros et al.

(54) ANTENNA WITH INNER SPRING CONTACT

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(21) Appl. No.: **11/989,435**

(22) PCT Filed: **Jul. 31, 2006**

(86) PCT No.: **PCT/EP2006/007565**

§ 371 (c)(1),
(2), (4) Date: **Apr. 8, 2008**

Related U.S. Application Data

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(30) **Foreign Application Priority Data**

Aug. 1, 2005 (EP) 05107095.1

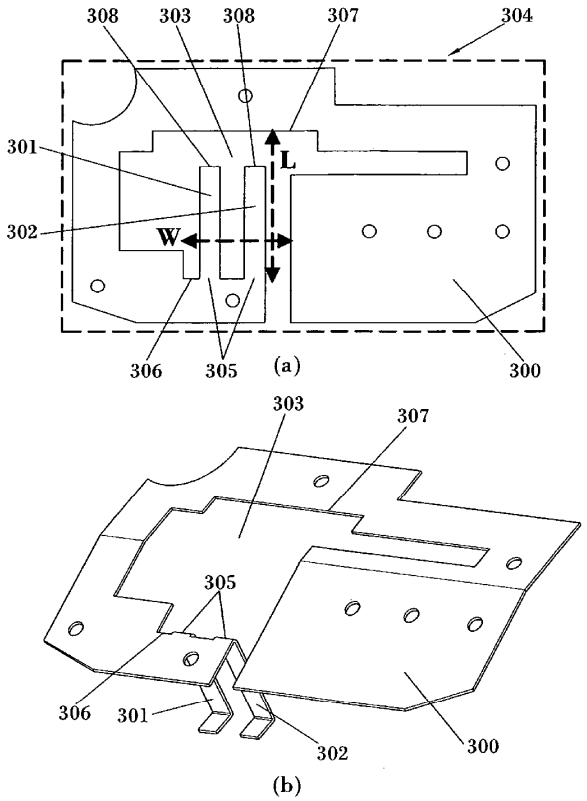
Publication Classification

(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H01Q 1/20 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** ..... **343/906**; 343/700 MS

(57) **ABSTRACT**

One aspect of the invention relates to an antenna for a wireless device having spring contact elements based on strips (**301**, **302**; **403**; **503**, **504**; **602**, **603**; **612**, **613**; **622**, **623**; **632**; **642**; **652**, **653**; **682**; **703**, **704**; **753**, **754**; **756**; **802**, **803**; **1412**, **1413**; **1422**, **1423**) that, before bending, are housed in at least one gap (**303**, **601**, **681**, **804**, **1411**, **1421**) in a main body (**300**, **402**, **502**, **600**, **700**, **750**, **800** **1400**) of the antenna. The invention provides for a reduced stamping area overhead while allowing the spring contacts embodied by the strips to be placed close to the perimeter of the smallest possible rectangle that can house the main body. This can be helpful for mounting the antenna close to an edge of a printed circuit board (**401**, **501**, **701**, **801**) while not extending beyond said edge.



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(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2009/0149231 A1**

(43) **Pub. Date: Jun. 11, 2009**

Sato

(54) **RADIO APPARATUS AND BUILT-IN ANTENNA DEVICE**

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(21) Appl. No.: **12/142,079**

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

(30) **Foreign Application Priority Data**

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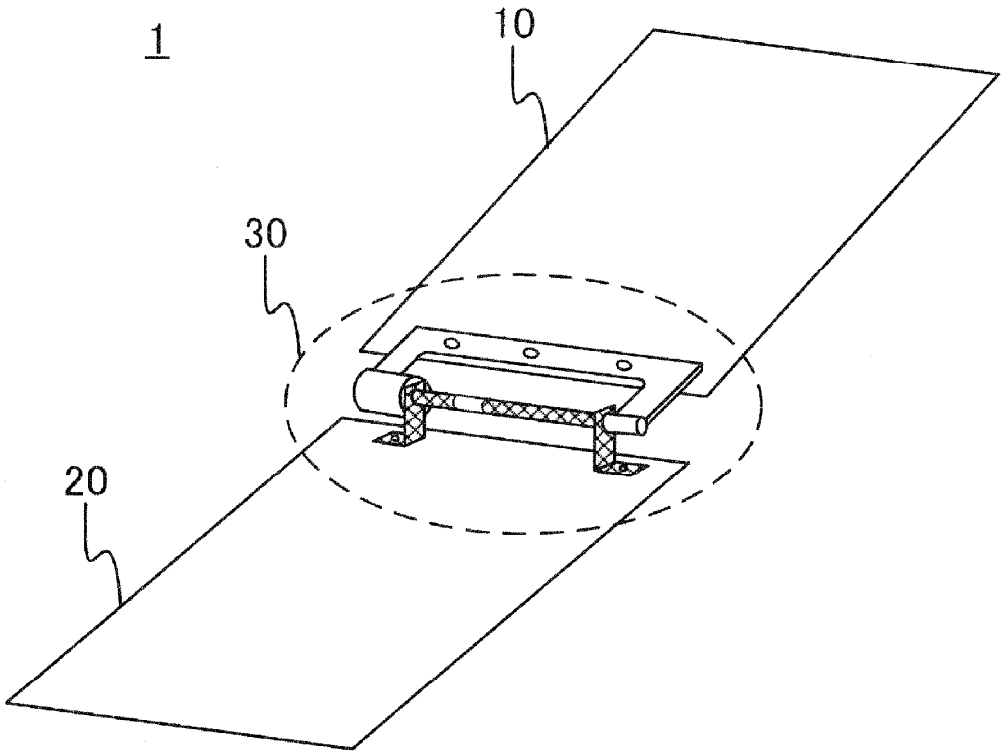
Publication Classification

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

(52) **U.S. Cl.** **455/575.7**

(57) **ABSTRACT**

A radio apparatus having a first housing section and a second housing section is provided. The radio apparatus has a printed board contained in the second housing. The printed board is provided with an antenna feeding circuit. The radio apparatus has a hinge section pivotally connecting the first housing section and the second housing section to each other so as to relatively rotate the first housing section and the second housing section. The hinge section includes a spring, a non-conductive portion and a conductive portion other than the spring. The conductive portion is connected to the antenna feeding circuit.



US 20090153407A1

(19) **United States**

(12) **Patent Application Publication**

Zhang et al.

(10) **Pub. No.: US 2009/0153407 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **HYBRID ANTENNAS WITH DIRECTLY FED ANTENNA SLOTS FOR HANDHELD ELECTRONIC DEVICES**

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(21) Appl. No.: **11/956,314**

(22) Filed: **Dec. 13, 2007**

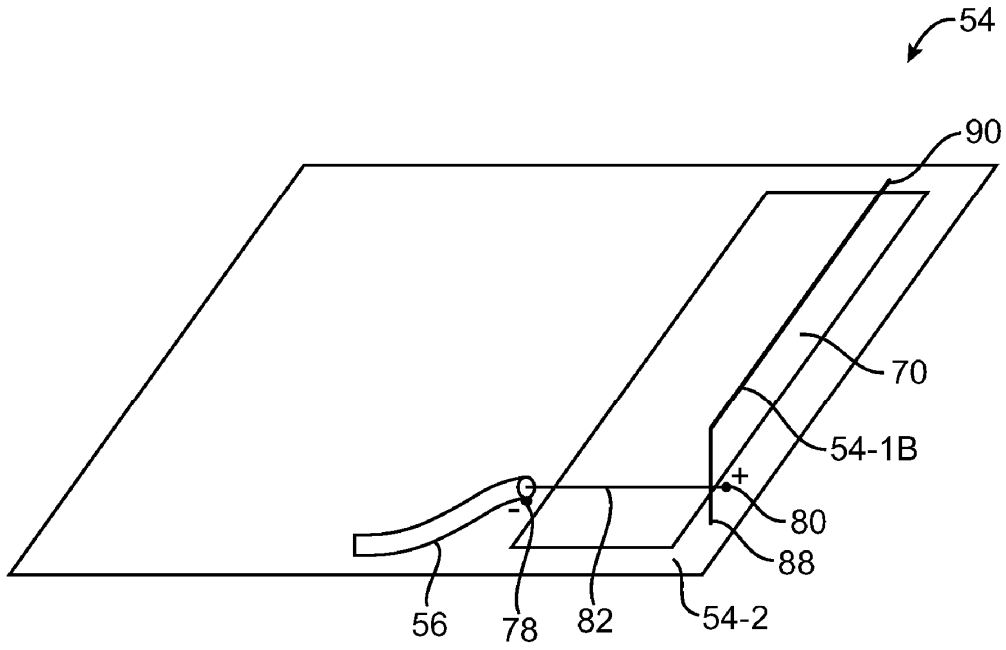
Publication Classification

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

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

(57) **ABSTRACT**

A handheld electronic device is provided that contains wireless communications circuitry. The wireless communications circuitry may include antennas. An antenna in the handheld electronic device may have a ground plane element. A slot antenna resonating element may be formed from an opening in the ground plane element. A near-field-coupled antenna resonating element may be electromagnetically coupled to the slot antenna resonating element through electromagnetic near-field coupling. A transmission line may directly feed the slot antenna resonating element. The transmission line may indirectly feed the near-field-coupled antenna resonating element through the slot antenna resonating element. The slot antenna resonating element may have one or more associated resonant frequencies and the near-field-coupled antenna resonating element may have one or more associated resonant frequencies. The antenna may be configured to cover one or more distinct communications bands.



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(19) **United States**

(12) **Patent Application Publication**

Chiang et al.

(10) **Pub. No.: US 2009/0153410 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **FEED NETWORKS FOR SLOT ANTENNAS IN ELECTRONIC DEVICES**

(76) Inventors: **Bing Chiang**, Cupertino, CA (US); **Gregory Allen Springer**, Sunnyvale, CA (US); **Douglas B. Kough**, San Jose, CA (US); **Enrique Ayala**, Watsonville, CA (US); **Matthew Ian McDonald**, San Jose, CA (US)

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(21) Appl. No.: **11/959,165**

(22) Filed: **Dec. 18, 2007**

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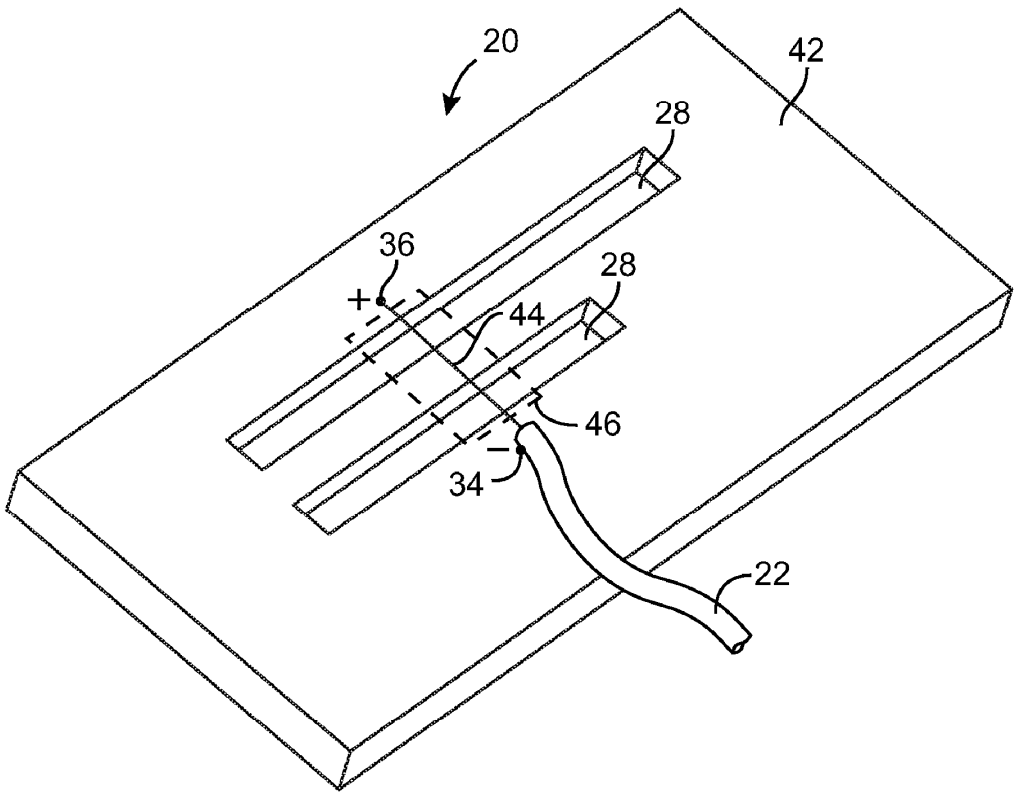
H01Q 1/24	(2006.01)
H01Q 1/38	(2006.01)

(52) **U.S. Cl.** ..... **343/702**; 343/770; 343/700 MS

(57) **ABSTRACT**

Electronic devices and antennas for electronic devices are provided. The antennas may have ground plane elements with dielectric-filled openings. The dielectric-filled openings may be configured to form one or more rectangular slots. The antennas may be fed using transmission lines having first and second conductors. The first conductor of a given transmission line may be coupled to the ground plane element on one side of the slots. The second conductor of the transmission line may be coupled to a planar conductive element. The planar conductive element may couple to the ground plane element on the other side of the slots. The slots may be separated by a portion of the ground plane element. The planar conductive element may bridge at least one of the slots and may overlap the portion of the ground plane element that separates the slots without electrically contacting that portion of the ground plane element.



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(19) **United States**

(12) **Patent Application Publication**

Chiang et al.

(10) **Pub. No.: US 2009/0153411 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **DUAL-BAND ANTENNA WITH ANGLED SLOT FOR PORTABLE ELECTRONIC DEVICES**

(76) Inventors: **Bing Chiang**, Cupertino, CA (US); **Gregory Allen Springer**, Sunnyvale, CA (US); **Douglas B. Kough**, San Jose, CA (US); **Enrique Ayala**, Watsonville, CA (US); **Matthew Ian McDonald**, San Jose, CA (US); **Hao Xu**, Cupertino, CA (US)

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(21) Appl. No.: **11/959,191**

(22) Filed: **Dec. 18, 2007**

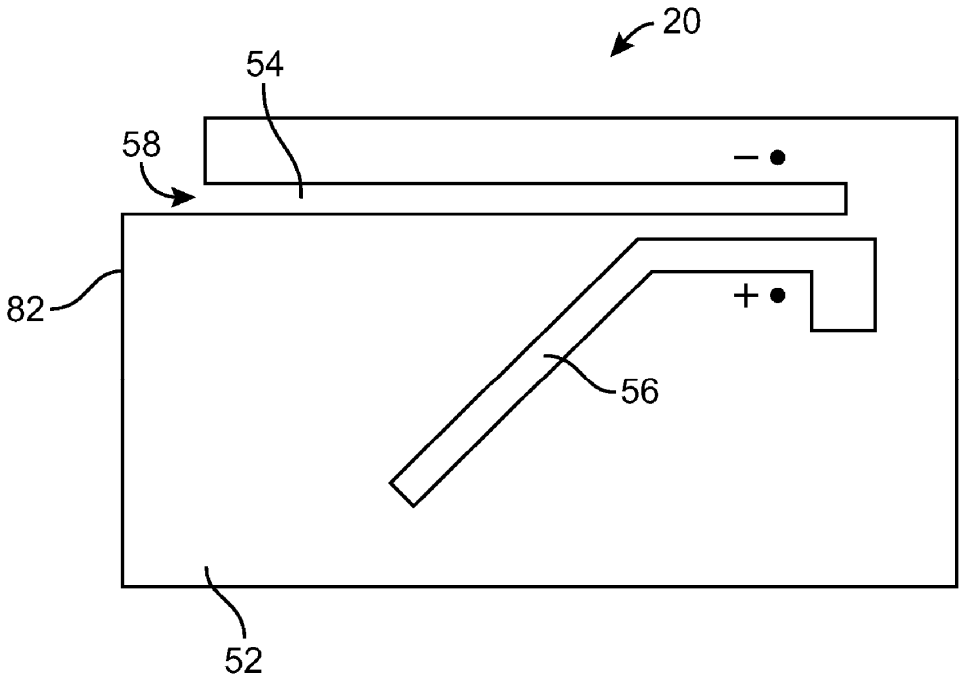
Publication Classification

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

(52) **U.S. Cl.** **343/702**; 343/770

(57) **ABSTRACT**

Dual slot antennas are provided for portable electronic devices such as handheld electronic devices. A dual slot antenna may have an open slot that has an open end that is not encircled by conductive material and may have a closed slot in which each end is surrounded by conductor. The closed and open slots may have portions that run parallel to each other. The antenna may be fed using feed terminals that bridge the closed and open slots in the vicinity of the portions of the slots that run parallel to each other. The slots may have portions that are angled with respect to each other. An end portion of one of the slots may be bent and widened for impedance matching and broadened bandwidth. Other portions of the slots may also be angled with respect to their main longitudinal axes.



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(19) **United States**

(12) **Patent Application Publication**

Hsieh et al.

(10) **Pub. No.: US 2009/0153414 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **ANTENNA STRUCTURE AND WIRELESS COMMUNICATION APPARATUS THEREOF**

(76) Inventors: **Chih-Sen Hsieh**, Taipei Hsien (TW); **Hung-Yi Lin**, Taipei Hsien (TW); **Feng-Chi Eddie Tsai**, Taipei Hsien (TW)

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(21) Appl. No.: **12/099,792**

(22) Filed: **Apr. 9, 2008**

(30) **Foreign Application Priority Data**

Dec. 14, 2007 (TW) 096147813

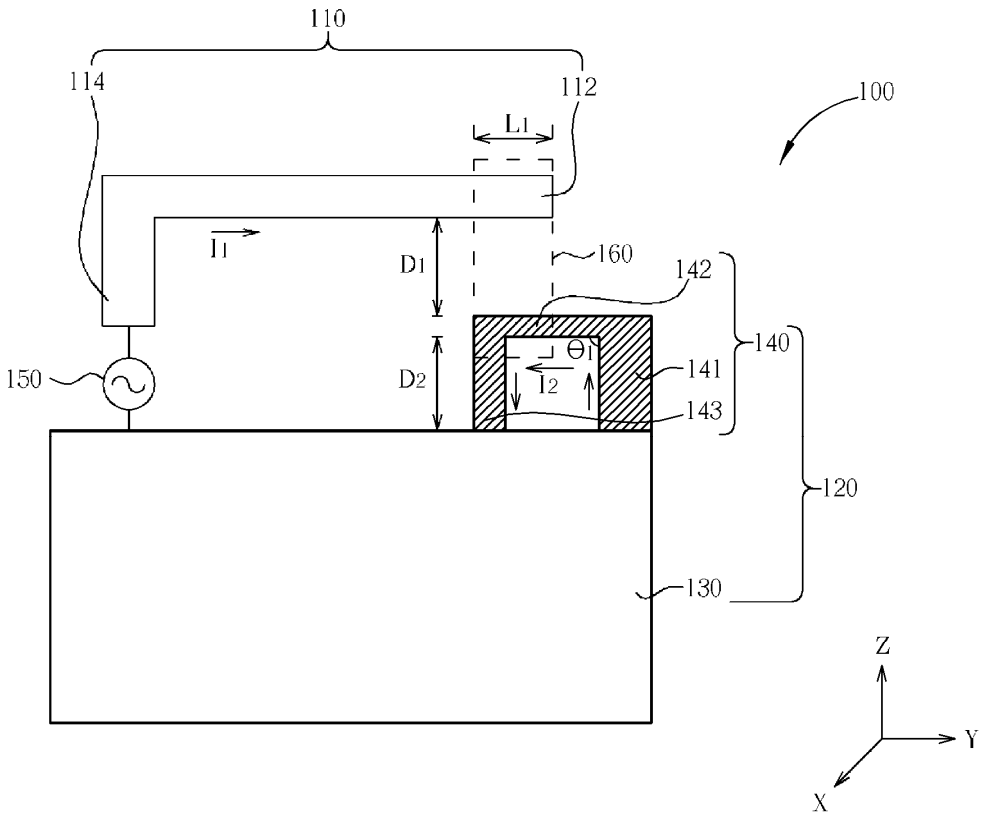
Publication Classification

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

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

(57) **ABSTRACT**

An antenna structure includes a radiation element, a grounding element, and a feeding point. The grounding element includes a first grounding sub-element and a second grounding sub-element. The second grounding sub-element is coupled to the first grounding sub-element and has a loop structure. One section of the loop structure overlaps a first end of the radiation element and is at a designated distance from the first end of the radiation element in a designated direction. The feeding point is coupled between a second end of the radiation element and the first grounding sub-element.



US 20090153415A1

(19) **United States**

(12) **Patent Application Publication**

Hsieh et al.

(10) **Pub. No.: US 2009/0153415 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **ANTENNA STRUCTURE AND WIRELESS COMMUNICATION APPARATUS THEREOF**

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(21) Appl. No.: **12/100,389**

(22) Filed: **Apr. 9, 2008**

(30) **Foreign Application Priority Data**

Dec. 14, 2007 (TW) 096147807

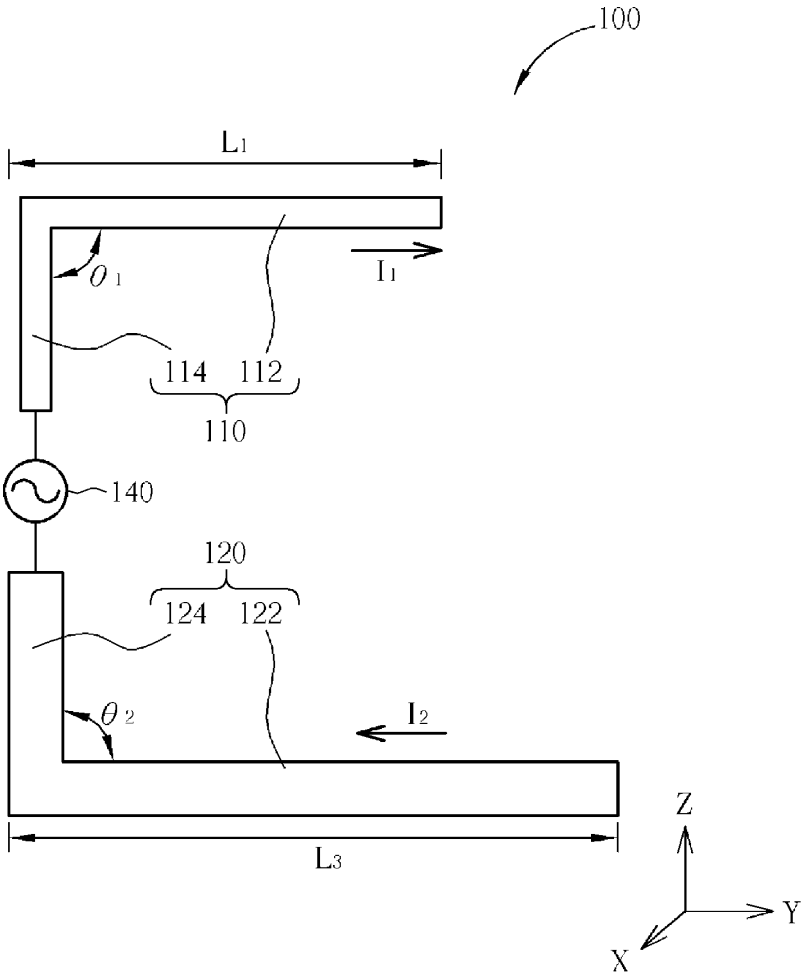
Publication Classification

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

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

(57) **ABSTRACT**

An antenna structure includes a radiation element, a grounding element, and a feeding point. The radiation element includes a first section and a second section coupled to the first section. The grounding element includes a third section and a fourth section coupled to the third section. The third section is substantially parallel to the first section. The feeding point is coupled between the second section of the radiation element and the fourth section of the grounding element.



US 20090153419A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2009/0153419 A1**

(43) **Pub. Date: Jun. 18, 2009**

LIN

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

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(21) Appl. No.: **12/333,122**

(22) Filed: **Dec. 11, 2008**

(30) **Foreign Application Priority Data**

Dec. 13, 2007 (TW) 096147777

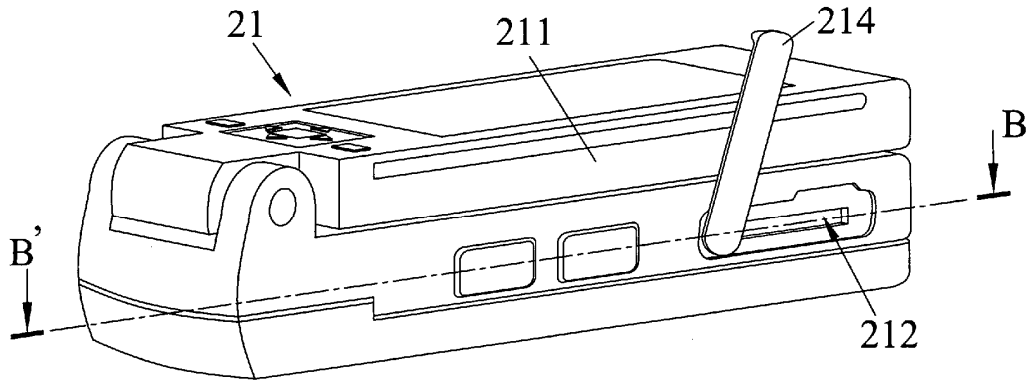
Publication Classification

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

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

(57) **ABSTRACT**

An antenna structure for portable electronic device includes an antenna and an electrical connection element. The portable electronic device includes a main body, a slotted section, a shaft, and a slot cover. The slot cover is coupled to the main body via the shaft, and the slot cover is located on the slotted section. The antenna is disposed on the slot cover, and the electrical connection element is coupled to the shaft and a printed circuit board mounted in the main body, so that the antenna is electrically coupled via the electrical connection element to the printed circuit board. Since the antenna disposed on the slot cover is not parallel with the printed circuit board, a clearance distance required between the antenna and the printed circuit board can be reduced to enable reduction of a volume of the portable electronic device.



US 20090153422A1

(19) **United States**

(12) **Patent Application Publication**

Chiang et al.

(10) **Pub. No.: US 2009/0153422 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **ANTENNAS WITH PERIODIC SHUNT INDUCTORS**

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(21) Appl. No.: **11/958,824**

(22) Filed: **Dec. 18, 2007**

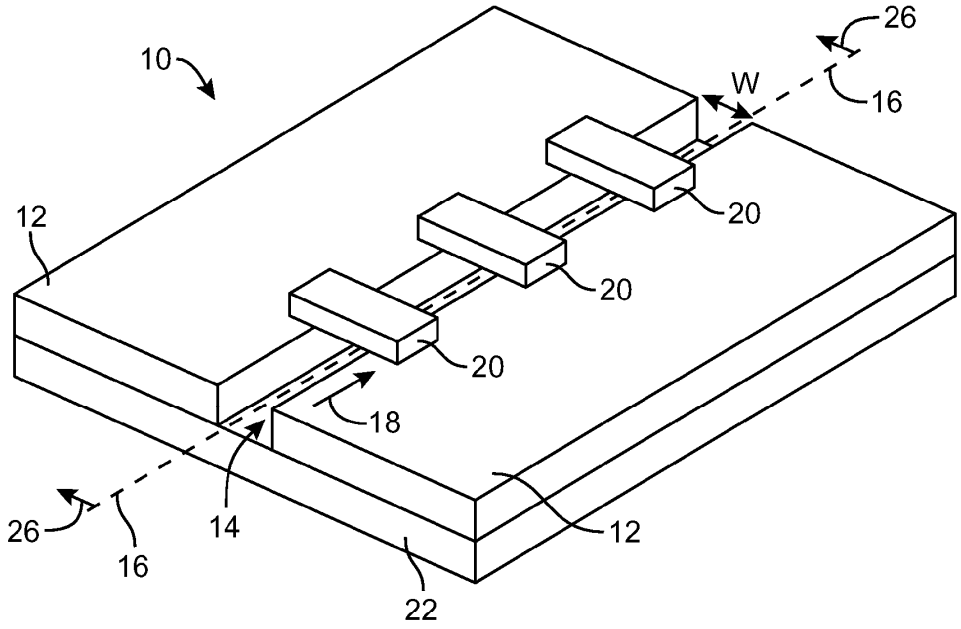
Publication Classification

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

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

(57) **ABSTRACT**

An antenna may be formed from conductive regions that define a gap that is bridged by shunt inductors. The inductors may have equal inductances and may be located equidistant from each other to form a scatter-type antenna structure. The inductors may also have unequal inductances and may be located along the length of the gap with unequal inductor-to-inductor spacings, thereby creating a decreasing shunt inductance at increasing distances from a feed for the antenna. This type of antenna structure functions as a horn-type antenna. One or more scatter-type antenna structures may be cascaded to form a multiband antenna. Antenna gaps may be formed in conductive device housings.



US 20090153423A1

(19) **United States**

(12) **Patent Application Publication**

DINALLO et al.

(10) **Pub. No.: US 2009/0153423 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **WIRELESS COMMUNICATION DEVICE WITH A MULTI-BAND ANTENNA SYSTEM**

(75) Inventors: **CARLO DINALLO**, PLANTATION, FL (US); **GIORGI G. BIT-BABIK**, SUNRISE, FL (US); **PETER C. SONG**, BIRMINGHAM (GB)

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(21) Appl. No.: **11/955,791**

(22) Filed: **Dec. 13, 2007**

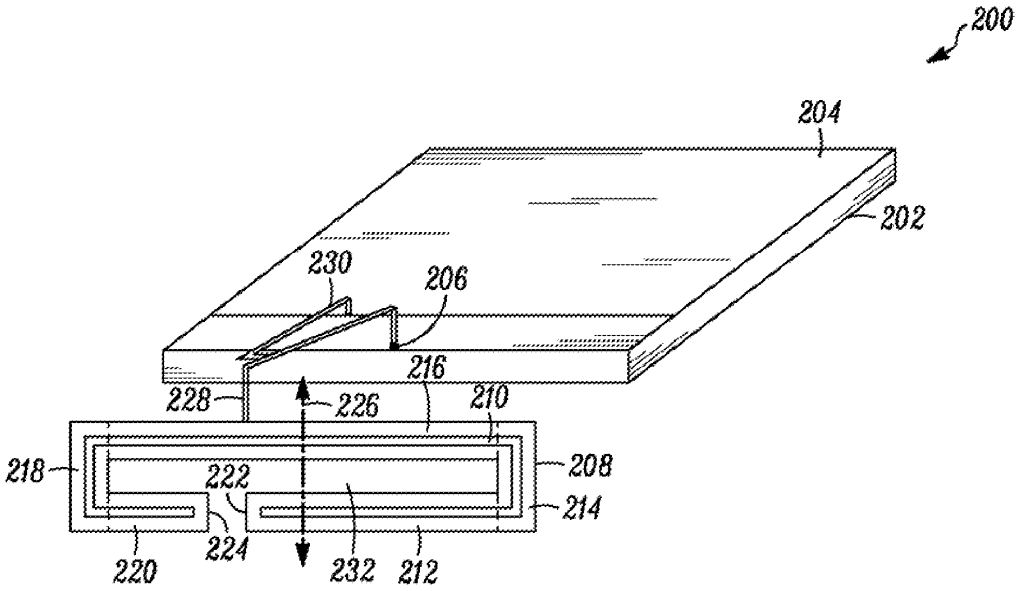
Publication Classification

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

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

(57) **ABSTRACT**

Disclosed is an apparatus for a wireless communication device **102** with a multi-band antenna system **106** supporting three common modes and one differential resonant mode. The multi-band antenna system **106** comprises a printed circuit board (PCB) **202** with a feeding contact **206**, a conductor **208** that extends completely out of a PCB ground **204**, wherein the conductor **208** has no ground contact with the PCB ground **204**. The conductor has an enclosed slot **210**. The conductor is fed with signals using a feed line **228** which is coupling the conductor **208** to the feeding contact **206**.



US 20090153424A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0153424 A1

(43) Pub. Date: Jun. 18, 2009

Ryou et al.

(54) **DUAL-BAND ANTENNA FOR RECEIVING VHF AND UHF SIGNAL AND COMMUNICATION DEVICE INCLUDING THE SAME**

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(21) Appl. No.: **12/281,620**

(22) PCT Filed: **Mar. 16, 2007**

(86) PCT No.: **PCT/KR2007/001298**

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

(30) **Foreign Application Priority Data**

Mar. 20, 2006 (KR) 10-2006-0025223

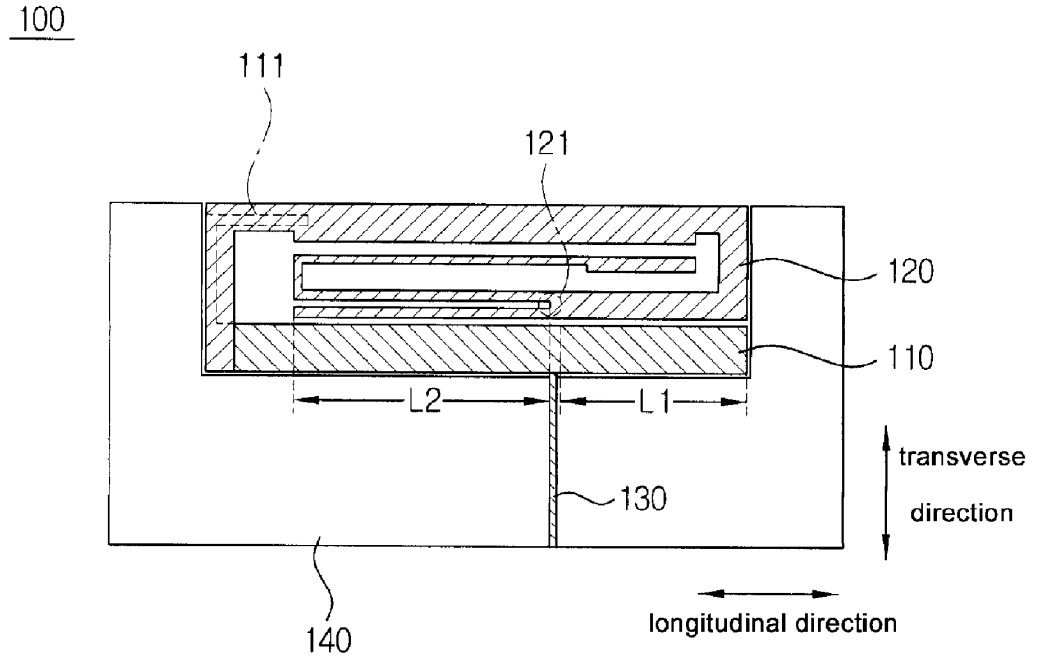
Publication Classification

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

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

(57) **ABSTRACT**

Disclosed herein is a dual-band antenna for a terminal for receiving VHF and UHF signals. A radiator of the dual-band antenna for a terminal for receiving VHF and UHF signals according to the present invention comprises a first patch bent at a part of a distal end thereof, and a second patch electrically connected to the first patch and formed in a spiral shape. A longitudinal portion of the second patch is constructed superposedly in a multi-structure in parallel with that of the first patch, so that the broadband of the VHF and UHF can be covered through an inverted L-shaped folded antenna structure.



US 20090153429A1

(19) **United States**

(12) **Patent Application Publication**

Su et al.

(10) **Pub. No.: US 2009/0153429 A1**

(43) **Pub. Date: Jun. 18, 2009**

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

(75) Inventors: **Chia-Hung Su**, Taipei (TW); **Chian-Chou Chiang**, Taipei (TW); **Chia-Ching Lin**, Taipei (TW); **Ting-Chih Tseng**, Taipei (TW)

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(73) Assignee: **Compal Communications, Inc.**

(21) Appl. No.: **12/314,576**

(22) Filed: **Dec. 12, 2008**

(30) **Foreign Application Priority Data**

Dec. 12, 2007 (TW) 096147356

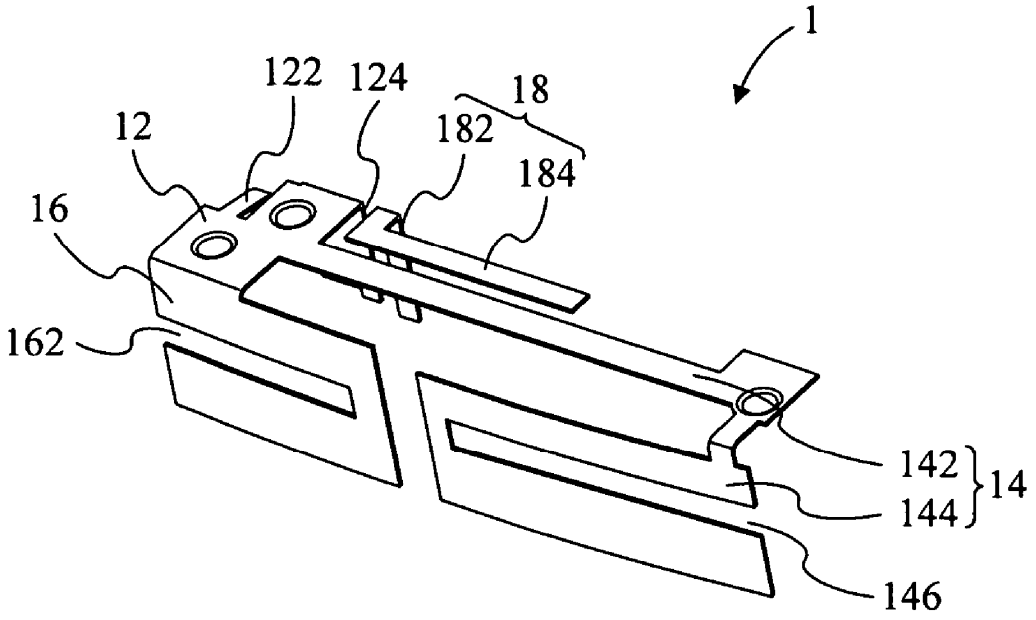
Publication Classification

(51) **Int. Cl.**
H01Q 19/02 (2006.01)

(52) **U.S. Cl.** **343/818**; 343/833

(57) **ABSTRACT**

The invention provides a multi-band antenna assembly comprising a connection conductor, a first resonant element, a second resonant element, and a parasitic resonant element. The first resonant element and the second resonant element are electrically connected with the connection conductor respectively. The parasitic resonant element and a grounding part of the connection conductor are grounded. The parasitic resonant element is disposed substantially parallel to the first resonant element, and therein a length of the parasitic resonant element is 15.2 mm~25.2 mm. The multi-band antenna assembly can provide a working band containing GSM**850**/GSM**900**/DCS/PSC/UMTS, even 2.4 GHz or GPS.



US 20090153430A1

(19) **United States**

(12) **Patent Application Publication**

Hung et al.

(10) **Pub. No.: US 2009/0153430 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **MULTI-FREQUENCY ANTENNA SUITABLY WORKING IN DIFFERENT WIRELESS NETWORKS**

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(21) Appl. No.: **12/378,644**

(22) Filed: **Feb. 17, 2009**

Related U.S. Application Data

(63) Continuation of application No. 11/906,691, filed on Oct. 2, 2007, now Pat. No. 7,498,992, which is a continuation of application No. 11/201,463, filed on Aug. 11, 2005, now Pat. No. 7,289,071.

(30) **Foreign Application Priority Data**

May 23, 2005 (TW) 94116677

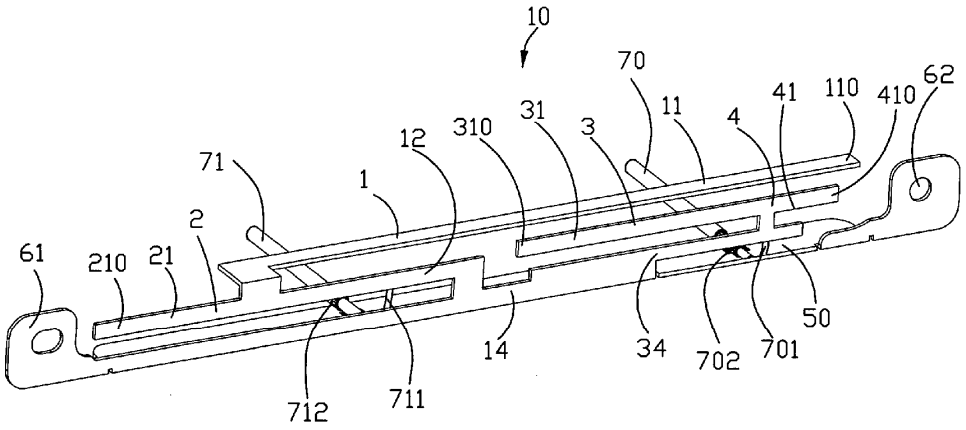
Publication Classification

(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 1/48 (2006.01)

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

(57) **ABSTRACT**

A multi-frequency antenna includes a first antenna (**1**) and a second antenna (**2**) both operating at wireless wide area network, a third antenna (**3**) and a fourth antenna (**4**) both operating at wireless local area network. The first antenna, the second antenna, the third antenna and the fourth antenna are integrally made from a metal sheet and have a common grounding portion (**50**). The first and the second antennas have a first connecting portion (**12**) on which a feeding point (**120**) is located, and the third and the fourth antenna have a second connecting portion (**34**) on which another feeding point (**340**) is located.



US 20090153432A1

(19) **United States**

(12) **Patent Application Publication**

Manasson et al.

(10) **Pub. No.: US 2009/0153432 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **ELECTRONICALLY-CONTROLLED MONOLITHIC ARRAY ANTENNA**

(76) Inventors: **Vladimir Manasson**, Irvine, CA (US); **Vladimir I. Litvinov**, Aliso Viejo, CA (US); **Lev Sadovnik**, Irvine, CA (US); **Mark Aretskin**, Irvine, CA (US); **Mikhail Felman**, Tarzana, CA (US); **Aramais Avakian**, Pasadena, CA (US)

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(21) Appl. No.: **11/956,229**

(22) Filed: **Dec. 13, 2007**

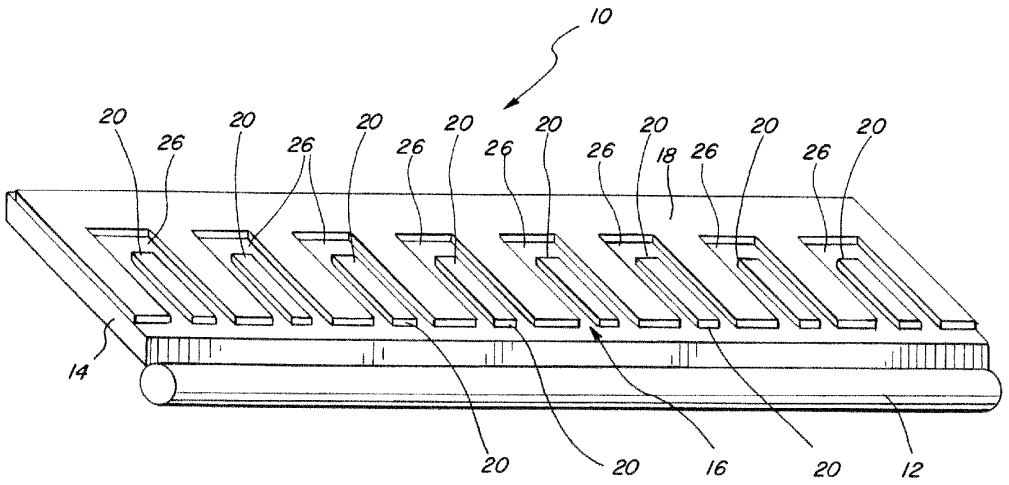
Publication Classification

(51) **Int. Cl.**
H01Q 3/24 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** ..... **343/876**; 343/700 MS

(57) **ABSTRACT**

An electronically controlled monolithic array antenna includes a transmission line through which an electromagnetic signal may be propagated, and a metal antenna element defining an evanescent coupling edge located so as to permit evanescent coupling of the signal between the transmission line and the antenna element. The antenna element includes a conductive ground plate; an array of conductive edge elements defining the coupling edge, each of the edge elements being electrically connected to a control signal source, and each of the edge elements being electrically isolated from the ground plate by an insulative isolation gap; and a plurality of switches, each of which is selectively operable in response to the control signal to electrically connect selected edge elements to the ground plate across the insulative isolation gap so as to provide a selectively variable electromagnetic coupling geometry of the coupling edge.



US 20090156151A1

(19) **United States**

(12) **Patent Application Publication**

Anguera et al.

(10) **Pub. No.: US 2009/0156151 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **WIRELESS PORTABLE DEVICE INCLUDING INTERNAL BROADCAST RECEIVER**

(76) Inventors: **Jaume Anguera**, Castellon (ES); **Alfonso Sanz**, Barcelona (ES)

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(21) Appl. No.: **12/226,024**

(22) PCT Filed: **Aug. 2, 2006**

(86) PCT No.: **PCT/EP2006/007782**

§ 371 (c)(1),
(2), (4) Date: **Nov. 14, 2008**

Related U.S. Application Data

(60) Provisional application No. 60/788,857, filed on Apr. 3, 2006.

(30) **Foreign Application Priority Data**

May 4, 2006 (EP) 06113473.0

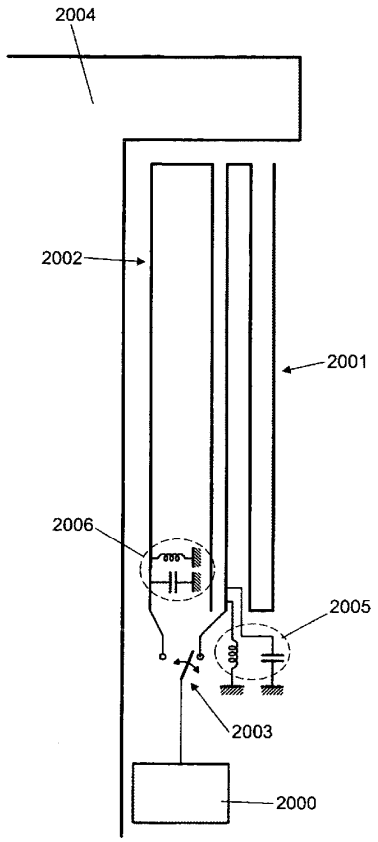
Publication Classification

(51) **Int. Cl.**
H04B 1/18 (2006.01)
H04B 1/16 (2006.01)

(52) **U.S. Cl.** **455/289**; 455/280

(57) **ABSTRACT**

The invention relates, inter alia, to a wireless portable device for radio communication, comprising at least one antenna element (**1210**), at least one ground-plane (**1250**), radio frequency communication circuitry (**1310**) and at least one matching network (**1320**). The device is arranged for communication involving, at least, receiving and processing a signal in accordance with a communication system having a bandwidth with a lower frequency limit (f_{min}) and an upper frequency limit (f_{max}). The antenna element is a non-resonant antenna element for frequencies from said lower frequency limit (f_{min}) up to said higher frequency limit (f_{min}). Another aspect of the invention involves two antenna elements (**2001**, **2002**) tuned around two different central frequencies within a frequency band, and a switch (**2003**) for selectively operatively connecting one of said at least two antenna elements to a radio frequency communication circuitry (**2000**).



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(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2009/0160714 A1**

(43) **Pub. Date: Jun. 25, 2009**

Qi et al.

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

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(73) Assignee: **Research In Motion Limited (a corp. organized under the laws of the Prov. of Ontario, Canada)**, Waterloo, CA (US)

(21) Appl. No.: **12/358,054**

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

Related U.S. Application Data

(63) Continuation of application No. 11/167,506, filed on Jun. 27, 2005, now Pat. No. 7,489,276.

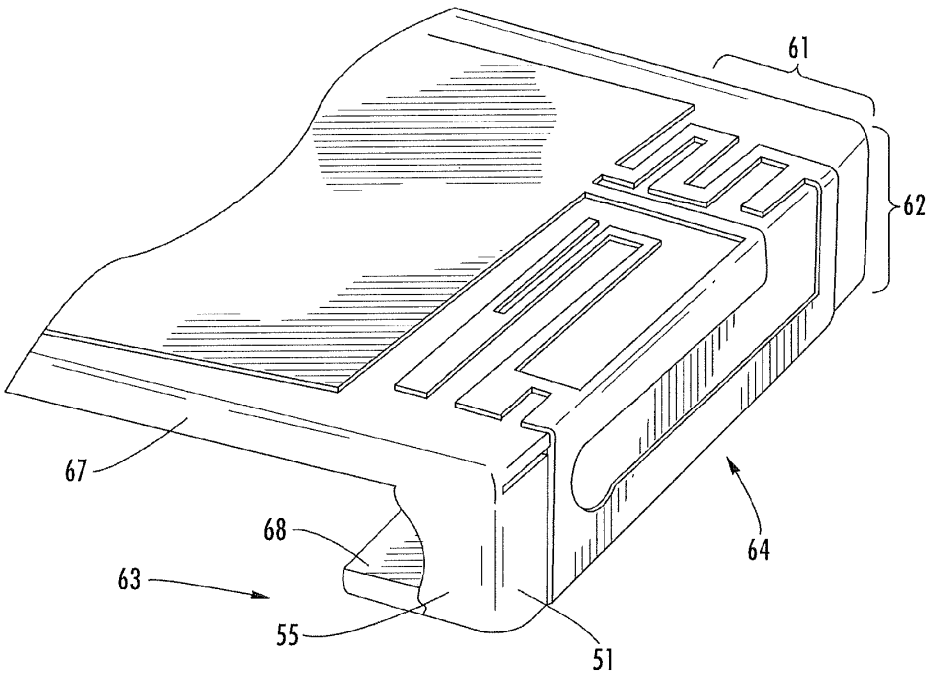
Publication Classification

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

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

(57) **ABSTRACT**

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.



US 20090160717A1

(19) **United States**

(12) **Patent Application Publication**

Tsutsumi et al.

(10) **Pub. No.: US 2009/0160717 A1**

(43) **Pub. Date: Jun. 25, 2009**

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

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

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

(21) Appl. No.: **12/230,707**

(22) Filed: **Sep. 3, 2008**

(30) **Foreign Application Priority Data**

Dec. 19, 2007 (JP) 2007-326968

Publication Classification

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

(52) **U.S. Cl.** **343/726**

(57) **ABSTRACT**

There is provided with an antenna device including: a dipole element that includes a first linear element and a second linear element with each one end thereof being provided closely; a loop-shaped element that includes a third linear element and a fourth linear element provided approximately in parallel to the first linear element and the second linear element with each one end thereof being provided closely, and a fifth linear element with one end thereof being connected to the other end of the third linear element and the other end thereof being connected to the other end of the fourth linear element; and a feeding point feeding power to each one ends of the first linear element and the second linear element and to each one ends of the third linear element and the fourth linear element.