

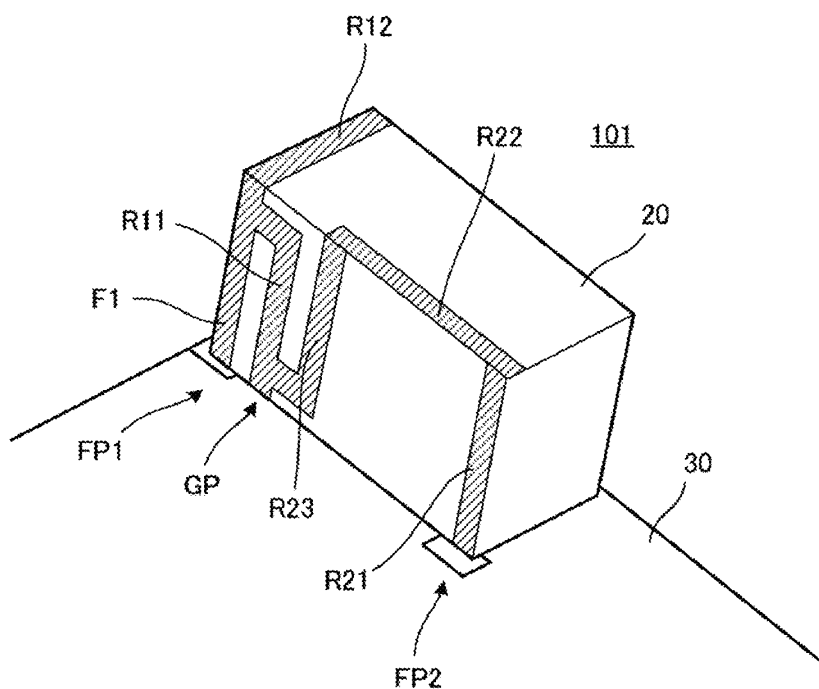


US 20110102268A1

(19) **United States**(12) **Patent Application Publication**
WATANABE et al.(10) **Pub. No.: US 2011/0102268 A1**(43) **Pub. Date: May 5, 2011**(54) **ANTENNA****Publication Classification**(75) Inventors: **Munehisa WATANABE**, Shiga-ken (JP); **Kengo ONAKA**, Kanagawa-ken (JP); **Takashi ISHIIHARA**, Tokyo-to (JP); **Tsuyoshi MUKAI**, Kyoto-fu (JP); **Yuichi KUSHIHI**, Kanagawa-ken (JP)(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 9/04 (2006.01)(52) **U.S. Cl.** **343/700 MS**(57) **ABSTRACT**(73) Assignee: **MURATA MANUFACTURING CO., LTD.**, Kyoto-fu (JP)(21) Appl. No.: **12/835,476**(22) Filed: **Jul. 13, 2010**(30) **Foreign Application Priority Data**

Jul. 14, 2009 (JP) 2009-165395

An antenna includes a base, a first radiating element, and second radiating element. The first radiating element is open at a first end thereof, is connected to a ground point at a second end thereof, and resonates in a substantially $\frac{1}{4}$ wavelength mode in a first communication frequency band. A feed line is connected between a first feed point and a predetermined position between the first end and the second end of the first radiating element. The second radiating element has a first end that is a second feed point, a second end that is connected to the ground point, and resonates in a substantially $\frac{1}{2}$ wavelength mode in a second communication frequency band. A distance from the ground point to the second feed point is longer than a distance from the ground point to the first feed point.



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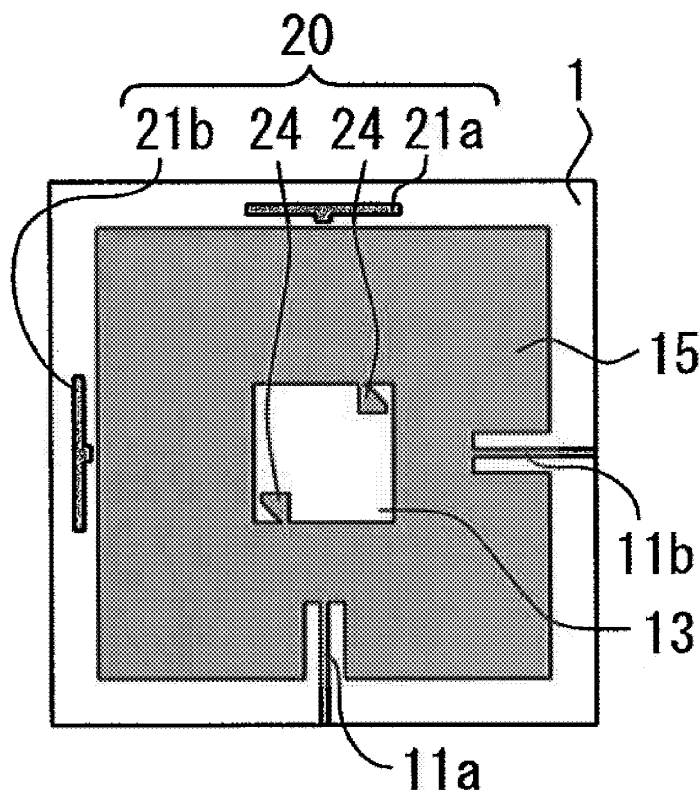


US 20110102269A1

(19) **United States**(12) **Patent Application Publication****Sato et al.**(10) **Pub. No.: US 2011/0102269 A1**(43) **Pub. Date: May 5, 2011**(54) **PATCH ANTENNA****Publication Classification**(76) Inventors: **Masato Sato**, Tokyo (JP); **Hiroyuki Iwasaki**, Tokyo (JP); **Shinji Iino**, Tokyo (JP)(51) **Int. Cl.**
H01Q 9/14 (2006.01)
H01Q 1/38 (2006.01)(52) **U.S. Cl.** **343/700 MS**(57) **ABSTRACT**(21) Appl. No.: **12/898,022**(22) Filed: **Oct. 5, 2010**(30) **Foreign Application Priority Data**

Nov. 2, 2009 (JP) 2009-252295

The patch antenna disclosed is easily adjusting the resonant frequency even by manual operation and without requiring a grinding process. A patch antenna includes a radiating element 12 and an adjustment land section 20. A power supply section 11 is disposed in the radiating element 12. The adjustment land section 20 adjusts the resonant frequency of the radiating element 12. When the resonant frequency needs to be adjusted, the adjustment land section 20 and the radiating element 12 are short-circuited to change the element length as viewed from the power supply section 11. As a result, the resonant frequency of the radiating element 12 can be adjusted.



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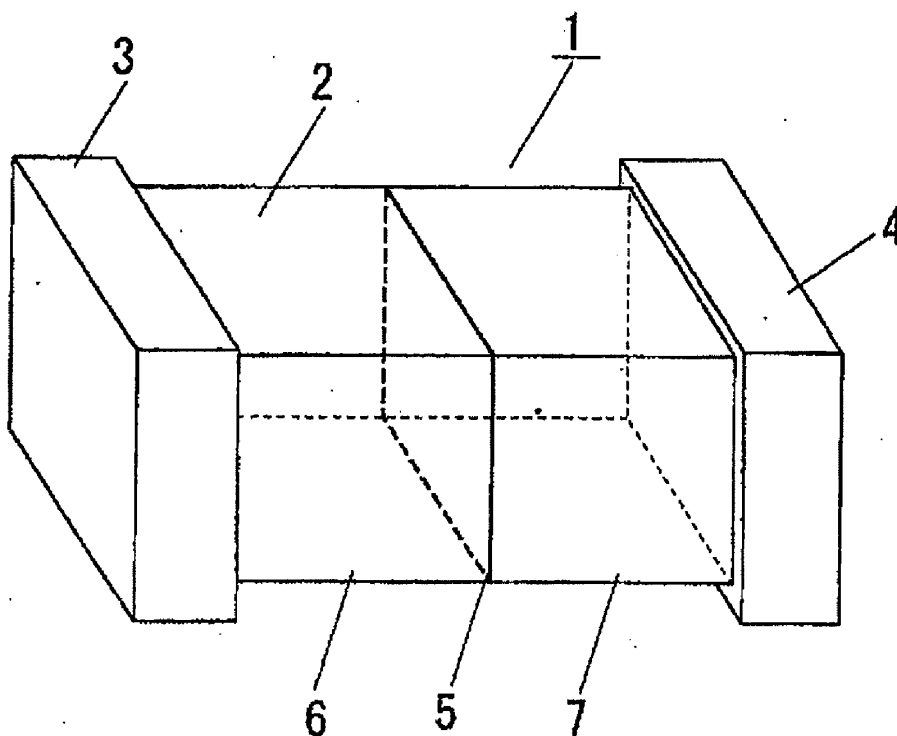
US 20110102270A1

(19) **United States**(12) **Patent Application Publication**
NAGATOMO et al.(10) **Pub. No.: US 2011/0102270 A1**(43) **Pub. Date: May 5, 2011**(54) **ANTENNA AND COMMUNICATION DEVICE
EQUIPPED WITH THE SAME****Publication Classification**(75) Inventors: **Yasuki NAGATOMO**, Miyazaki
(JP); **Kenichi KOZAKI**, Miyazaki
(JP); **Kazuhide GOTOU**, Miyazaki
(JP)(51) **Int. Cl.**
H01Q 1/38 (2006.01)(52) **U.S. Cl.** **343/700 MS**(73) Assignee: **PANASONIC CORPORATION**,
Osaka (JP)(57) **ABSTRACT**(21) Appl. No.: **12/915,163**

An antenna comprises the followings: a base substance provide on a substrate **8**; a conductive film made on the base substance; and a gap **5** that electrically divides the conductive film into a first conductive film **6** and a second conductive film **7**. The first conductive film **6** is connected to a power supply section provided on the substrate **8**, and the second conductive film **7** is connected to a ground section **9** by way of a conductor. The power supply section, the first conductive film **6**, the gap **5**, the second conductive film **7**, a conductor **11**, and the ground section **9** are serially connected in this sequence.

(22) Filed: **Oct. 29, 2010**(30) **Foreign Application Priority Data**

Oct. 30, 2009 (JP) 2009-249789



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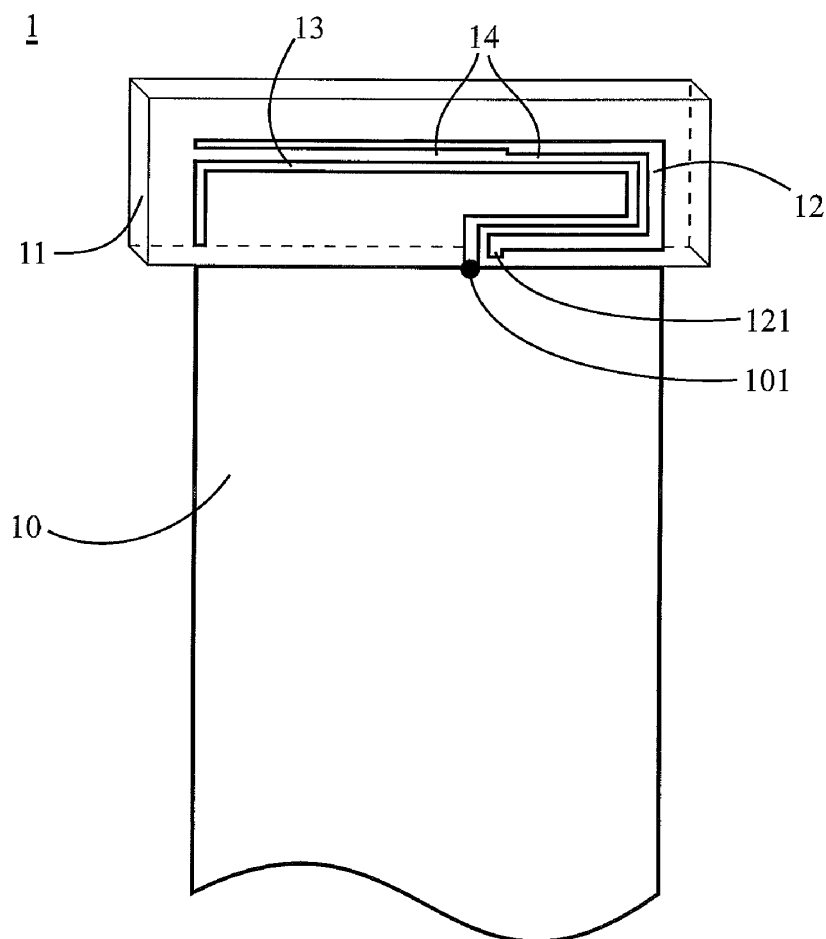
US 20110102272A1

(19) **United States**(12) **Patent Application Publication**
Wong et al.(10) **Pub. No.: US 2011/0102272 A1**(43) **Pub. Date: May 5, 2011**(54) **MOBILE COMMUNICATION DEVICE AND
ANTENNA THEREOF**(52) **U.S. CL.** 343/702; 343/700 MS(76) **Inventors:** **Kin-Lu Wong**, Hsichih (TW);
Fang-Hsien Chu, Hsichih (TW)(57) **ABSTRACT**(21) **Appl. No.:** **12/715,461**(22) **Filed:** **Mar. 2, 2010**(30) **Foreign Application Priority Data**

Nov. 5, 2009 (TW) 098137619

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

The present invention is related to a mobile communication device comprising a ground plane and an antenna. The antenna is disposed on one surface of a dielectric substrate. The antenna comprises a first radiating metal portion and a second radiating metal portion. The first radiating metal portion has at least one bending. One end of the first radiating metal portion is a feeding point of the antenna and the other end is left open. One end of the second radiating metal portion is short-circuited to the ground plane, and the other end is left open. A length of the second radiating metal portion is 0.75 to 1.25 times that of the first radiating metal portion. At least a portion of the second radiating metal portion is extended along the first radiating metal portion with a gap of less than a specified distance therebetween.



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US 20110102273A1

(19) **United States**(12) **Patent Application Publication****Chen et al.**(10) **Pub. No.: US 2011/0102273 A1**(43) **Pub. Date: May 5, 2011**(54) **DIPOLE ANTENNA AND PORTABLE
COMPUTER UTILIZING THE SAME****Publication Classification**

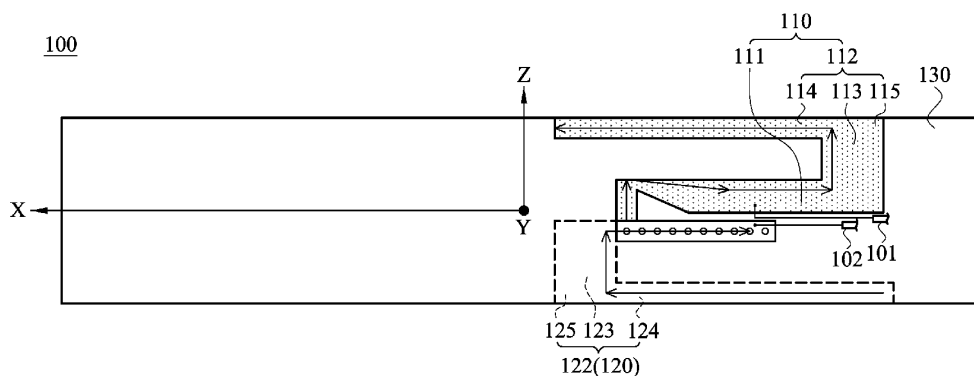
(51) **Int. Cl.**
H01Q 9/28 (2006.01)
H01Q 1/24 (2006.01)
(52) **U.S. Cl.** **343/702; 343/795**

(57) **ABSTRACT**

A dipole antenna is provided. The dipole antenna includes a signal line, a ground line, a substrate, a first radiation element and a second radiation element. The substrate includes a first surface and a second surface, wherein the first surface is opposite to the second surface. The first radiation element is disposed on the first surface and electrically connected to the signal line, wherein the first radiation element comprises a first connection portion and a first extending portion, the first extending portion comprises a first bending portion, the first bending portion forms a first section and a second section on the first extending portion, and the first section is connected to the first connection portion. The second radiation element is disposed on the second surface and electrically connected to the ground line, wherein the second radiation element comprises a second connection portion.

(75) Inventors: **Huang-Chih Chen**, Taipei Hsien (TW); **Chia Huang Shen**, Taipei Hsien (TW); **Yung-Jinn Chen**, Taipei (TW)(73) Assignee: **WISTRON NEWEB CORP.**,
TAIPEI HSIEN (TW)(21) Appl. No.: **12/765,778**(22) Filed: **Apr. 22, 2010**(30) **Foreign Application Priority Data**

Oct. 29, 2009 (TW) TW98136627



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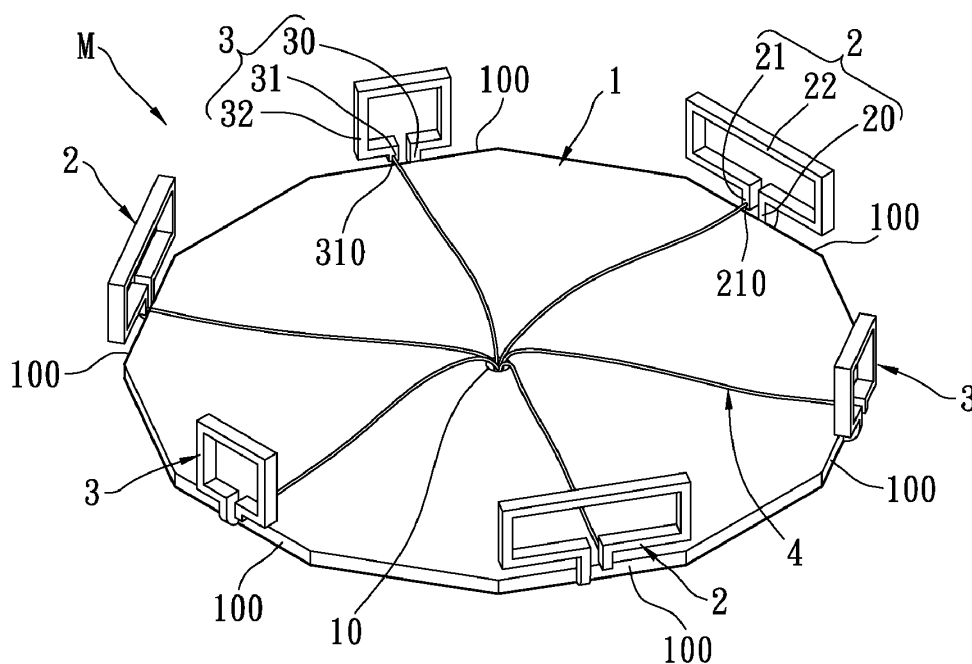


US 20110102281A1

(19) **United States**(12) **Patent Application Publication**
SU(10) **Pub. No.: US 2011/0102281 A1**(43) **Pub. Date: May 5, 2011**(54) **MULTI-LOOP ANTENNA MODULE WITH
WIDE BEAMWIDTH****Publication Classification**(51) **Int. Cl.**
H01Q 11/12 (2006.01)(52) **U.S. Cl.** **343/742**(57) **ABSTRACT**(75) **Inventor:** **Saou-Wen SU**, Keelung City (TW)(73) **Assignees:** **SILITEK ELECTRONIC
(GUANGZHOU) CO., LTD.**,
Guangzhou (CN); **LITE-ON
TECHNOLOGY
CORPORATION**, Taipei City
(TW)(21) **Appl. No.:** **12/786,867**(22) **Filed:** **May 25, 2010**(30) **Foreign Application Priority Data**

Oct. 29, 2009 (CN) 200910210175.4

A multi-loop antenna module with wide beamwidth includes a grounding unit and a plurality of first loop units and second loop units. The first loop units are vertically disposed on outer peripheral sides of the grounding unit. Each first loop unit has a first shorting pin disposed on the grounding unit, a first feeding pin separated from the first shorting pin and suspended above the grounding unit, and a first loop radiating body connected between the first shorting pin and the first feeding pin. The second loop units are vertically disposed on outer peripheral sides of the grounding unit. Each second loop unit has a second shorting pin disposed on the grounding unit, a second feeding pin separated from the second shorting pin and suspended above the grounding unit, and a second loop radiating body connected between the second shorting pin and the second feeding pin.



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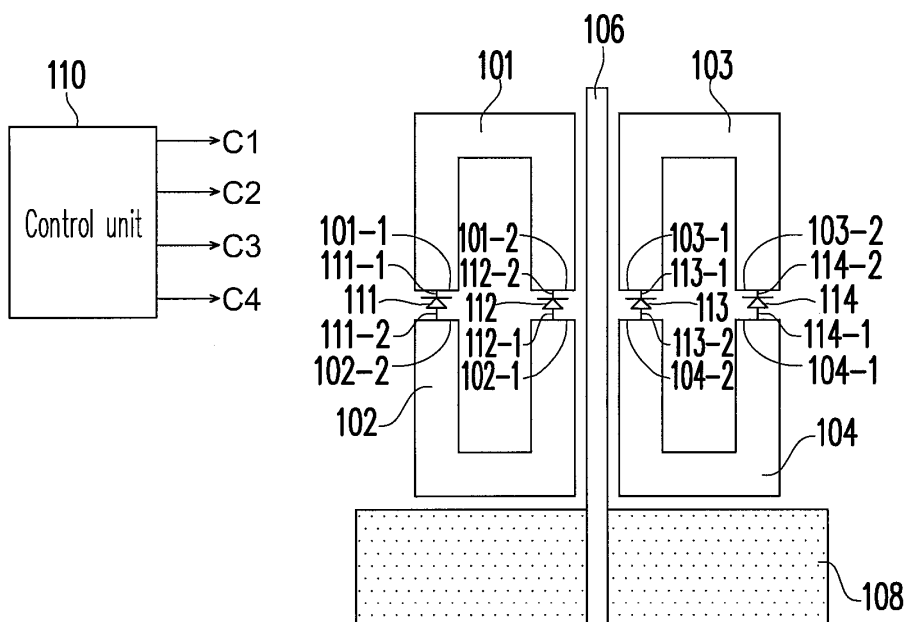
US 20110102282A1

(19) **United States**(12) **Patent Application Publication****Liu et al.**(10) **Pub. No.: US 2011/0102282 A1**(43) **Pub. Date: May 5, 2011**(54) **RECONFIGURABLE MULTI-BAND
ANTENNA SYSTEM AND ELECTRONIC
APPARATUS HAVING THE SAME****Publication Classification**(51) **Int. Cl.**
H01Q 9/00 (2006.01)(52) **U.S. Cl.** **343/745**(75) **Inventors:** **Chang-Chih Liu**, Taichung County
(TW); **Chang-Sheng Chen**, Taipei
City (TW); **Kuo-Chiang Chin**,
Taipei County (TW); **Li-Chi
Chang**, Taichung City (TW);
Wei-Ting Chen, Tainan County
(TW); **Cheng-Hua Tsai**, Taipei
County (TW)(57) **ABSTRACT**

A reconfigurable multi-band antenna system has a signal transmission metal, a ground metal, at least two resonators, and at least two switches. The signal transmission metal and the ground metal respectively act as a signal feed-in end and a ground end and of the reconfigurable multi-band antenna system. The at least two resonators are disposed on at least one side of the transmission metal line. Each switch is coupled to the at least two resonators or one of them. Each switch has a control end, and independently and respectively receives one of the at least two control signals, wherein the at least two control signals respectively and independently the short and open of the switches. The at least two resonators form a resonator configuration of a semi-close resonating configuration or a close resonating configuration, and generates a signal within a frequency according to the resonator configuration.

(73) **Assignee:** **INDUSTRIAL TECHNOLOGY
RESEARCH INSTITUTE**,
Hsinchu (TW)(21) **Appl. No.:** **12/773,845**(22) **Filed:** **May 5, 2010**(30) **Foreign Application Priority Data**

Nov. 2, 2009 (TW) 98137163





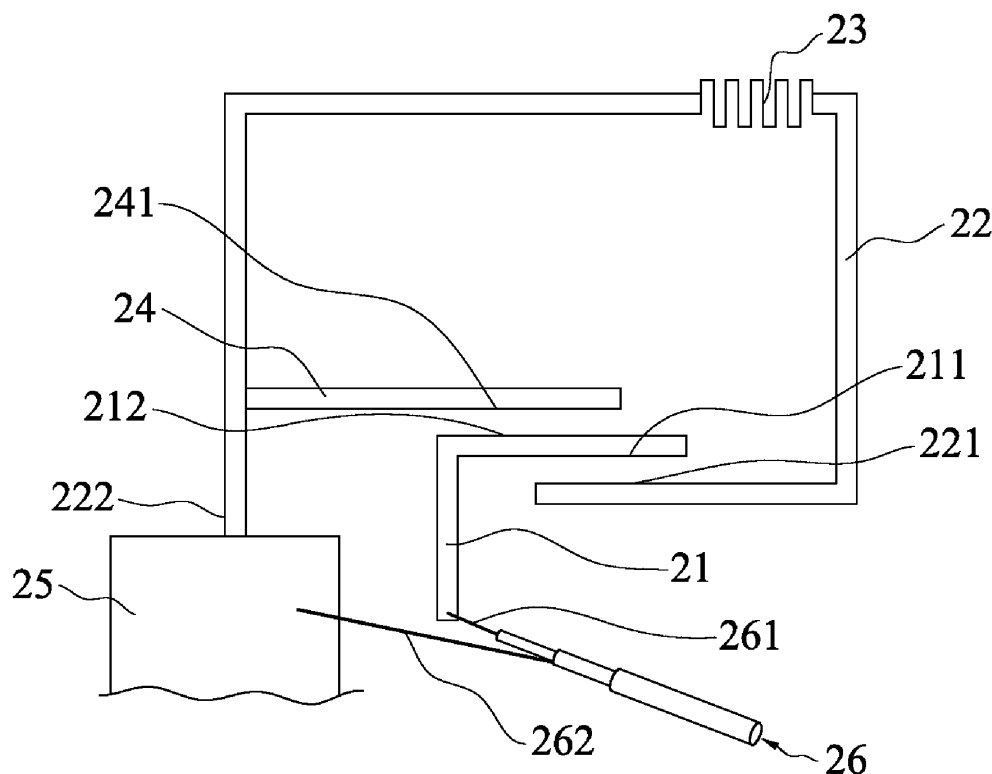
US 20110102283A1

(19) **United States**(12) **Patent Application Publication**
Chang et al.(10) **Pub. No.: US 2011/0102283 A1**(43) **Pub. Date: May 5, 2011**(54) **INTEGRATED MULTI-BAND ANTENNA**(52) **U.S. CL.** 343/749; 343/848(75) Inventors: **Yao-Yuan Chang**, Taipei County (TW); **Tsung-Wen Chiu**, Taipei (TW); **Fu-Ren Hsiao**, Taipei (TW); **Wen-Shyang Chen**, Taipei (TW)(73) Assignee: **ADVANCED-CONNECTEK, INC.**, Taipei County (TW)(21) Appl. No.: **12/649,670**(22) Filed: **Dec. 30, 2009**(30) **Foreign Application Priority Data**

Oct. 30, 2009 (TW) 098136944

Publication Classification(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 1/48 (2006.01)
H01Q 1/36 (2006.01)(57) **ABSTRACT**

An integrated multi-band antenna comprises a first conductor, a second conductor, at least one inductor member, an extension conductor, and a grounding plane. The first conductor and a first branch of the second conductor form a first coupling region. The inductor member is arranged near the first branch. The extension conductor is arranged near a second branch of the second conductor and extends therefrom to form a terminal. The terminal and first conductor form a second coupling region. The first and second coupling regions are arranged on opposite sides of the first conductor. The second branch connects to the grounding plane. The present invention adopts a design incorporating the capacitive coupling of the conductors and the choke of the inductor member, integrates the standard frequency bands of the low-frequency and high-frequency systems of the digital TV to achieve a miniaturized digital TV antenna spanning a wide range of frequency bands.



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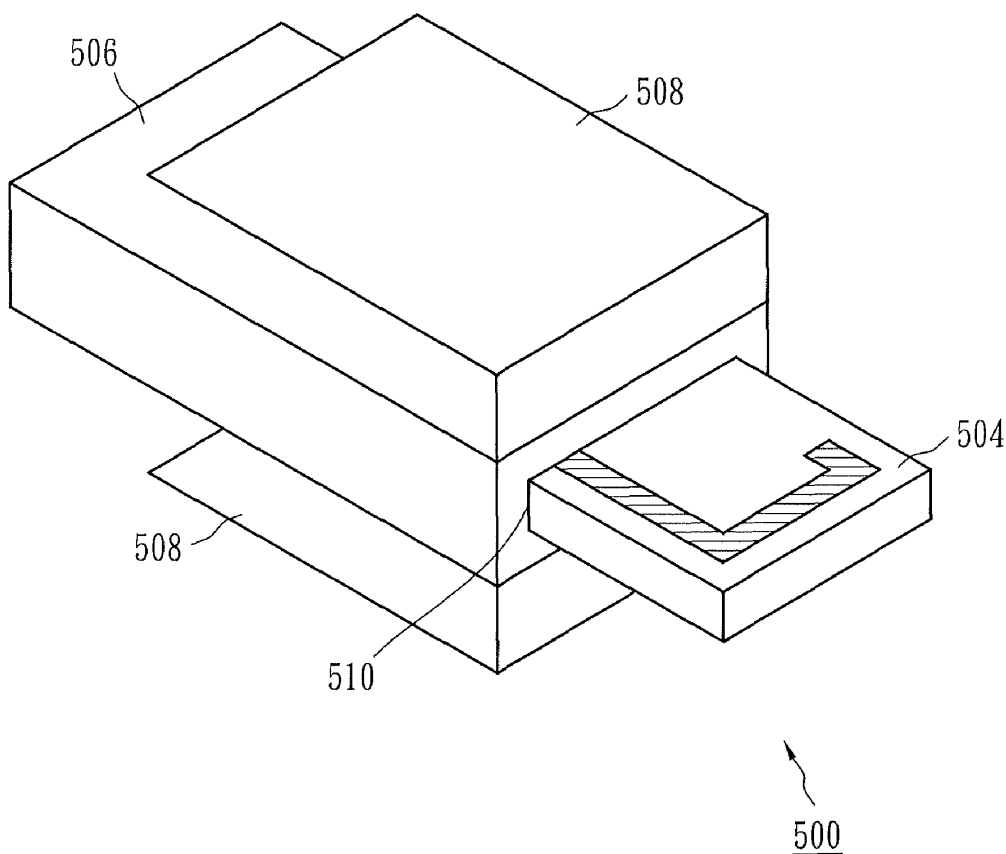
US 20110102288A1

(19) **United States**(12) **Patent Application Publication****LIN et al.**(10) **Pub. No.: US 2011/0102288 A1**(43) **Pub. Date: May 5, 2011**(54) **ANTENNA APPARATUS**(30) **Foreign Application Priority Data**

Nov. 2, 2009 (TW) 098137065

(75) Inventors: **JUNN YI LIN**, HSINCHU
COUNTY (TW); **XIN CHANG
CHEN**, HSINCHU COUNTY
(TW)**Publication Classification**(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01Q 1/38 (2006.01)
H01Q 1/48 (2006.01)(73) Assignee: **RALINK TECHNOLOGY
CORPORATION**, HSINCHU
COUNTY (TW)(52) **U.S. Cl.** **343/841; 343/700 MS; 343/848**(57) **ABSTRACT**(21) Appl. No.: **12/906,400**

An antenna apparatus comprises a planar monopole antenna device and an extending layer. The planar monopole antenna device includes an electromagnetic shielding box. The extending layer is composed of electric conducting material and extends outward from a feed point of the electromagnetic shielding box.

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

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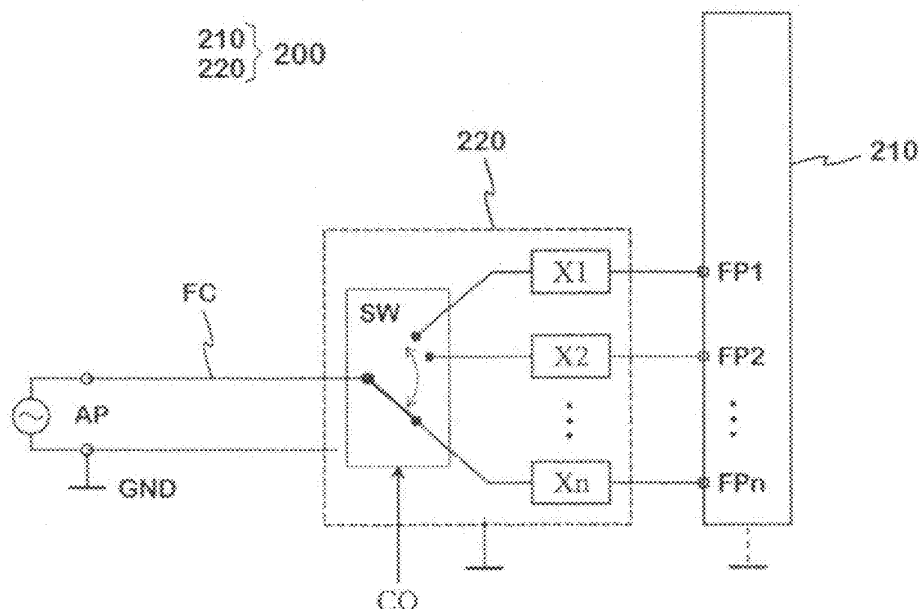


US 20110102290A1

(19) **United States**(12) **Patent Application Publication**
Milosavljevic(10) **Pub. No.: US 2011/0102290 A1**(43) **Pub. Date: May 5, 2011**(54) **ADJUSTABLE MULTI-BAND ANTENNA AND METHODS****Publication Classification**(76) Inventor: **Zlatoljub Milosavljevic, Kempele (FI)**(51) **Int. Cl.****H01Q 1/50** (2006.01)**H01Q 1/38** (2006.01)(52) **U.S. Cl. 343/852; 343/700 MS; 343/876**(21) Appl. No.: **12/673,966**(57) **ABSTRACT**(22) PCT Filed: **Aug. 20, 2008**(86) PCT No.: **PCT/FI2008/050469**§ 371 (c)(1),
(2), (4) Date: **Jan. 7, 2011**(30) **Foreign Application Priority Data**

Aug. 30, 2007 (FI) 20075597

An adjustable multi-band planar antenna especially applicable in mobile terminals. The feed of the antenna can be connected by a multiple-way switch (SW) to at least two alternative points (FP1, FP2, FP3) in the radiator (310). When the feed point is changed, the resonance frequencies and thus the operating bands of the antenna change. Besides the basic dimensions of the antenna, the distance (x, y, z) of each feed point to other feed points and possible short-circuit point in the radiator, the value of the series capacitance (C31; C32; C33) belonging to a reactive circuit between the feed point and switch and the distance of the ground plane (GND) from the radiator are variables in the antenna design.



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US 20110102293A1

(19) **United States**(12) **Patent Application Publication****Chen et al.**(10) **Pub. No.: US 2011/0102293 A1**(43) **Pub. Date: May 5, 2011**(54) **ANTENNA ASSEMBLY****Publication Classification**

(73) Inventors: **Jun Jie Chen**, Shanghai (CN); **Min Ding**, Shanghai (CN); **Jun Ping Geng**, Shanghai (CN); **Xian Guang Guo**, Shanghai (CN); **Rong Hong Jin**, Shanghai (CN); **Mattias Lampe**, Wolfenbuettel (DE); **Christoph Weiler**, Bretten (DE)

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

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

(57) **ABSTRACT**

An antenna module that includes two directional antennae arranged in a back-to-back manner, and a converter. The converter realizes conversion between an omnidirectional antenna mode and a directional antenna mode by switching on two directional antennae simultaneously or by switching on one of the directional antennae. Alternatively, the antenna module includes a horizontal polarization antenna, a vertical polarization antenna and a converter, where the converter provides the conversion between the horizontal polarization antenna mode and the vertical polarization antenna mode by switching on the horizontal polarization antenna or the vertical polarization antenna.

(73) Assignee: **Siemens AG**, Munchen (DE)

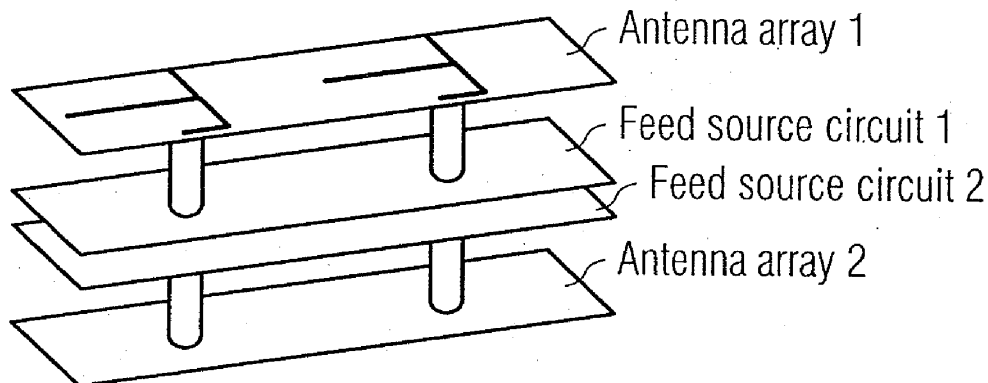
(21) Appl. No.: **12/937,083**

(22) PCT Filed: **Apr. 10, 2008**

(86) PCT No.: **PCT/CN2008/000738**

§ 371 (c)(1),

(2), (4) Date: **Dec. 30, 2010**



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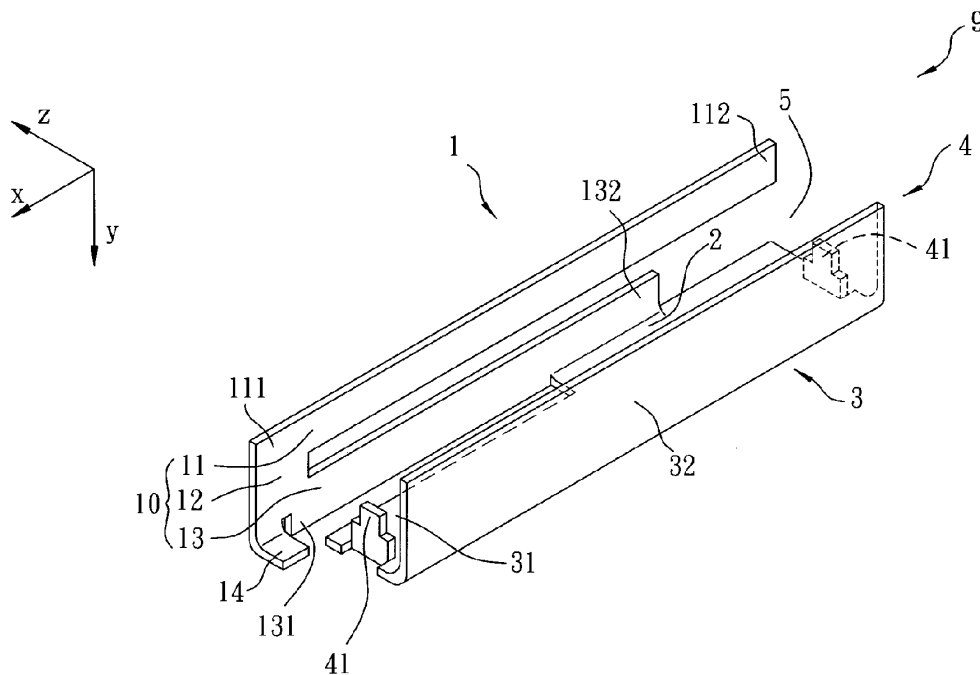
US 20110109509A1

(19) **United States**(12) **Patent Application Publication**
Chou et al.(10) **Pub. No.: US 2011/0109509 A1**(43) **Pub. Date: May 12, 2011**(54) **ANTENNA MODULE AND CIRCUIT BOARD
HAVING THE SAME**(52) **U.S. CL. 343/700 MS**(75) **Inventors: Chen Yu Chou, Taipei Hsien (TW);
Shih Chang Hsu, Taipei Hsien (TW)**(57) **ABSTRACT**(73) **Assignee: WISTRON CORPORATION**(21) **Appl. No.: 12/707,465**(22) **Filed: Feb. 17, 2010**(30) **Foreign Application Priority Data**

Nov. 11, 2009 (TW) 098220901

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

An antenna module is adapted for receiving a radio frequency current signal, and includes a radiator unit, a connecting unit, and a ground unit. The radiator unit includes a radiator body, and a feed-in part for receiving the radio frequency current signal. The connecting unit extends from and extends substantially perpendicular to the radiator body, and has one end that is opposite to the radiator body. The ground unit includes first and second ground parts. The first ground part extends from the one end of the connecting unit, extends parallel to the connecting unit, and has one end that is opposite to the connecting unit. The second ground part extends from the one end of the first ground part, and extends substantially perpendicular to the first ground part in a manner that the radiator body, the connecting unit, and the ground unit cooperate to form a receiving space.



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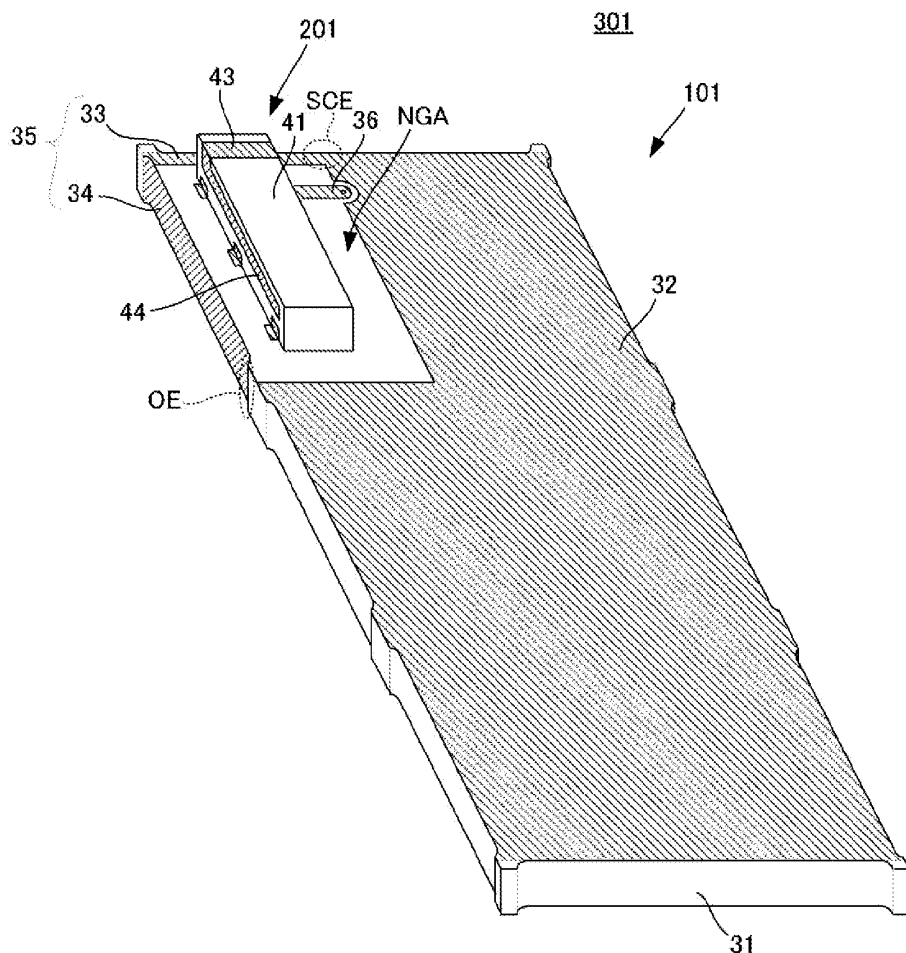
US 20110109510A1

(19) **United States**(12) **Patent Application Publication**
ONAKA et al.(10) **Pub. No.: US 2011/0109510 A1**(43) **Pub. Date: May 12, 2011**(54) **ANTENNA****Publication Classification**(75) Inventors: **Kengo ONAKA**, Kanagawa-ken
(JP); **Takashi ISIIHARA**,
Tokyo-to (JP)(51) **Int. Cl.**
H01Q 1/38 (2006.01)(52) **U.S. Cl.** **343/700 MS**(73) Assignee: **MURATA MANUFACTURING**
CO., LTD., Kyoto-fu (JP)(57) **ABSTRACT**(21) Appl. No.: **12/911,542**

An antenna includes a board having a substrate and a ground electrode, electrodes provided on external surfaces of the substrate, a feeding element provided near an end surface of the board. The feeding element includes an electrically insulating base member and a feeding radiation electrode provided on the base member. A non-feeding element including a substantially line-shaped electrode is provided on the board and includes at least one end thereof connected to the ground electrode and electromagnetically coupled with the feeding element. At least part of the substantially line-shaped electrodes is provided on the end surface of the board.

(22) Filed: **Oct. 25, 2010**(30) **Foreign Application Priority Data**

Nov. 6, 2009 (JP) 2009-254970



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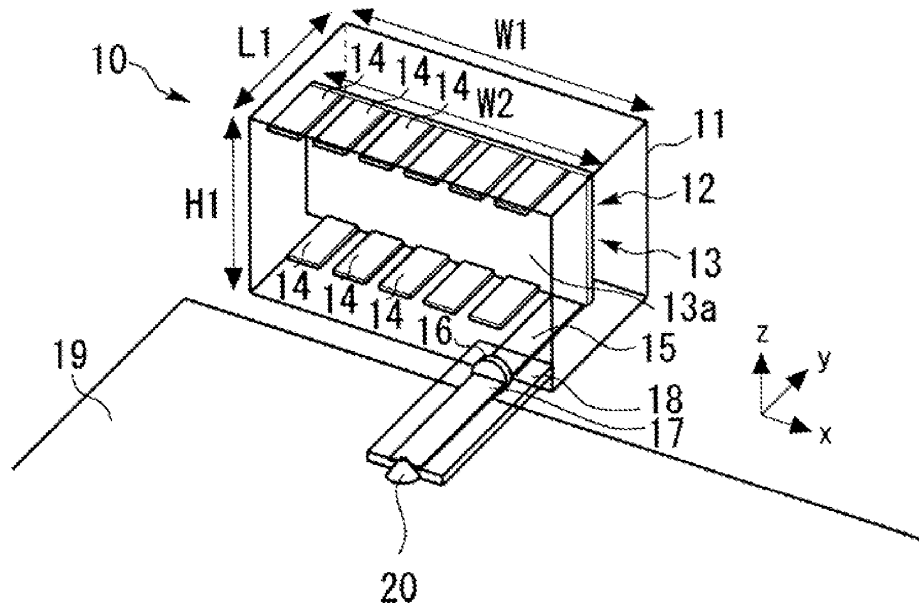


US 20110109511A1

(19) **United States**(12) **Patent Application Publication**
ANDRENKO et al.(10) **Pub. No.: US 2011/0109511 A1**(43) **Pub. Date: May 12, 2011**(54) **ANTENNA DEVICE****Publication Classification**(75) Inventors: **Andrey S. ANDRENKO**,
Kawasaki (JP); **Takashi**
YAMAGA-JO, Kawasaki (JP)(51) **Int. Cl.**
H01Q 1/38 (2006.01)(52) **U.S. Cl.** **343/700 MS**(73) Assignee: **FUJITSU LIMITED**,
Kawasaki-shi (JP)(57) **ABSTRACT**(21) Appl. No.: **12/940,181**(22) Filed: **Nov. 5, 2010**(30) **Foreign Application Priority Data**

Nov. 9, 2009 (JP) 2009-256373

Provided is an antenna device, including: a substrate formed using a material having a high dielectric constant; and an antenna conductor accommodated inside the substrate, in which the antenna conductor includes: a first metal strip in a plate shape, in which a flat surface shape thereof has two opposing sides; and a plurality of second metal strips extending, from the two opposing sides of the first metal strip, toward one flat surface side of the first metal strip so as to be orthogonal to a flat surface of the first metal strip.



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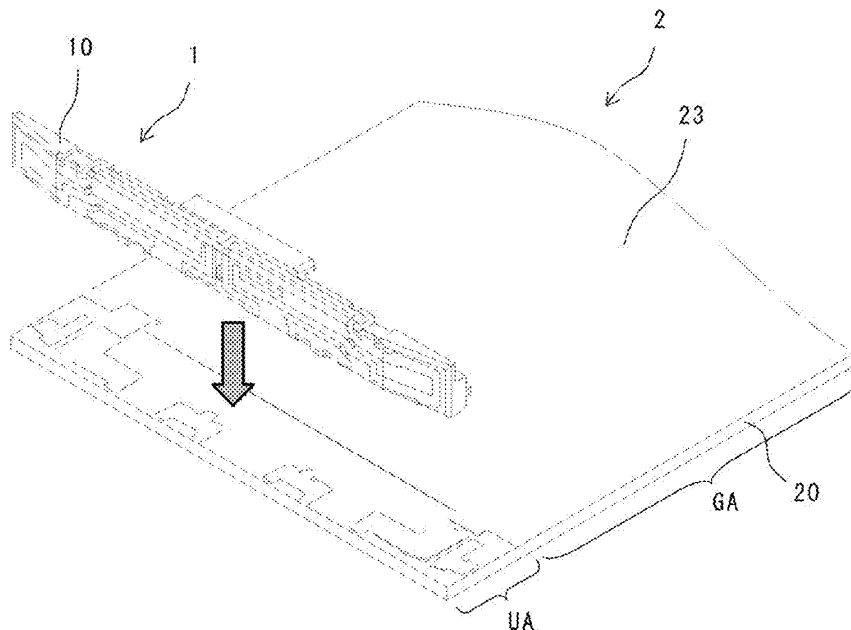


US 20110109512A1

(19) **United States**(12) **Patent Application Publication**
ONAKA et al.(10) **Pub. No.: US 2011/0109512 A1**(43) **Pub. Date: May 12, 2011**(54) **ANTENNA AND WIRELESS
COMMUNICATION DEVICE****Publication Classification**(75) Inventors: **Kengo ONAKA**, Yokohama-shi
(JP); **Kunihiro KOMAKI**,
Hakusan-shi (JP); **Takashi**
ISHIHARA, Machida-shi (JP);
Takuya MURAYAMA,
Ishikawa-ken (JP); **Tsuyoshi**
MUKAI, Hakusan-shi (JP)(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/38 (2006.01)(52) **U.S. Cl.** **343/700 MS**(57) **ABSTRACT**(73) Assignee: **MURATA MANUFACTURING
CO., LTD.**, Kyoto-fu (JP)(21) Appl. No.: **12/957,032**(22) Filed: **Nov. 30, 2010****Related U.S. Application Data**(63) Continuation of application No. PCT/JP2009/055101,
filed on Mar. 17, 2009.(30) **Foreign Application Priority Data**

Jun. 6, 2008 (JP) 2008-149652

An antenna includes an antenna element in which a predetermined electrode is provided on a dielectric base member and a substrate in which a predetermined electrode is provided on a base. A feed-terminal connecting electrode to which a feed terminal provided on the lower surface of the antenna element, an external-terminal connecting electrode to which an external electrode is connected, and a ground-terminal connecting electrode to which a ground terminal provided on the lower surface of the antenna element are provided on the upper surface of an ungrounded area of the substrate. A chip inductor is connected between the external-terminal connecting electrode and the feed-terminal connecting electrode, and a chip inductor is connected between the external-terminal connecting electrode and the ground-terminal connecting electrode. The shortcut of a current route achieved by each of the chip inductors enables the electrical length of the radiation electrode to be reduced and the resonant frequency in a fundamental mode to be specified independently of the resonant frequency in a harmonic mode.



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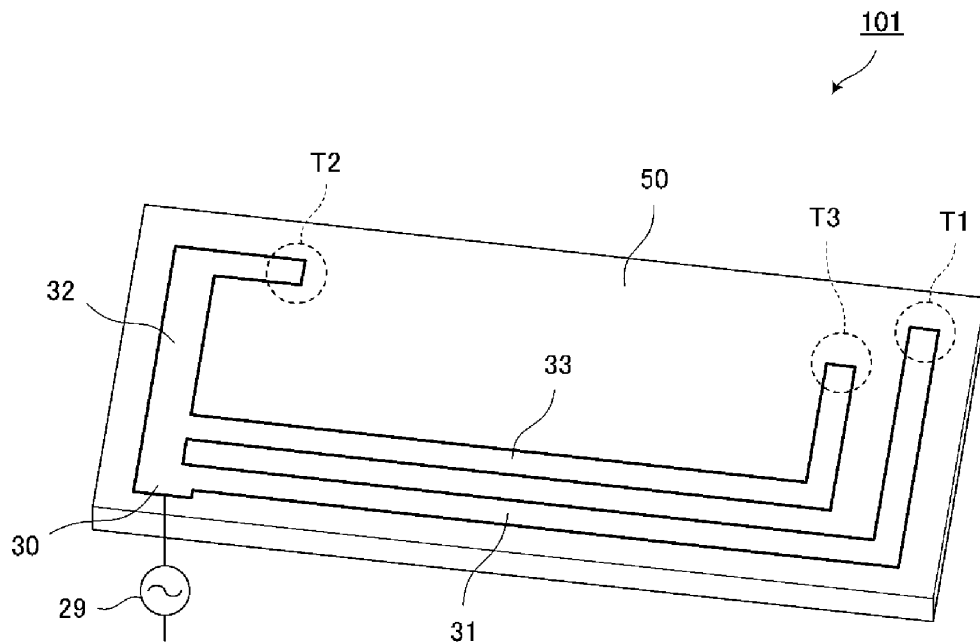


US 20110109513A1

(19) **United States**(12) **Patent Application Publication**
YAMAKI(10) **Pub. No.: US 2011/0109513 A1**(43) **Pub. Date: May 12, 2011**(54) **MULTI-RESONANT ANTENNA****Publication Classification**(75) Inventor: **Kazuhisa YAMAKI**, Ishikawa-ken
(JP)(51) **Int. Cl.**
H01Q 1/38 (2006.01)(52) **U.S. Cl.** **343/700 MS**(73) Assignee: **MURATA MANUFACTURING**
CO., LTD., Kyoto-fu (JP)(57) **ABSTRACT**(21) Appl. No.: **13/007,360**(22) Filed: **Jan. 14, 2011****Related U.S. Application Data**(63) Continuation of application No. PCT/JP2009/057449,
filed on Apr. 13, 2009.(30) **Foreign Application Priority Data**

Jul. 17, 2008 (JP) 2008-185508

A multi-resonant antenna having three independent resonance characteristics for three frequency bands includes a first electrode having an open end formed on the top surface of a dielectric substrate of a rectangular plate shape so as to extend from a feeding portion in a first direction (e.g., counterclockwise) along the periphery of the rectangular area; a second electrode having an open end and extending from the feeding portion in a second direction (e.g., clockwise) along the periphery of the rectangular area; and a third electrode positioned such that an open end of the third electrode is closer to the open end of the first electrode than to the open end of the second electrode, and such that the open end of the third electrode is closer to the open end of the first electrode than to a midsection (i.e., half the length) of the first electrode in the longitudinal direction thereof.



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US 20110109514A1

(19) **United States**

(12) **Patent Application Publication**
Galeev

(10) **Pub. No.: US 2011/0109514 A1**

(43) **Pub. Date: May 12, 2011**

(54) **WIRELESS COMMUNICATION TERMINAL
WITH A MULTI-BAND ANTENNA THAT
EXTENDS BETWEEN SIDE SURFACES
THEREOF**

(75) Inventor: **Roustem Galeev, Lund (SE)**

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

(21) Appl. No.: **12/613,843**

(22) Filed: **Nov. 6, 2009**

Publication Classification

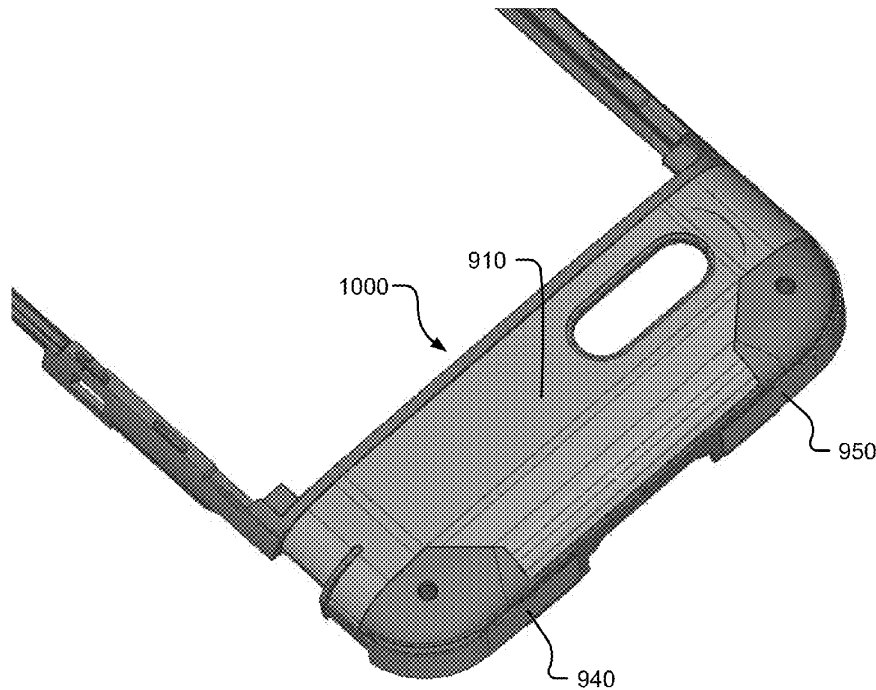
(51) **Int. Cl.**
H01Q 1/24 (2006.01)

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

(57) **ABSTRACT**

A wireless communications terminal can include a housing having an interior surface that is configured to enclose at least

a controller circuit, a transceiver circuit, and a RF feed circuit and to at least partially enclose a display device and a user input interface. The housing extends between opposing top and bottom surfaces, between opposing first and second side surfaces, and between opposing front and back surfaces. A first radiator line is connected on distal ends to a feed node and to a ground node and extends in a loop across at least a majority of a width of the housing between the first and second side surfaces. The first radiator line resonates in a first frequency range responsive to first electromagnetic radiation coupled to the feed and ground nodes. A second radiator line is connected to the feed node and extends away from an adjacent portion of the first radiator line, and resonates in a second frequency range responsive to second electromagnetic radiation coupled to the feed and ground nodes. A third radiator line is connected to the first radiator line at a branch node that is spaced apart from the feed node and the ground node, and extends away from an adjacent portion of the first radiator line and resonates in a third frequency range responsive to third electromagnetic radiation coupled to the feed and ground nodes.



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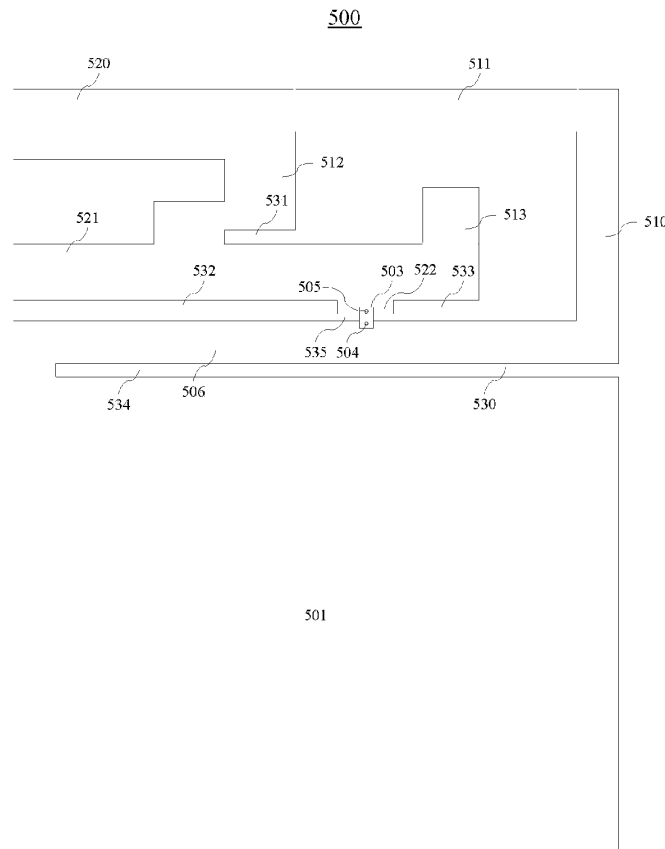


US 20110109515A1

(19) **United States**(12) **Patent Application Publication**
Rao(10) **Pub. No.: US 2011/0109515 A1**(43) **Pub. Date: May 12, 2011**(54) **COMPACT MULTIPLE-BAND ANTENNA FOR WIRELESS DEVICES**(76) Inventor: **Qinjiang Rao, Waterloo (CA)**(21) Appl. No.: **12/615,267**(22) Filed: **Nov. 10, 2009****Publication Classification**(51) **Int. Cl.****H01Q 1/38** (2006.01)**H01Q 1/24** (2006.01)**H01Q 1/00** (2006.01)(52) **U.S. Cl. 343/702; 343/700 MS; 343/722**(57) **ABSTRACT**

A compact multiple-band antenna for wireless devices having a plurality of operating frequency bands is provided. In one embodiment, a multiple-band antenna for a wireless device, comprises a ground area; a first radiating member having a first end, an intermediate portion and a second end and coop-

eratively receiving and substantially radiating RF signals at a first, second and third resonant frequency, wherein said first end of said first radiating member is electrically connected to said ground area and said intermediate portion is electrically connected to a first feed point; a second radiating member having a first end and a second end and cooperatively receiving and substantially radiating RF signals at a first, second and third resonant frequency, wherein said first end of said second radiating member is electrically connected to said second end of said first radiating member; a third radiating member having a first end and a second end and cooperatively receiving and substantially radiating RF signals at a first, second and third resonant frequency, wherein said first end of said third radiating member is electrically connected to said second end of said second radiating member; and a fourth radiating member having a first end, an intermediate portion and a second end and providing a fourth resonant frequency, wherein said first end of said fourth radiating member is electrically connected to said second end of said third radiating member, said intermediate portion of said fourth radiating member is electrically connected to a second feed point and said second end of said fourth radiating member is unconnected.



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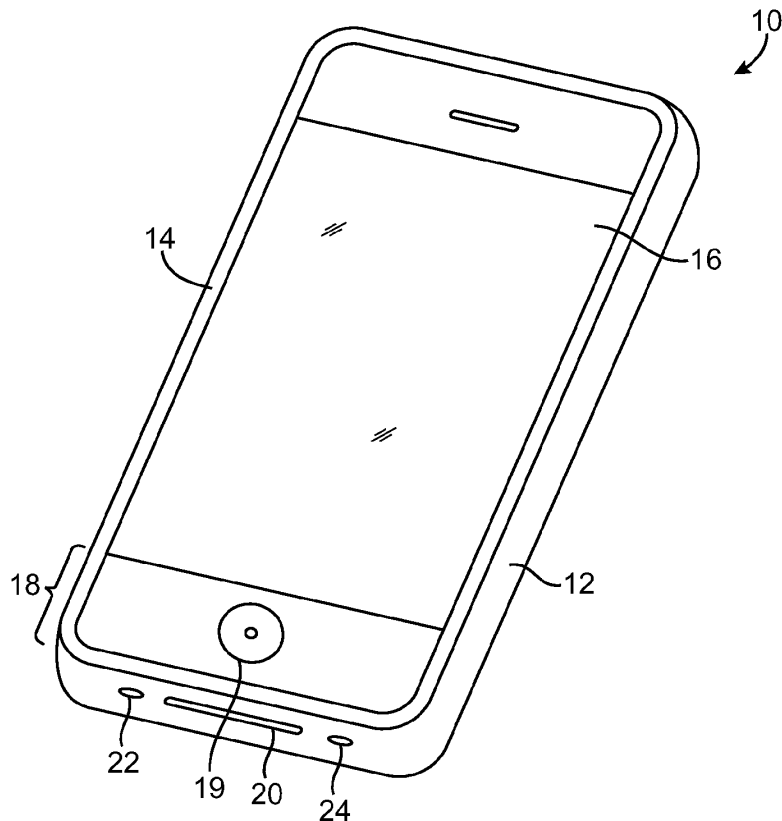
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US 20110109516A1

(19) **United States**(12) **Patent Application Publication**
Hobson et al.(10) **Pub. No.: US 2011/0109516 A1**(43) **Pub. Date: May 12, 2011**(54) **WIRELESS HANDHELD ELECTRONIC
DEVICE****Publication Classification**(51) **Int. Cl.**
H01Q 1/24 (2006.01)(52) **U.S. Cl. 343/702**(76) Inventors: **Phillip M. Hobson**, Menlo Park,
CA (US); **Stephen P. Zadesky**,
Portola Valley, CA (US); **Erik L.**
Wang, Redwood City, CA (US);
Tang Yew Tan, San Francisco, CA
(US); **Richard Hung Minh Dinh**,
San Jose, CA (US); **Adam D.**
Mittleman, San Francisco, CA
(US); **Kenneth A. Jenks**,
Cupertino, CA (US); **Robert J.**
Hill, Salinas, CA (US); **Robert W.**
Schlub, Campbell, CA (US)(21) Appl. No.: **13/008,586**(22) Filed: **Jan. 18, 2011****Related U.S. Application Data**(63) Continuation of application No. 12/142,552, filed on
Jun. 19, 2008, now Pat. No. 7,876,274.(60) Provisional application No. 60/936,796, filed on Jun.
21, 2007.(57) **ABSTRACT**

A handheld electronic device may be provided that contains a conductive housing and other conductive elements. The conductive elements may form an antenna ground plane. One or more antennas for the handheld electronic device may be formed from the ground plane and one or more associated antenna resonating elements. Transceiver circuitry may be connected to the resonating elements by transmission lines such as coaxial cables. Ferrules may be crimped to the coaxial cables. A bracket with extending members may be crimped over the ferrules to ground the coaxial cables to the housing and other conductive elements in the ground plane. The ground plane may contain an antenna slot. A dock connector and flex circuit may overlap the slot in a way that does not affect the resonant frequency of the slot. Electrical components may be isolated from the antenna using isolation elements such as inductors and resistors.



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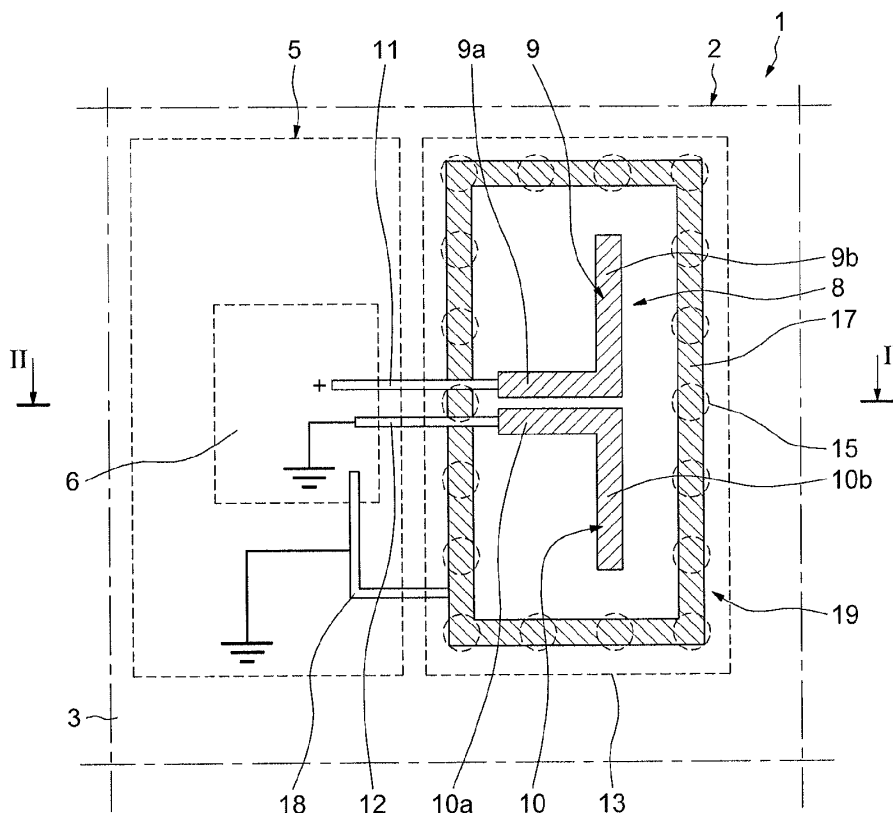
US 20110109521A1

(19) **United States**(12) **Patent Application Publication**
Pilard et al.(10) **Pub. No.: US 2011/0109521 A1**(43) **Pub. Date: May 12, 2011**(54) **ELECTRONIC DEVICE COMPRISING A
SEMICONDUCTOR COMPONENT
INTEGRATING AN ANTENNA**(30) **Foreign Application Priority Data**

Nov. 10, 2009 (FR) 0957941

Publication Classification(75) Inventors: **Romain Pilard**, Goncelin (FR);
Daniel Gloria, Detrier (FR);
Frederic Giancesello, Crolles (FR);
Cedric Durand, Saint Martin
D'heres (FR)(51) **Int. Cl.**
H01Q 1/48 (2006.01)(52) **U.S. Cl.** **343/848**(57) **ABSTRACT**

An electronic device includes a semiconductor component having a support substrate in the form of a wafer. On one side of this substrate integrated circuits including an RF circuit and an antenna connected to this RF circuit are formed. A metal layer is situated on the other side of the substrate, facing the antenna. At least one metal via is provided in a through-hole in the substrate, this via being connected at one end to the metal layer and at the other end to the RF circuit, at the same reference potential node as the antenna.

(73) Assignee: **STMicroelectronics S.A.**,
Montrouge (FR)(21) Appl. No.: **12/941,292**(22) Filed: **Nov. 8, 2010**

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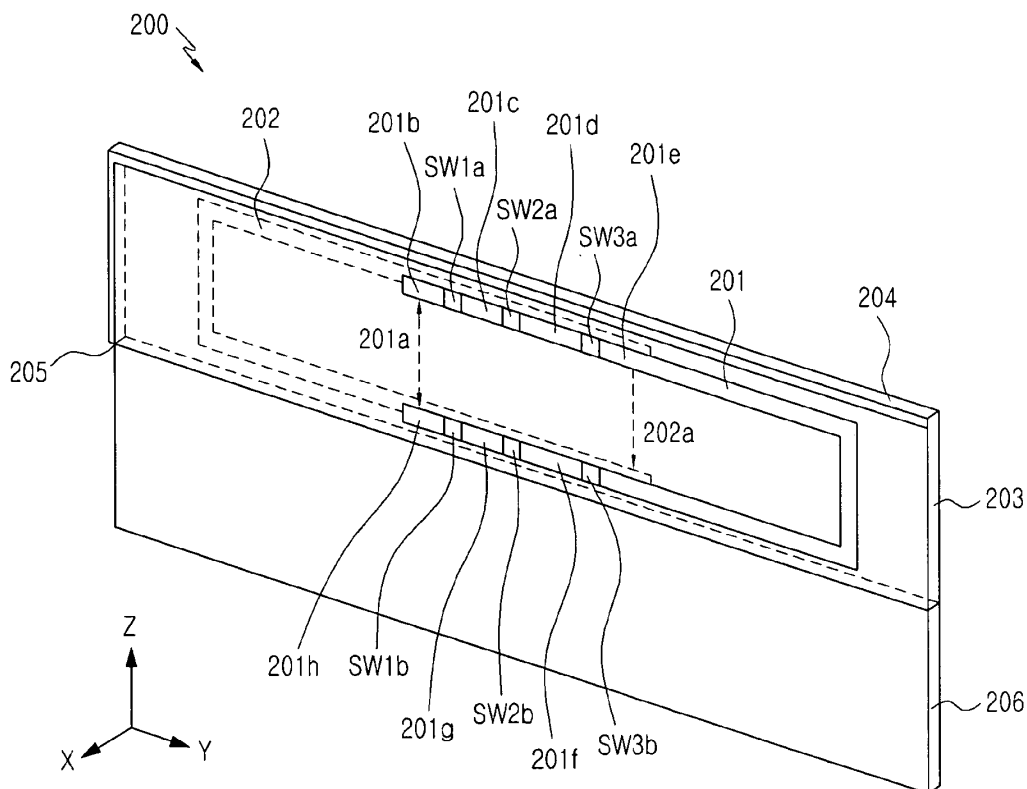
US 20110109525A1

(19) **United States**(12) **Patent Application Publication**
Takemura et al.(10) **Pub. No.: US 2011/0109525 A1**(43) **Pub. Date: May 12, 2011**(54) **ANTENNA DEVICE AND WIRELESS
COMMUNICATION APPARATUS HAVING
THE SAME****Publication Classification**(51) **Int. Cl.**
H01Q 3/24 (2006.01)(52) **U.S. Cl.** **343/904**(57) **ABSTRACT**

An antenna device includes a dielectric that has a first and a second substantially planar surfaces facing in substantially opposite directions. An inverted-L antenna is disposed at a side of the dielectric. A first conductive member forms a first loop that has a first gap. A planar side of the first loop is disposed facing the first substantially planar surface of the dielectric. A second conductive member forms a second loop that has a second gap. A planar side of the second loop is disposed facing the second substantially planar surface of the dielectric. Each of the first and second conductive members includes a plurality of member components and a plurality of switches, and each of the plurality of switches are provided between two adjacent member components to allow the plurality of member components to be electrically conducted or cut off.

(75) Inventors: **Nobuyasu Takemura,**
Yokohama-shi (JP); **Minoru**
Hasegawa, Yokohama-shi (JP)(73) Assignee: **SAMSUNG ELECTRONICS**
CO., LTD., Suwon-si (KR)(21) Appl. No.: **12/927,350**(22) Filed: **Nov. 12, 2010**(30) **Foreign Application Priority Data**

Nov. 12, 2009 (JP) 2009-258646
Nov. 12, 2009 (JP) 2009-258647
Sep. 17, 2010 (KR) 10-2010-0091687



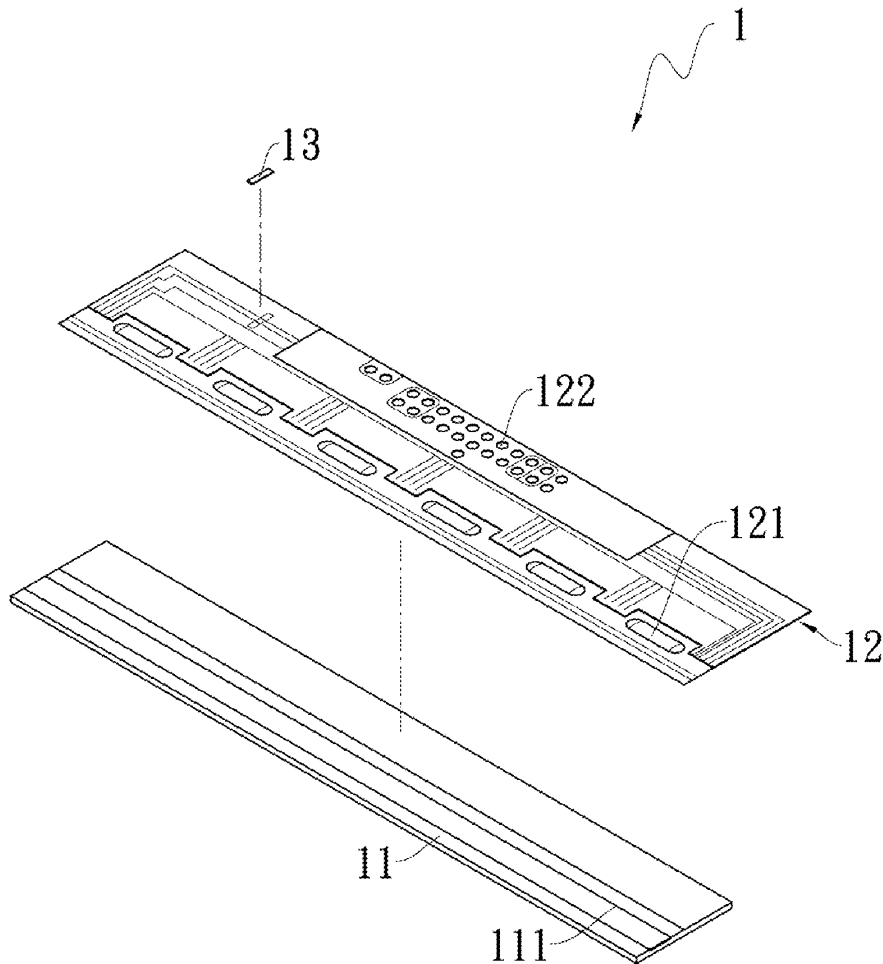
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US 20110109671A1

(19) **United States**(12) **Patent Application Publication**
Tai et al.(10) **Pub. No.: US 2011/0109671 A1**(43) **Pub. Date: May 12, 2011**(54) **INTEGRATED STRUCTURE OF AN INKJET
HEAD AND AN ANTENNA**(52) **U.S. CL.** 347/2; 340/572.1(75) **Inventors:** **Feng-Yi Tai**, Chung-Ho City (TW);
Ta-Cheng Hsiung, Hsinchu City
(TW)(57) **ABSTRACT**(73) **Assignee:** **Godex International Co., Ltd.**,
Chung-Ho City (TW)

An integrated structure of an inkjet head and an antenna includes a metal heat dissipation board, a flexible (or rigid) circuit board and an antenna module. The metal heat dissipation has an elongated printing ribbon. The flexible (or rigid) circuit board is mounted on the metal heat dissipation board, and has one end electrically connected with the printing ribbon and the other end having a plurality of parallel circuits mounted thereon and connected to external control circuits. The antenna module is directly mounted on and electrically connected with the flexible (or rigid) circuit board. Given the integrated structure, the antenna module is effectively mounted on the inkjet head to reduce the size of the structure and lower the cost thereof.

(21) **Appl. No.:** **12/617,699**(22) **Filed:** **Nov. 12, 2009****Publication Classification**(51) **Int. Cl.**
B41J 3/00 (2006.01)
G08B 13/14 (2006.01)

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US 20110115678A1

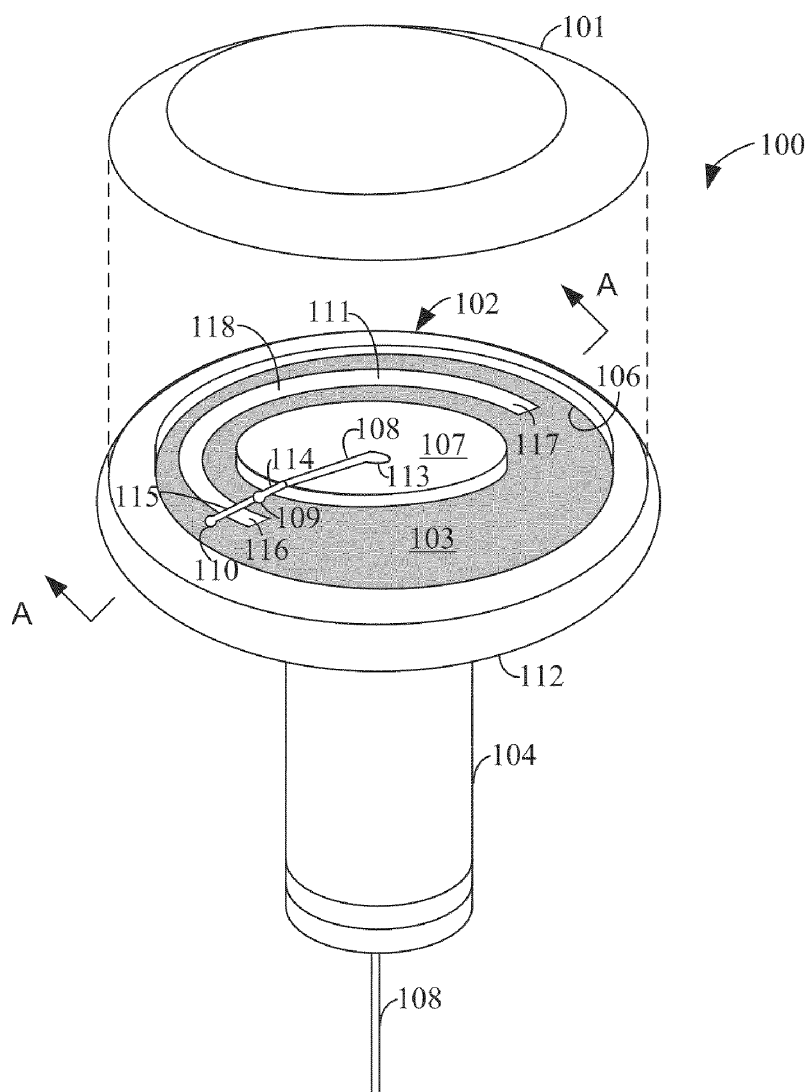
(19) **United States**(12) **Patent Application Publication**
Owens(10) **Pub. No.: US 2011/0115678 A1**(43) **Pub. Date: May 19, 2011**(54) **SLOT HALO ANTENNA DEVICE**(52) **U.S. CL.** 343/702; 343/767; 343/769(76) **Inventor:** **Roger Owens**, Huntsville, AL (US)(57) **ABSTRACT**(21) **Appl. No.:** **12/619,506**(22) **Filed:** **Nov. 16, 2009****Publication Classification**(51) **Int. Cl.****H01Q 13/10**

(2006.01)

H01Q 1/12

(2006.01)

An antenna of the present disclosure has a housing having a shallow cavity in a top of the housing and a shallow cavity in a bottom of the housing. The antenna further has a substantially circular radiating element disposed in the shallow cavity on the top of the housing, the radiating element having an arc shape slot. In addition, the antenna has a substantially circular parasitic element disposed in the shallow cavity on the bottom of the housing.



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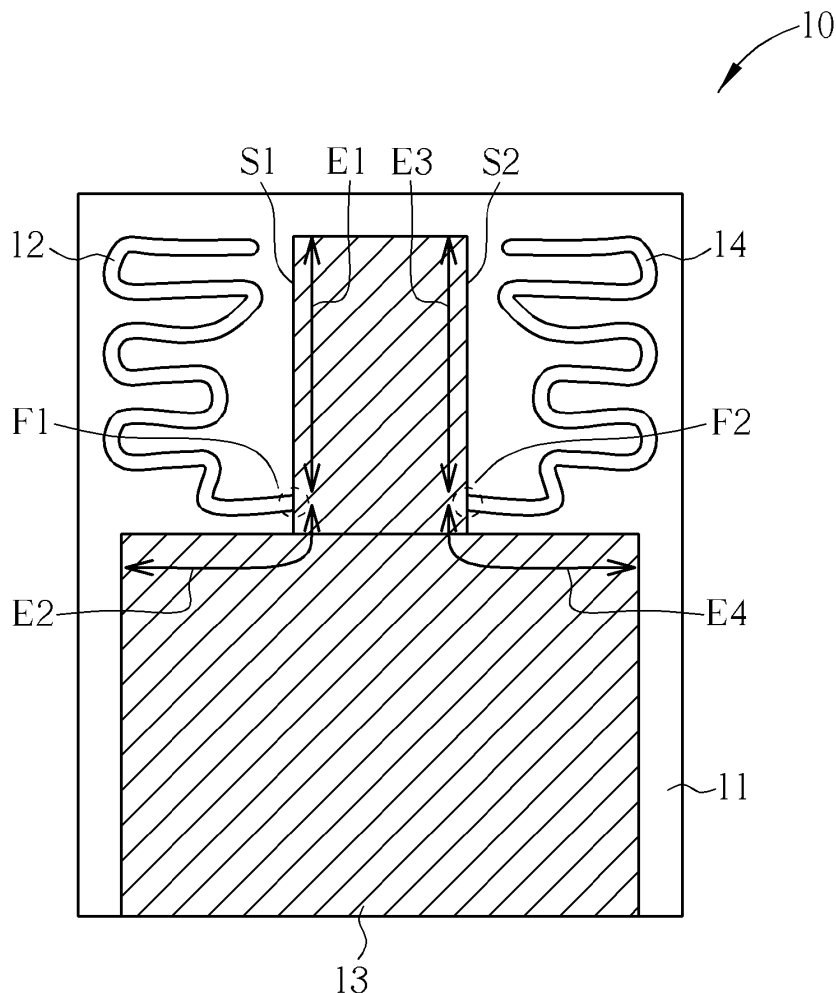
US 20110115687A1

(19) **United States**(12) **Patent Application Publication**
Huang(10) **Pub. No.: US 2011/0115687 A1**(43) **Pub. Date: May 19, 2011**(54) **PRINTED DUAL-BAND ANTENNA FOR
ELECTRONIC DEVICE**(52) **U.S. CL. 343/843**(76) **Inventor: Hsiao-Ting Huang, Taichung
County (TW)**(21) **Appl. No.: 12/895,803**(22) **Filed: Sep. 30, 2010**(30) **Foreign Application Priority Data**

Nov. 13, 2009 (TW) 098138660

Publication Classification(51) **Int. Cl.**
H01Q 5/01 (2006.01)
H01Q 1/36 (2006.01)(57) **ABSTRACT**

A printed dual-band antenna for an electronic device includes a substrate, a first monopole antenna and a grounding metal sheet. The first monopole antenna is formed on the substrate, and has an electrical length approximating to a quarter wavelength of a first frequency band and a three quarter wavelength of a second frequency band. The grounding metal sheet is formed on the substrate to be a ground of the first monopole antenna. A feeding terminal of the first monopole antenna, formed at a first side of the grounding metal sheet, divides the first side into a first edge and a second edge. Lengths of the first edge and the second edge approximate to a quarter wavelength of the second frequency band.



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US 20110117976A1

(19) **United States**(12) **Patent Application Publication**
Nishikido et al.(10) **Pub. No.: US 2011/0117976 A1**(43) **Pub. Date: May 19, 2011**(54) **ANTENNA ELEMENT AND PORTABLE
RADIO****Publication Classification**

(51) **Int. Cl.**
H04W 88/02 (2009.01)
H01Q 1/36 (2006.01)
H01Q 1/22 (2006.01)
(52) **U.S. Cl.** **455/575.3; 343/700 MS; 455/575.7**
(57) **ABSTRACT**

(75) **Inventors:** **Tomoaki Nishikido**, Sendai-shi
(JP); **Hironori Kikuchi**, Sendai-shi
(JP); **Yoshio Koyanagi**,
Yokohama-shi (JP); **Kenichi Sato**,
Sendai-shi (JP); **Hiroaki Ohmori**,
Sendai-shi (JP)

(73) **Assignee:** **PANASONIC CORPORATION**,
Kadoma-shi, Osaka (JP)

(21) **Appl. No.:** **12/672,401**

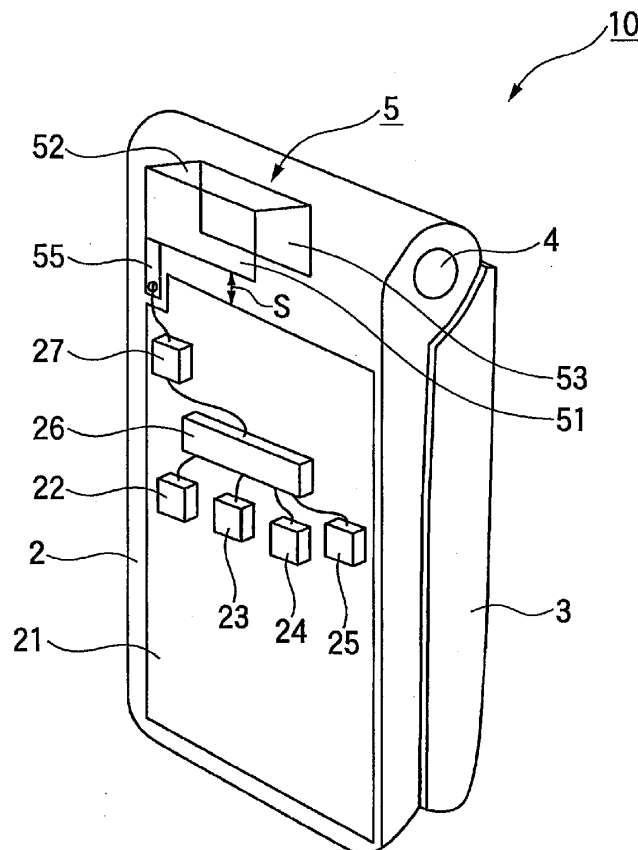
(22) **PCT Filed:** **Aug. 10, 2007**

(86) **PCT No.:** **PCT/JP2007/065744**

§ 371 (c)(1),
(2), (4) **Date:**

Feb. 5, 2010

There are provided an antenna element and a portable radio that enable miniaturization, acquisition of a high gain, and broadening of a band and that copies compatible with multiple bands. A rectangular-parallelepiped-shaped antenna element is formed by folding two or more faces of a board-shaped monopole element having an rectangular shape so that the antenna element has a substantially rectangular first conductor plate **51** disposed in proximity to a hinge **4** while arranged at a predetermined space **S** from a lower circuit board (ground plate) **21**, a substantially rectangular second conductor plate **52** that shares a widthwise one side of the first conductor plate **51** and that is arranged while bent to an angle of about 90° with respect to the first conductor plate, and a substantially rectangular third conductor plate **53** that shares another widthwise side of the second conductor plate **52** opposing the side shared by the first conductor plate **51** and the second conductor plate **52** and that is arranged at an angle of about 90° so as to oppose the first conductor plate **51**.



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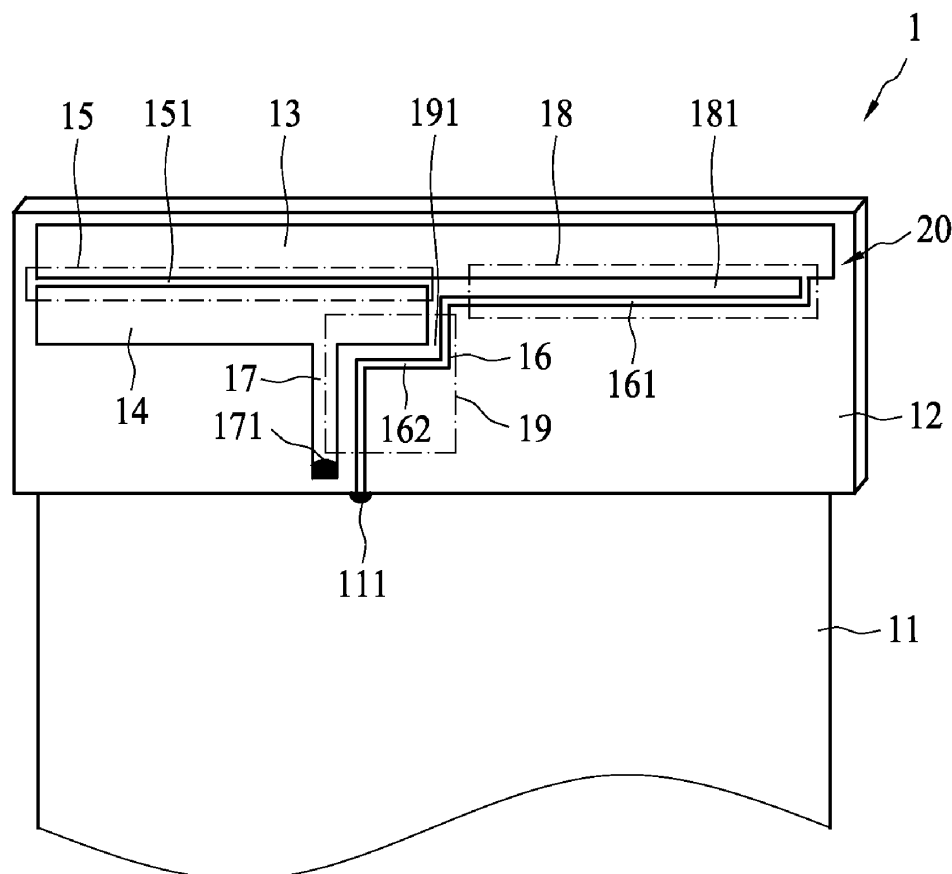
US 20110122027A1

(19) **United States**(12) **Patent Application Publication**
WONG et al.(10) **Pub. No.: US 2011/0122027 A1**(43) **Pub. Date: May 26, 2011**(54) **MOBILE COMMUNICATION DEVICE****Publication Classification**(75) Inventors: **Kin Lu WONG**, Kaohsiung City (TW); **Ming Fang Tu**, Hsinchu City (TW); **Chun Yih Wu**, Taipei City (TW); **Wei Yu Li**, Yilan City (TW)(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/38 (2006.01)(52) **U.S. Cl.** **343/700 MS**(57) **ABSTRACT**(73) Assignees: **INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE**, Hsinchu (TW); **NATIONAL SUN YAT-SEN UNIVERSITY**, Kaohsiung (TW)

A mobile communication device includes a ground plane and an antenna. The antenna is disposed on a dielectric substrate and includes a radiating metal portion, a coupling metal portion, and an inductive shorting metal portion. The radiating metal portion provides a resonant path for the antenna to generate first and second operating bands. The coupling metal portion is coupled to the radiating metal portion to form a first coupling portion and is connected to a source through a connecting metal strip. One end of the inductive shorting metal portion is electrically connected to the radiating metal portion, and the other end is electrically connected to the ground plane. The inductive shorting metal portion includes a first fractional section coupled to the radiating metal portion to form a second coupling portion, and a second fractional section coupled to the coupling metal portion to form a third coupling portion.

(21) Appl. No.: **12/872,450**(22) Filed: **Aug. 31, 2010****Related U.S. Application Data**

(60) Provisional application No. 61/263,938, filed on Nov. 24, 2009.



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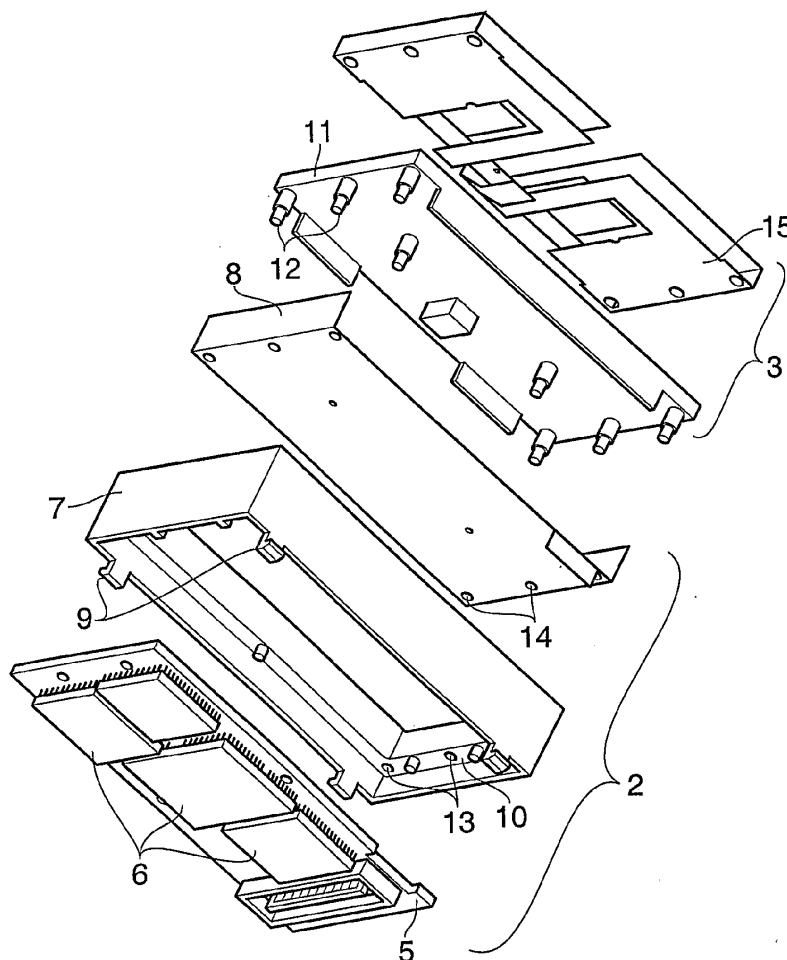
US 20110122028A1

(19) **United States**(12) **Patent Application Publication****Saario et al.**(10) **Pub. No.: US 2011/0122028 A1**(43) **Pub. Date: May 26, 2011**(54) **TWO-MODULE INTEGRATED ANTENNA
AND RADIO**(30) **Foreign Application Priority Data**

Jan. 20, 2005 (GB) 0501170.5

(75) Inventors: **Seppo Saario**, Brisbane (AU);
Jonathan Ide, Queensland (AU);
Simon Philip Kingsley, Cambridge
(GB)**Publication Classification**(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 23/00 (2006.01)(73) Assignee: **ANTENOVA LIMITED**,
Cambridge (GB)(52) **U.S. Cl.** **343/702**(21) Appl. No.: **11/795,600**(57) **ABSTRACT**(22) PCT Filed: **Jan. 20, 2006**(86) PCT No.: **PCT/GB2006/000213**§ 371 (c)(1),
(2), (4) Date: **Apr. 28, 2008**

A modular radio-antenna device comprising first and second separable modules, the first module containing all radio and radio-frequency front-end components of the device, and the second module containing only antenna components of the device, the first and second modules being provided with means for physical and electrical interconnection with each other.



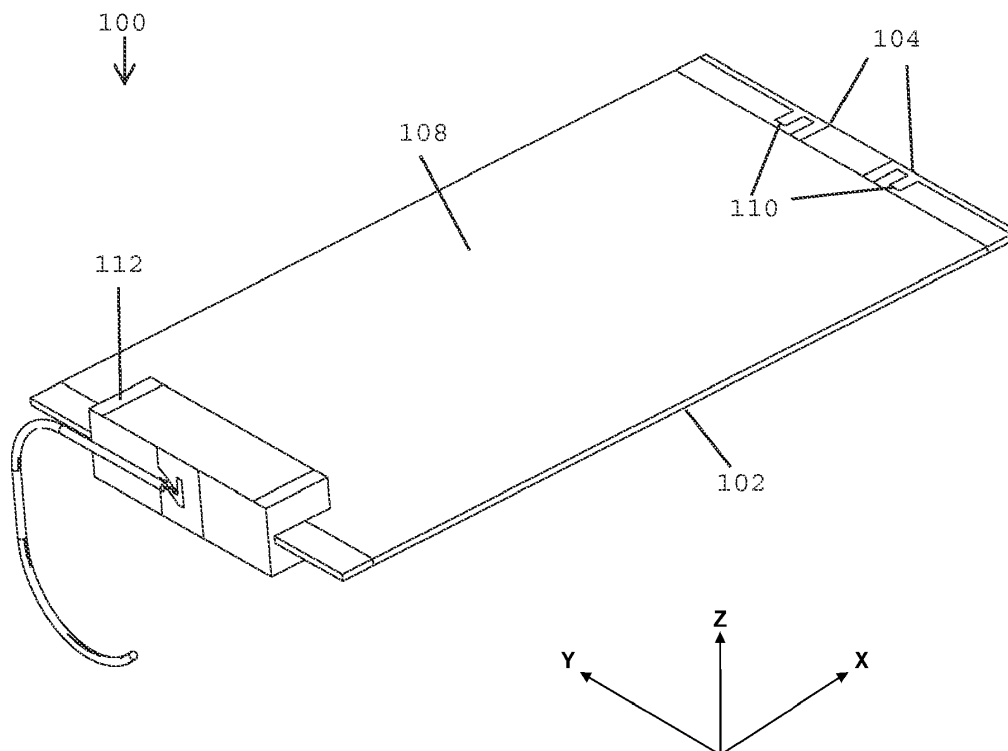
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US 20110122035A1

(19) **United States**(12) **Patent Application Publication**
Montgomery et al.(10) **Pub. No.: US 2011/0122035 A1**(43) **Pub. Date: May 26, 2011**(54) **ANTENNA SYSTEM PROVIDING HIGH
ISOLATION BETWEEN ANTENNAS ON
ELECTRONICS DEVICE**(75) Inventors: **Mark T. Montgomery**, Melbourne
Beach, FL (US); **Frank M. Caimi**,
Vero Beach, FL (US); **Paul A.**
Tornatta, JR., Melbourne, FL (US)(73) Assignee: **SkyCross, Inc.**, Viera, FL (US)(21) Appl. No.: **12/899,900**(22) Filed: **Oct. 7, 2010****Related U.S. Application Data**(60) Provisional application No. 61/250,344, filed on Oct.
9, 2009, provisional application No. 61/363,085, filed
on Jul. 9, 2010.**Publication Classification**(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01Q 21/00 (2006.01)
H01Q 21/30 (2006.01)(52) **U.S. Cl.** **343/727**(57) **ABSTRACT**

An antenna system is provided in a portable electronics device having a printed circuit board assembly. The antenna system includes a first antenna and a second balanced antenna provided on the printed circuit board assembly. The first antenna is fed from a portion of the printed circuit board assembly such that a ground plane of the printed circuit board assembly serves as a counterpoise for the first antenna. The second balanced antenna has dipole ends configured and oriented to generally minimize coupling to the ground plane of the printed circuit board assembly to increase isolation between the first antenna and the second balanced antenna.



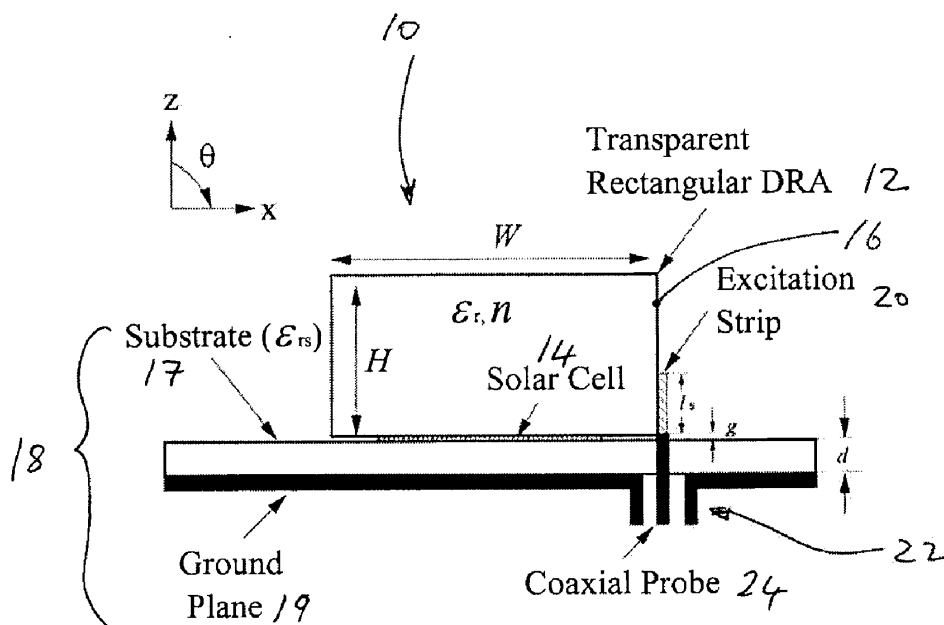
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US 20110122036A1

(19) **United States**(12) **Patent Application Publication****Leung et al.**(10) **Pub. No.: US 2011/0122036 A1**(43) **Pub. Date: May 26, 2011**(54) **LIGHT TRANSMISSIBLE RESONATORS FOR
CIRCUIT AND ANTENNA APPLICATIONS**(52) **U.S. CL. 343/785**(57) **ABSTRACT**(75) Inventors: **Kwok Wa Leung**, Hong Kong
(HK); **Eng Hock Lim**, Selangor
Darul Ehsan (MY)(73) Assignee: **CITY UNIVERSITY OF HONG
KONG**, Kowloon (HK)(21) Appl. No.: **12/624,562**(22) Filed: **Nov. 24, 2009****Publication Classification**(51) **Int. Cl.**
H01Q 13/00 (2006.01)

Provided is a circuit for an electronic device having a non-planar transparent resonator. The transparent resonator is mounted on said circuit so as to at least partially occupy a footprint of another component of the circuit. The transparent resonator forms part of a light pathway on said circuit for transmitting light to or from said another component. Also provided is a transparent dielectric resonator antenna (DRA) for optical applications. Since the DRA is transparent, it can let light pass through itself and, thus, the light can be utilized by an optical part of a system or device. The transparent DRA can be placed on top of a solar cell. Since the DRA does not block the light, the light can reach the solar cell panel and power can be generated for the system or device. The system or device so obtained is very compact because no extra footprint is needed within the system or device for the DRA. It finds application in compact wireless applications that need a self-sustaining power device.



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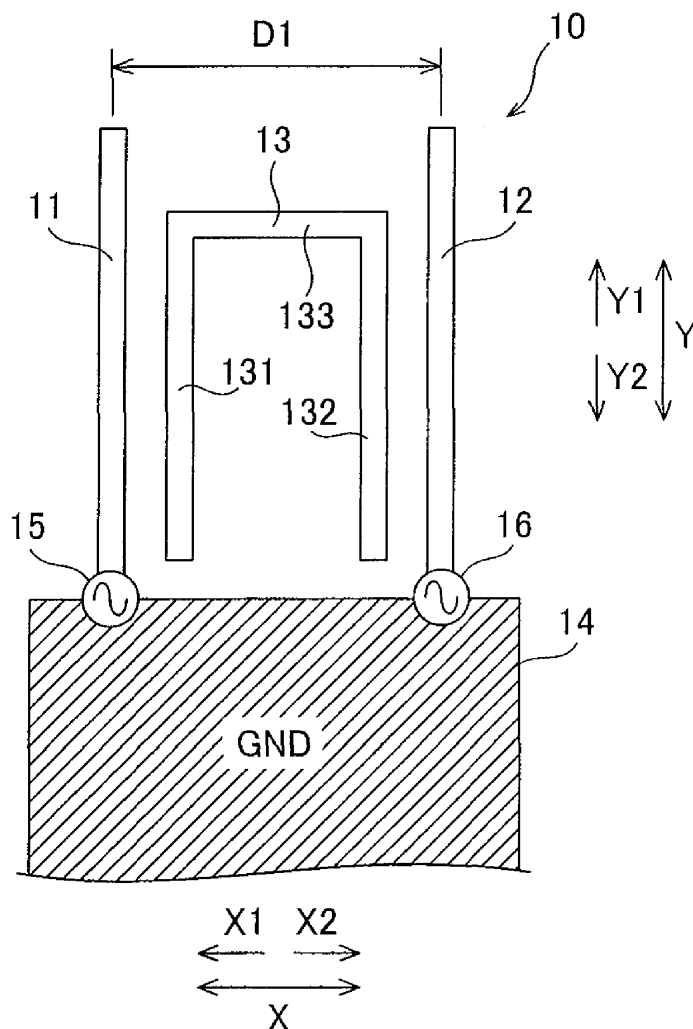


US 20110122040A1

(19) **United States**(12) **Patent Application Publication**
WAKABAYASHI(10) **Pub. No.: US 2011/0122040 A1**(43) **Pub. Date: May 26, 2011**(54) **MULTI-ANTENNA APPARATUS AND
MOBILE DEVICE****Publication Classification**(51) **Int. Cl.**
H01Q 19/32 (2006.01)(52) **U.S. Cl.** **343/833**(57) **ABSTRACT**(75) **Inventor:** **Naoyuki WAKABAYASHI,**
Daito-shi (JP)(73) **Assignee:** **Funai Electric Co., Ltd.,** Daito-shi
(JP)(21) **Appl. No.:** **12/949,994**(22) **Filed:** **Nov. 19, 2010**(30) **Foreign Application Priority Data**

Nov. 20, 2009 (JP) 2009-264448

This multi-antenna apparatus includes a first antenna element and a second antenna element, and an ungrounded passive antenna element arranged between the first antenna element and the second antenna element, wherein the passive antenna element has a first opposing portion opposed to the first antenna element, a second opposing portion opposed to the second antenna element, and a coupling portion coupling the first opposing portion and the second opposing portion with each other.



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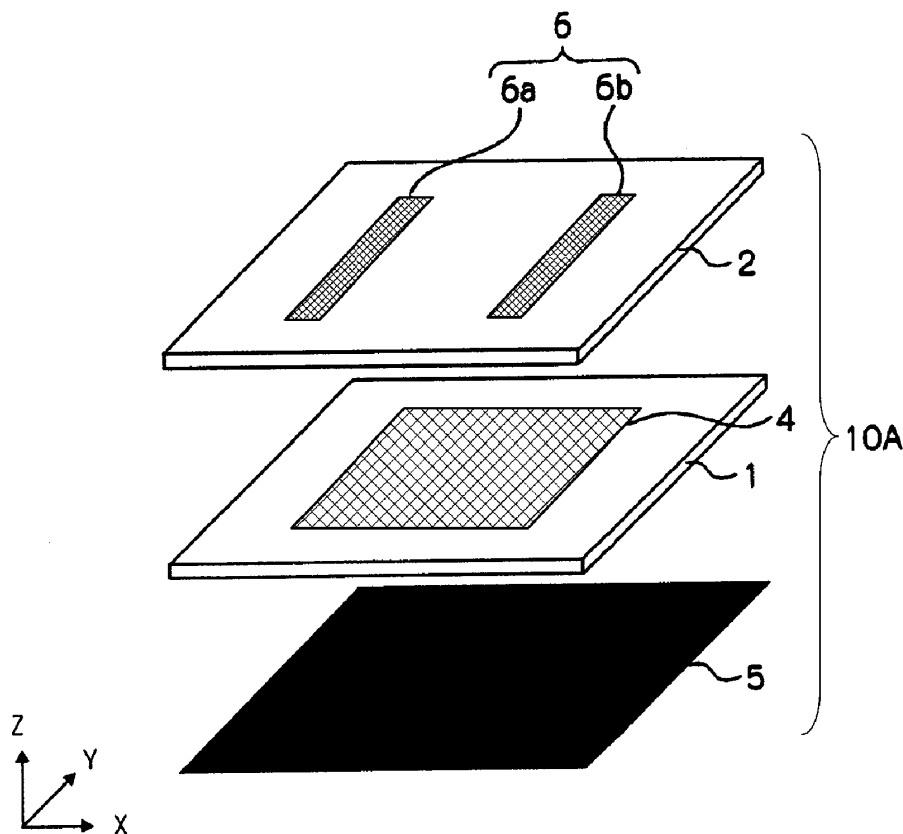


US 20110122041A1

(19) **United States**(12) **Patent Application Publication**
Morishita et al.(10) **Pub. No.: US 2011/0122041 A1**(43) **Pub. Date: May 26, 2011**(54) **PLANAR ANTENNA****Publication Classification**(75) Inventors: **Ken Morishita**, Tokyo (JP); **Naoki Kobayashi**, Tokyo (JP)(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 1/48 (2006.01)(73) Assignee: **NEC CORPORATION**, Tokyo (JP)(52) **U.S. Cl.** **343/846; 343/700 MS**(57) **ABSTRACT**(21) Appl. No.: **13/055,856**(22) PCT Filed: **Jul. 17, 2009**(86) PCT No.: **PCT/JP2009/062969**§ 371 (c)(1),
(2), (4) Date: **Jan. 25, 2011**(30) **Foreign Application Priority Data**

Jul. 30, 2008 (JP) 2008-195660

The present device is equipped with a first dielectric layer (1) and a second dielectric layer (2), and an antenna conductor (4), a ground conductor (5), and pad conductors (6), which are provided so as to sandwich the first dielectric layer (1) and the second dielectric layer (2) in the lamination direction respectively. The first dielectric layer (1) is arranged between the antenna conductor (4) and the ground conductor (5). The second dielectric layer (2) is arranged between either the antenna conductor (4) or the ground conductor (5), and pad conductors (6). A connection conductor (7) for electrically connecting either the antenna conductor (4) or the ground conductor (5), whichever remains, and the pad conductors (6) is provided.



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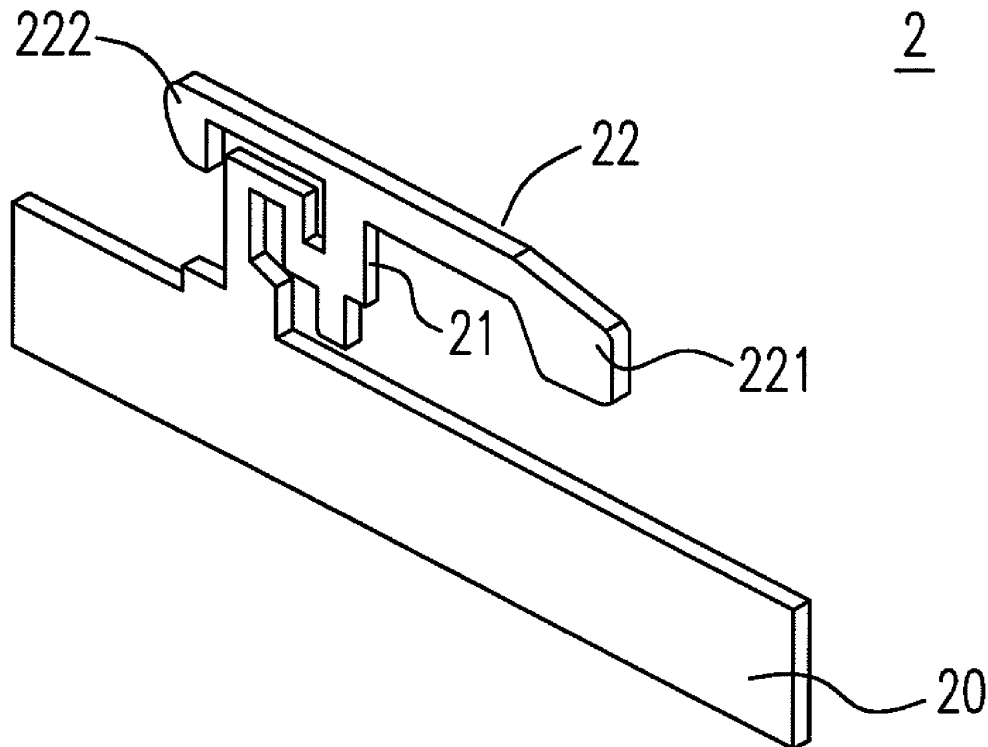


US 20110122042A1

(19) **United States**(12) **Patent Application Publication**
Huang et al.(10) **Pub. No.: US 2011/0122042 A1**(43) **Pub. Date: May 26, 2011**(54) **ANTENNA WITH MULTI-BANDS****Publication Classification**(75) Inventors: **Chih-Yung Huang**, Dongshih
Township (TW); **Kuo-Chang Lo**,
Hsinchu (TW)(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/50 (2006.01)(52) **U.S. Cl.** **343/860; 343/700 MS**(73) Assignee: **Arcadyan Technology
Corporation**(57) **ABSTRACT**(21) Appl. No.: **12/904,426**(22) Filed: **Oct. 14, 2010**(30) **Foreign Application Priority Data**

Nov. 20, 2009 (TW) 098139644

An antenna connected to an interface connection port is provided. The antenna comprises a ground surface having a plurality of bands thereon; a first radiation element disposed on the ground surface and including a first bending section and a second bending section, wherein the ground surface is extended from the first bending section; and a second radiation element having a shape of a strip, extended from the second bending section, including a first end and a second end, and having a first flange at the first end and a second flange at the second end.



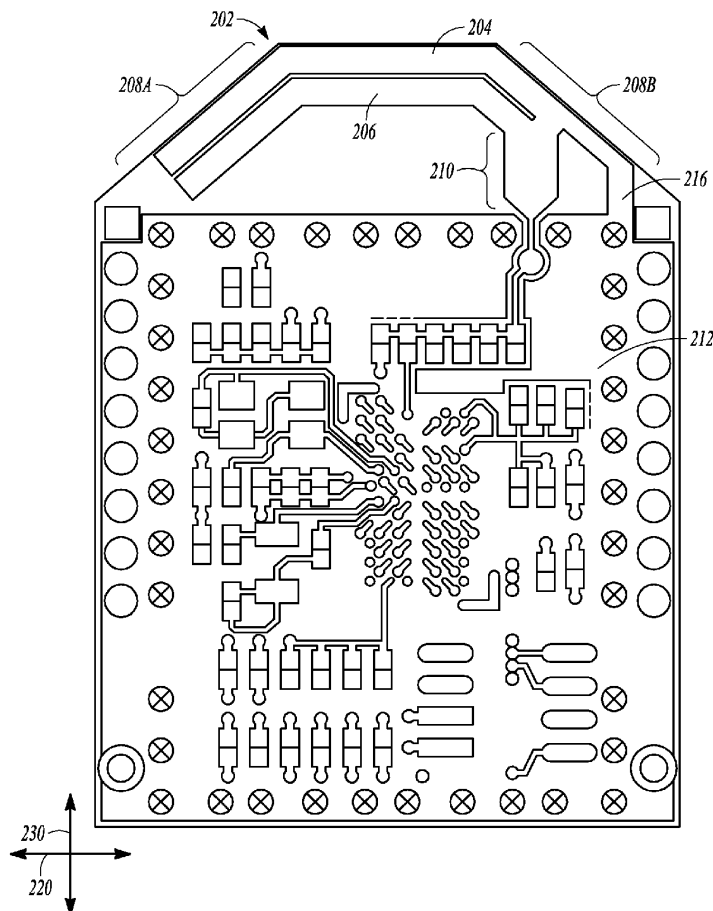
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(19) **United States**(12) **Patent Application Publication**
Ridgeway(10) **Pub. No.: US 2011/0122043 A1**(43) **Pub. Date: May 26, 2011**(54) **WIDEBAND ANTENNA FOR PRINTED
CIRCUIT BOARDS****Publication Classification**(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 1/50 (2006.01)
H01P 11/00 (2006.01)(52) **U.S. Cl.** **343/860; 343/700 MS; 29/601**(57) **ABSTRACT**

A planar antenna, such as included as a portion of a wireless communication assembly, can include a dielectric portion, a first conductive portion, extending along a surface of the dielectric portion, and a second conductive portion, parallel to the first conductive portion, extending along the surface of the dielectric portion, the second conductive portion laterally offset from the first portion to provide a specified lateral separation between the first and second conductive portions. The first and second conductive portions can be configured to provide respective resonant operating frequencies ranges offset from each other, and the first and second conductive portions can be configured to follow a commonly-shared path, including at least one bend, along the surface of the dielectric portion.

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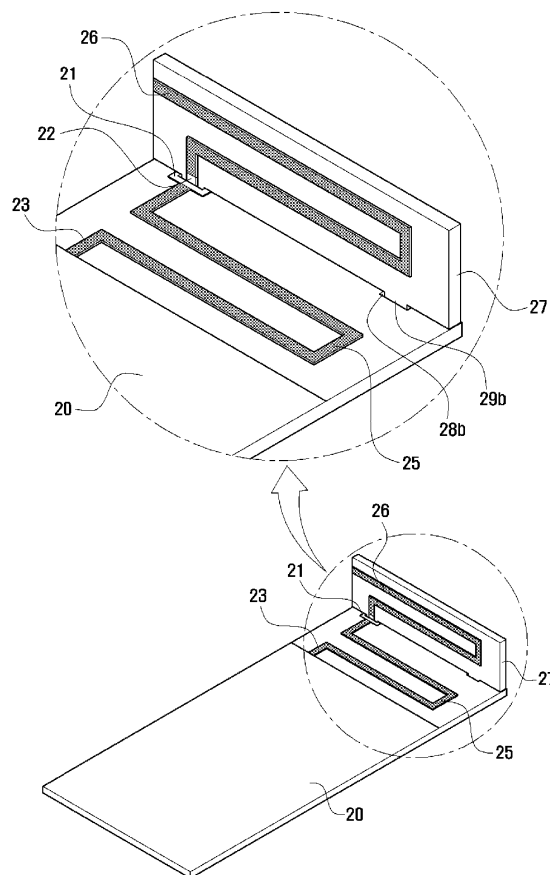
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(19) **United States**(12) **Patent Application Publication**
SEO et al.(10) **Pub. No.: US 2011/0122045 A1**(43) **Pub. Date: May 26, 2011**(54) **BUILT-IN PRINTED CIRCUIT BOARD
ANTENNA OF MOBILE TERMINAL**(52) **U.S. Cl. 343/906; 343/700 MS; 29/600**(75) Inventors: **Jae Min SEO**, Suwon-si (KR); **Jae
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Publication Classification(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01P 11/00 (2006.01)

A built-in Printed Circuit Board (PCB) antenna of a mobile terminal is erected to guarantee a sufficient distance from a human body. The built-in PCB antenna includes a main PCB having a power feeding line and a first antenna pattern having a power feeding antenna line having an end electrically connected to the power feeding line, through-holes formed at an end of the main PCB and having a conduction hole electrically connected to the first antenna pattern, an erected PCB fixed on the main PCB orthogonally and having a second antenna pattern formed thereon, and protrusions formed at a lateral side of the erected PCB and having a conduction protrusion, inserted into the conduction hole, electrically connected to an end of the second antenna pattern. The built-in PCB antenna may reduce deterioration of radiation performance caused by a body of a user.



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