US 20100109953A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2010/0109953 A1**

(43) **Pub. Date: May 6, 2010**

**Tang**

(54) **MULTI-BAND MONOPOLE ANTENNA WITH IMPROVED HAC PERFORMANCE**

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(21) Appl. No.: **12/289,557**

(22) Filed: **Oct. 30, 2008**

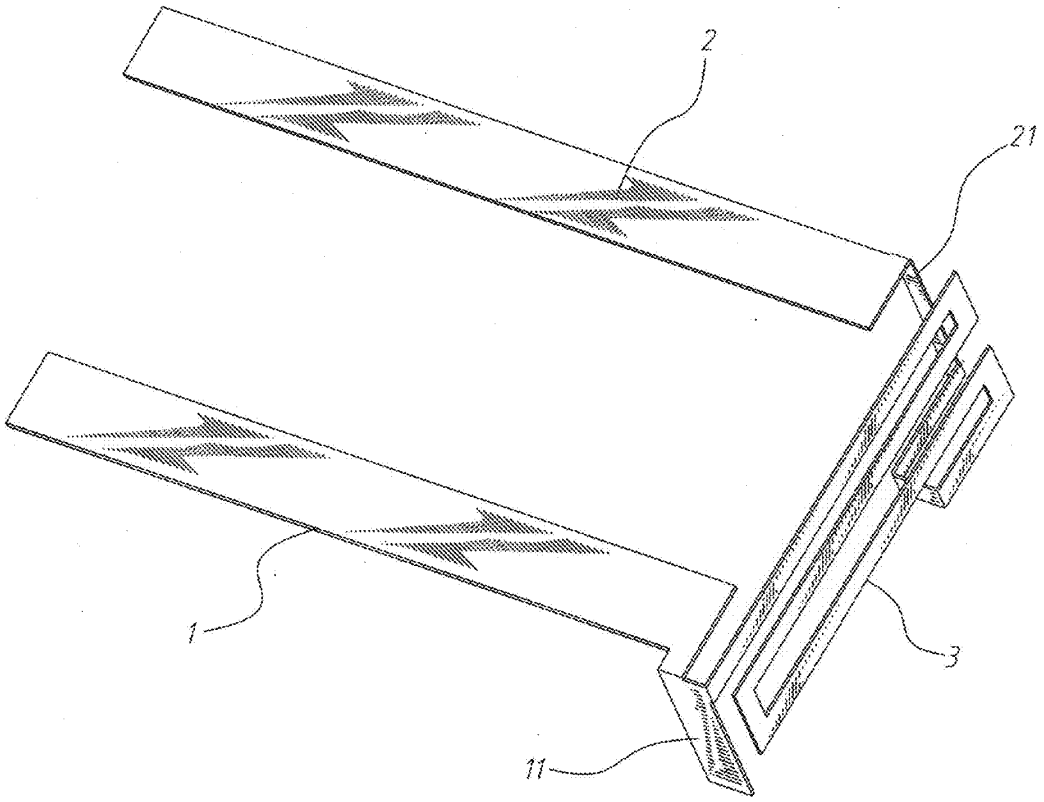
**Publication Classification**

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

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

(57) **ABSTRACT**

A multi-band monopole antenna includes a first metal radiator and a second metal radiator extending in a same direction and arranged in parallel for exciting a high frequency band, and a detoured wire pattern connected between the feed end of the first metal radiator and the connection end of the second metal radiator for exciting a low frequency band. The detoured wire pattern has a, circuit path length longer than one half of the high frequency band λ/2 so that the phase difference on current between the feed end of the first metal radiator and the connection end of the second metal radiator is about π(180-degrees); the electric fields generated at the lower sides of the first metal radiator and the second metal radiator have approximately the same size but reversed phases and the magnetic fields have the same characteristics; when the reversed phases of electromagnetic waves excited by the first and second metal radiators reach the HAC test surface, they cause a destructive interference, thereby improving hearing aid compatibility performance of the multi-band monopole antenna.



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(19) United States

(12) Patent Application Publication

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(43) Pub. Date: May 6, 2010

SHIM et al.

(54) **INTERNAL ANTENNA FOR MITIGATING EFFECT OF ELECTROMAGNETIC WAVES ON HUMAN BODY USING COUPLING**

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(21) Appl. No.: **12/610,013**

(22) Filed: **Oct. 30, 2009**

(30) **Foreign Application Priority Data**

Nov. 4, 2008 (KR) ..... 10-2008-0108806

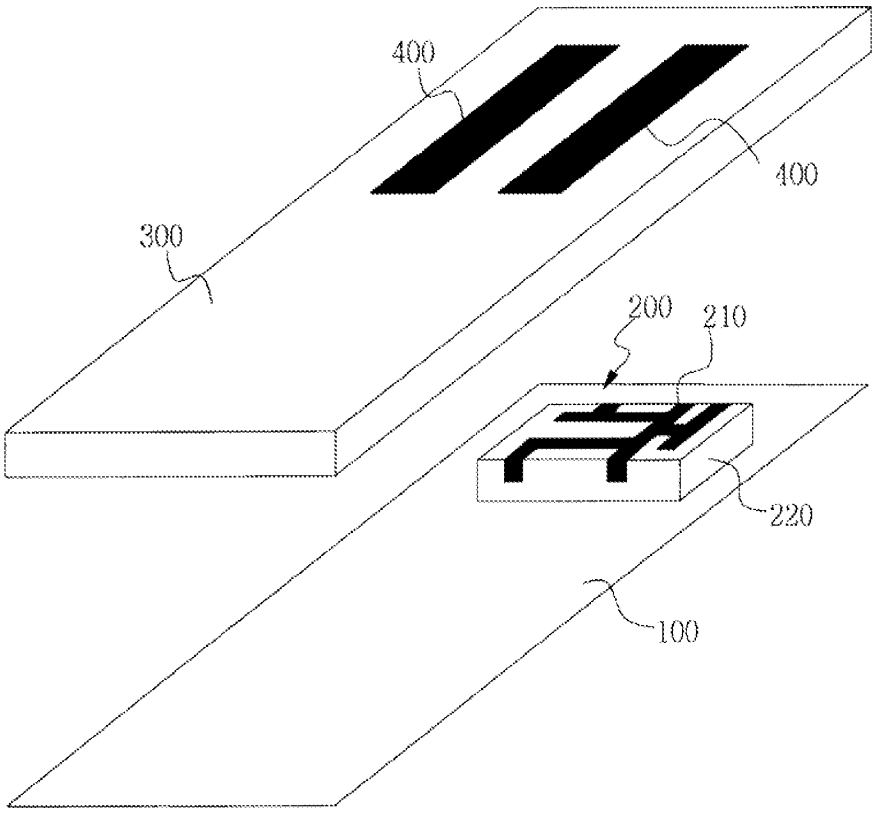
**Publication Classification**

(51) **Int. Cl.**
***H01Q 1/38*** (2006.01)
***H01Q 5/00*** (2006.01)

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

(57) **ABSTRACT**

Disclosed herein is an internal antenna capable of mitigating the effect of electromagnetic waves on a human body using coupling. The internal antenna includes an antenna pattern part and a conductive conductor pattern. The antenna pattern part is form on the Printed Circuit Board (PCB) of a mobile communication terminal. The conductive conductor pattern is formed in a predetermined pattern on one side surface of a cover which covers the antenna pattern part. Coupling occurs between the antenna pattern part formed on the PCB and the conductive conductor pattern formed in a predetermined pattern on one side surface of the cover, so that current components are transferred from the antenna pattern part to the conductive conductor pattern.



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(19) **United States**

(12) **Patent Application Publication**

**Anguera et al.**

(10) **Pub. No.: US 2010/0109955 A1**

(43) **Pub. Date: May 6, 2010**

(54) **WIRELESS DEVICE INCLUDING A MULTIBAND ANTENNA SYSTEM**

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(21) Appl. No.: **12/593,290**

(22) PCT Filed: **Mar. 26, 2008**

(86) PCT No.: **PCT/EP08/53526**

§ 371 (c)(1),
(2), (4) Date: **Sep. 26, 2009**

**Related U.S. Application Data**

(60) Provisional application No. 60/910,113, filed on Apr. 4, 2007.

(30) **Foreign Application Priority Data**

Mar. 30, 2007 (EP) ..... 07105364.9

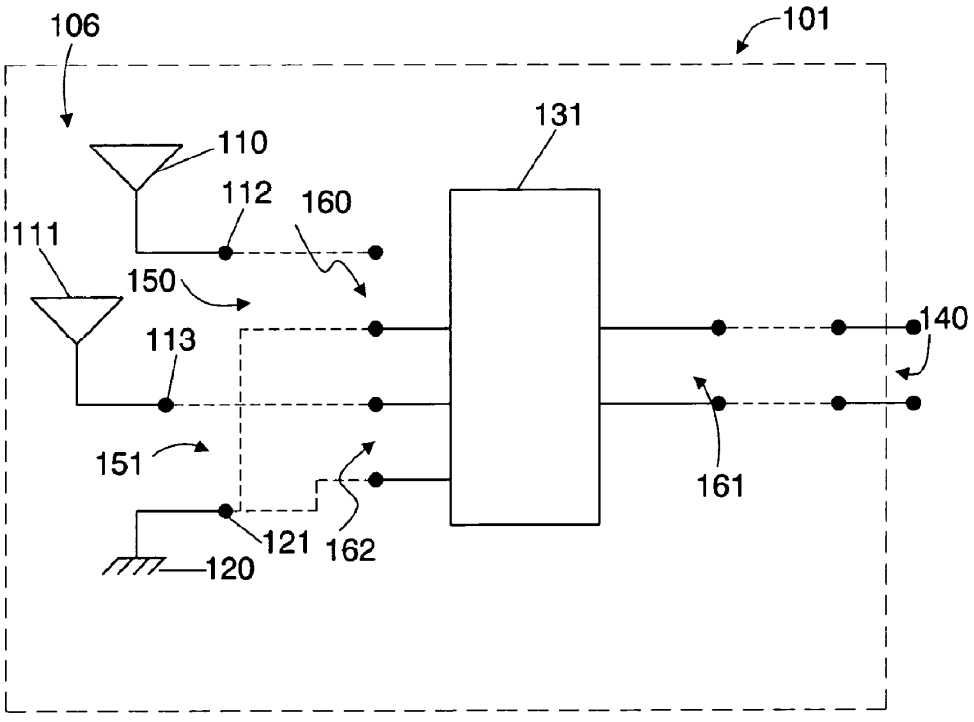
**Publication Classification**

(51) **Int. Cl.**
***H01Q 1/50*** (2006.01)
***H01Q 1/24*** (2006.01)

(52) **U.S. Cl.** ..... **343/702**; 343/860

(57) **ABSTRACT**

A wireless handheld or portable device includes an antenna system operative in a first frequency region and a higher, second frequency region that includes an antenna structure, a matching and tuning system, and an external input/output port. The antenna structure includes at least one radiating element including a connection point, a ground plane layer including at least one connection point, and at least one internal input/output port. At least one radiating element of the antenna structure protrudes beyond the ground plane layer. The antenna structure features at any of its at least one internal input/output ports when disconnected from the matching and tuning system an input return loss curve having a minimum at a frequency outside the first frequency region of operation of the antenna system. The matching and tuning system provides impedance matching to the antenna system in the first and second regions of operation of the antenna system.



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(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2010/0109959 A1

(43) Pub. Date: May 6, 2010

Coupez

(54) MONO- OR MULTI-FREQUENCY ANTENNA

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(21) Appl. No.: **12/447,363**

(22) PCT Filed: **Oct. 26, 2007**

(86) PCT No.: **PCT/EP07/61549**

§ 371 (c)(1),
(2), (4) Date: **Dec. 18, 2009**

(30) **Foreign Application Priority Data**

Oct. 27, 2006 (FR) ..... 0609448

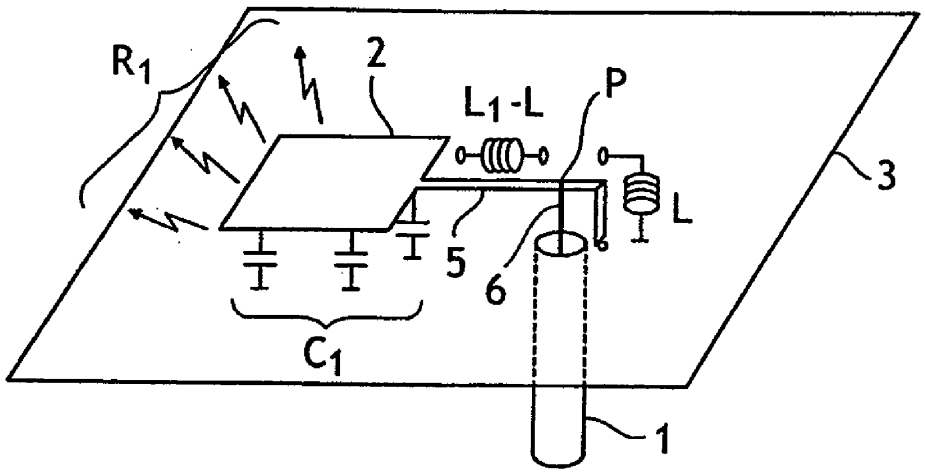
**Publication Classification**

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

(52) **U.S. Cl.** ..... **343/745**; 29/600

(57) **ABSTRACT**

The invention relates to a transmission/reception antenna having one or more given operating frequencies, comprising: at least one metallic member (**2**) provided or to be provided opposite a mass plane (**3**) for providing a capacitive function; and an inductive member (**5**); characterised in that the metallic member (**2**) and the inductive member (**5**) have general dimensions lower than λ/10, where λ is the operational wavelength, the metallic member (**2**) and the inductive member (**5**) defining together a resonator circuit at a frequency corresponding to the operational wavelength, and the metallic member (**2**) comprising discontinuities which represent the origin of radiation loss during operation.



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(19) **United States**

(12) **Patent Application Publication**

**Suzuki et al.**

(10) **Pub. No.: US 2010/0109968 A1**

(43) **Pub. Date: May 6, 2010**

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

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(21) Appl. No.: **12/593,408**

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

(86) PCT No.: **PCT/JP2007/056980**

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(2), (4) Date: **Sep. 28, 2009**

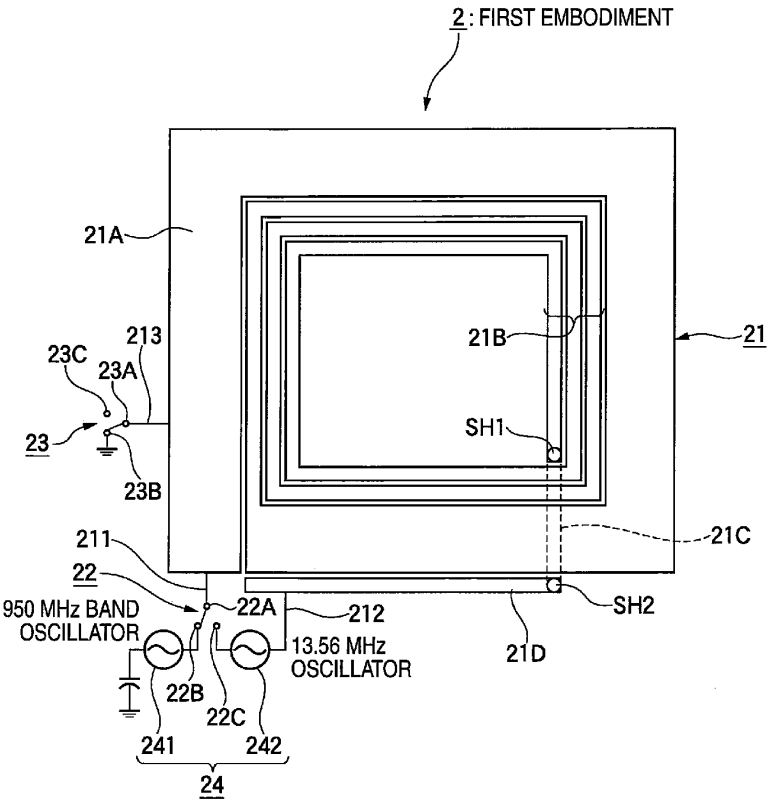
**Publication Classification**

(51) **Int. Cl.**
***H01Q 3/24*** (2006.01)
***H01Q 1/36*** (2006.01)

(52) **U.S. Cl.** ..... **343/876**; 343/895

(57) **ABSTRACT**

An antenna device and a portable terminal device are provided that can be used for radio communication systems having different frequency bands by sharing a single antenna. An antenna device has a spiral antenna **21** formed in a spiral shape; a first feeding part **241** connected to and feeding an electric power to a first radio system operating in a first frequency band; and a second feeding part **242** connected to and feeding an electric power to a second radio system operating in a second frequency band. The antenna device includes: a feeding part switch unit **24** that switches a connecting state of the first feeding part **241** or the second feeding part **242** and an outermost periphery or an inner periphery inside the outermost periphery of the spiral antenna **21**, and a grounding switch unit **23** that switches a prescribed point of the outermost periphery of the spiral antenna **21** to either an opening or a grounding. The spiral antenna **21** is formed in such a way that the width of a conductor forming the spiral antenna is different in its dimension between the outermost periphery and the inner periphery inside the outermost periphery.



US 20100109970A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2010/0109970 A1

(43) Pub. Date: May 6, 2010

Ganwani et al.

(54) **FOLDED ANTENNA STRUCTURES FOR PORTABLE DEVICES**

(76) Inventors: **Nisha Ganwani**, Austin, TX (US); **Jonathan D. Pearce**, London (GB); **Greg Allan Hodgson**, Austin, TX (US); **Aaron Blank**, Elgin, TX (US)

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(21) Appl. No.: **12/317,031**

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

**Related U.S. Application Data**

(60) Provisional application No. 61/198,010, filed on Oct. 31, 2008.

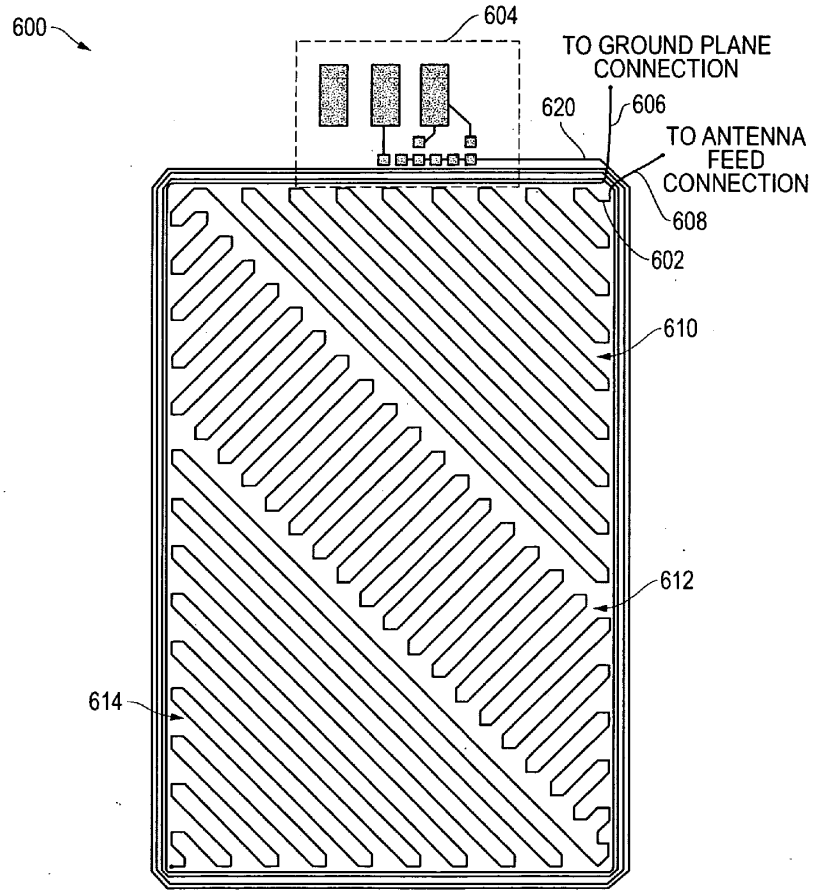
**Publication Classification**

(51) **Int. Cl.**
*H01Q 1/36* (2006.01)
*H01Q 1/38* (2006.01)
*H01Q 1/24* (2006.01)

(52) **U.S. Cl.** ..... **343/895**; 343/700 MS; 343/702

(57) **ABSTRACT**

Methods and systems are disclosed for folded antenna structures that allow for receive and/or transmit antennas to be used for portable or other devices. The folded antennas described herein can be configured, for example, to fit the design constraints and considerations for portable devices. The folded antenna structures can be implemented using relatively flat flexible printed circuits (e.g., flex circuits) and can be placed in available spaces within the portable device, such as above or behind a battery, while still providing good performance characteristics. Still further, the folded antenna structures can be implemented on a printed circuit board and/or as part of plastic materials and pieces included as part of a portable device.



US 20100109971A2

(19) **United States**

(12) **Patent Application Publication**

**Gummalla et al.**

(10) **Pub. No.: US 2010/0109971 A2**

(43) **Pub. Date: May 6, 2010**

**REPUBLICATION**

(54) **METAMATERIAL STRUCTURES WITH MULTILAYER METALLIZATION AND VIA**

(75) Inventors: **Ajay Gummalla**, San Diego, CA (US); **Maha Achour**, San Diego, CA (US); **Norberto Lopez**, San Diego, CA (US); **Shane Thornwall**, San Diego, CA (US); **Nhan Nguyen**, Oceanside, CA (US); **Gregory Poilasne**, El Cajon, CA (US)

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(21) Appl. No.: **12/270,410**

(22) Filed: **Nov. 13, 2008**

**Prior Publication Data**

(65) US 2009/0135087 A1 May 28, 2009

**Related U.S. Application Data**

(60) Provisional application No. 60/987,750, filed on Nov. 13, 2007. Provisional application No. 61/024,876, filed on Jan. 30, 2008. Provisional application No. 61/028,457, filed on Feb. 13, 2008. Provisional application No. 61/091,203, filed on Aug. 22, 2008.

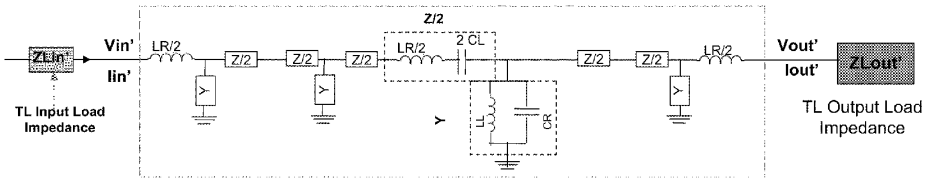
**Publication Classification**

(51) **Int. Cl.**
***H01Q 15/02*** (2006.01)

(52) **U.S. Cl.** ..... **343/909**

(57) **ABSTRACT**

Techniques and apparatus based on metamaterial structures are provided for antenna and transmission line devices, including multilayer metallization metamaterial structures with one or more conductive vias connecting conductive parts in two different metallization layers.



US 20100109972A2

(19) **United States**

(12) **Patent Application Publication**

**Xu et al.**

(10) **Pub. No.: US 2010/0109972 A2**

(43) **Pub. Date: May 6, 2010**

**REPUBLICATION**

(54) **SINGLE-FEED MULTI-CELL METAMATERIAL ANTENNA DEVICES**

(75) Inventors: **Nan Xu**, Carlsbad, CA (US); **Norberto Lopez**, San Diego, CA (US); **Vaneet Pathak**, San Diego, CA (US); **Ajay Gummalla**, San Diego, CA (US)

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(73) Assignee: **Rayspan Corporation**, San Diego, CA (US)

(21) Appl. No.: **12/408,642**

(22) Filed: **Mar. 20, 2009**

**Prior Publication Data**

(65) US 2009/0251385 A1 Oct. 8, 2009

**Related U.S. Application Data**

(60) Provisional application No. 61/042,699, filed on Apr. 4, 2008. Provisional application No. 61/053,616, filed on May 15, 2008.

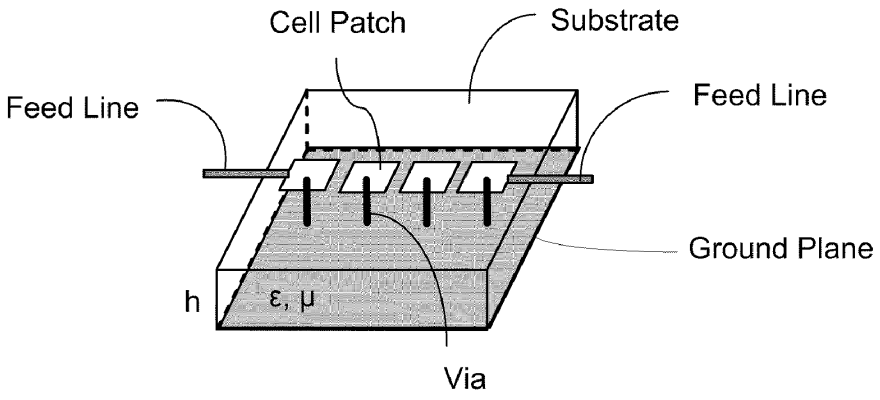
**Publication Classification**

(51) **Int. Cl.**
***H01Q 15/08*** (2006.01)

(52) **U.S. Cl.** ..... **343/911 R**; 343/700 MS

(57) **ABSTRACT**

Designs and techniques of Composite Right-Left Handed (CRLH) Metamaterial (MTM) antenna devices, including a CRLH MTM devices that include MTM cells formed on a substrate and a conductive launch stub formed on the substrate to be adjacent to each of the MTM cells and electromagnetically coupled to each of the MTM cells.



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(19) **United States**

(12) **Patent Application Publication**

**Gummalla et al.**

(10) **Pub. No.: US 2010/0110943 A2**

(43) **Pub. Date: May 6, 2010**

**REPUBLICATION**

(54) **ADVANCED ACTIVE METAMATERIAL ANTENNA SYSTEMS**

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(73) Assignee: **Rayspan Corporation**, San Diego, CA (US)

(21) Appl. No.: **12/400,525**

(22) Filed: **Mar. 9, 2009**

**Prior Publication Data**

(65) US 2009/0245146 A1 Oct. 1, 2009

**Related U.S. Application Data**

(60) Provisional application No. 61/039,407, filed on Mar. 25, 2008.

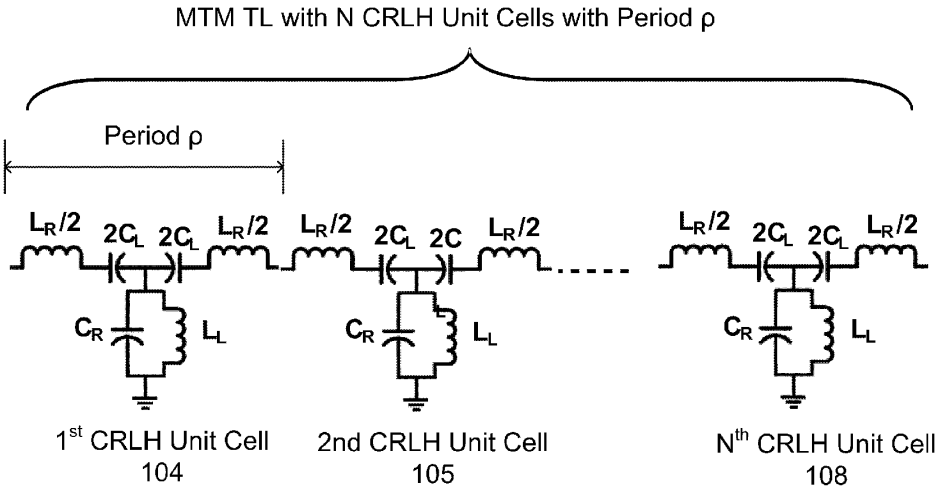
**Publication Classification**

(51) **Int. Cl.**
***H04J 1/00*** (2006.01)

(52) **U.S. Cl.** ..... **370/281**

(57) **ABSTRACT**

Techniques, antenna systems and apparatus based on composite right and left handed (CRLH) metamaterial (MTM) structures to couple CRLH MTM circuits to transistors to amplify signals in wireless RF receivers and transmitters.



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(12) **Patent Application Publication**

**YI et al.**

(10) **Pub. No.: US 2010/0112964 A1**

(43) **Pub. Date: May 6, 2010**

(54) **WRIST WATCH TYPE MOBILE TERMINAL**

(76) Inventors: **Kyung-Hack YI**, Seoul (KR); **Hyun-Jun Kim**, Seoul (KR); **Man-Su Shin**, Seoul (KR); **An-Sun Hyun**, Seoul (KR)

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(21) Appl. No.: **12/611,801**

(22) Filed: **Nov. 3, 2009**

(30) **Foreign Application Priority Data**

Nov. 4, 2008 (KR) ..... 10-2008-0109112

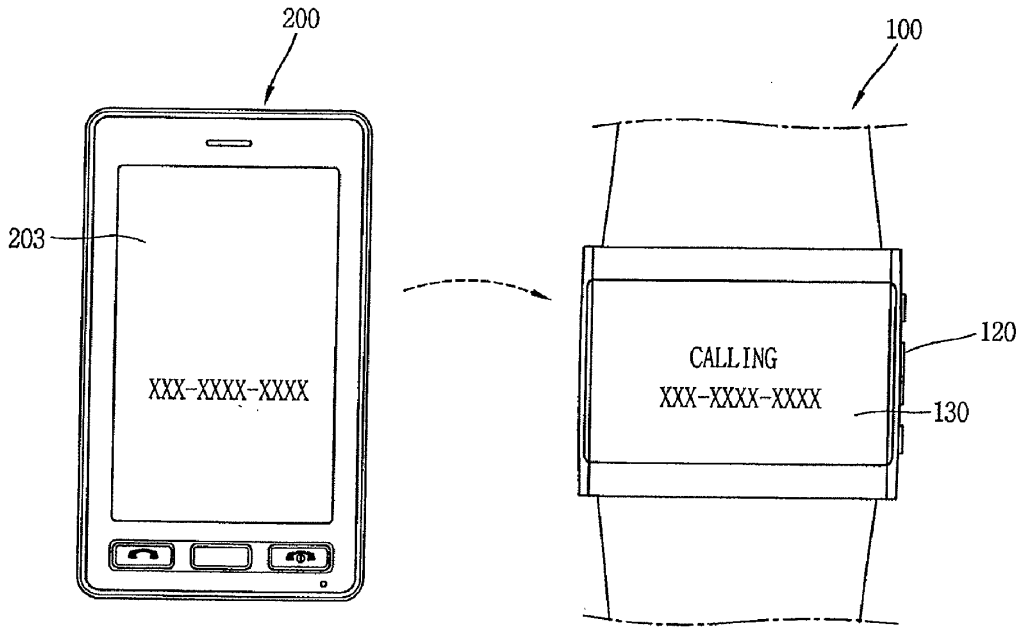
**Publication Classification**

(51) **Int. Cl.**
***H04B 1/38*** (2006.01)
*G04B 47/00* (2006.01)

(52) **U.S. Cl.** ..... **455/90.3**; 368/13

(57) **ABSTRACT**

The present invention relates to a wrist watch type mobile terminal, and may include a conductive metal housing connected with a band or strap to be worn on a human body, and formed to be operable as an antenna at a specific bandwidth, a wireless communication module configured to process a signal transmitted and/or received by the housing, and a feeding portion configured to electrically connect the metal housing with the wireless communication module. The metal housing thereof may function as an antenna transmitting and/or receiving a specific bandwidth, and thus has an advantage of facilitating the implementation of the wireless performance and improving the appearance thereof, compared to a case in which an antenna is disposed within the housing having a small and limited size.



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(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2010/0113111 A1

(43) Pub. Date: May 6, 2010

Wong et al.

(54) **RADIATION REDIRECTING EXTERNAL CASE FOR PORTABLE COMMUNICATION DEVICE AND ANTENNA EMBEDDED IN BATTERY OF PORTABLE COMMUNICATION DEVICE**

(76) Inventors: **Alfred Y. Wong**, Los Angeles, CA (US); **Robert Moreno**, Acton, CA (US); **Karl Richard Shields**, North Hills, CA (US); **Rong Wang**, Sherman Oaks, CA (US)

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(21) Appl. No.: **12/614,132**

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

**Related U.S. Application Data**

(60) Provisional application No. 61/112,141, filed on Nov. 6, 2008, provisional application No. 61/158,551, filed on Mar. 9, 2009.

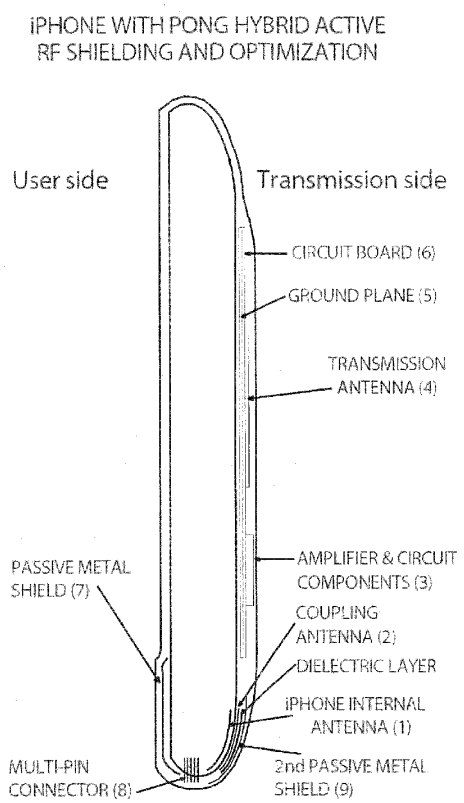
**Publication Classification**

(51) **Int. Cl.**
*H04W 88/02* (2009.01)

(52) **U.S. Cl.** ..... **455/575.5**

(57) **ABSTRACT**

An advanced antenna or set of antennae for a wireless device is provided by embedding the antennae into the battery case or generally the largest surface area of a wireless phone. The antenna connections are made through the battery's connections to the wireless device. The antenna design can be compact and located in any area of the battery. The antenna design can be thin and flat, located at the back surface of the battery or the large rear surface of a wireless phone, facing away from the user. An RF shielding device can be embedded into the battery and configured in relation to the antenna such that the RF field intensity and the consequent specific absorption rate for the user is lowered while the outgoing signals of the wireless device remain fully adequate for the function of the wireless device. This feature is preserved for a multi-band operation because a digital phase shifter is used between two radiating antennae. An external case is used as a complement to the wireless phone to provide additional antennae, power and capability.



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(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2010/0117907 A1

(43) Pub. Date: May 13, 2010

Su et al.

(54) **DUAL-BAND ANTENNA**

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(21) Appl. No.: **12/269,631**

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

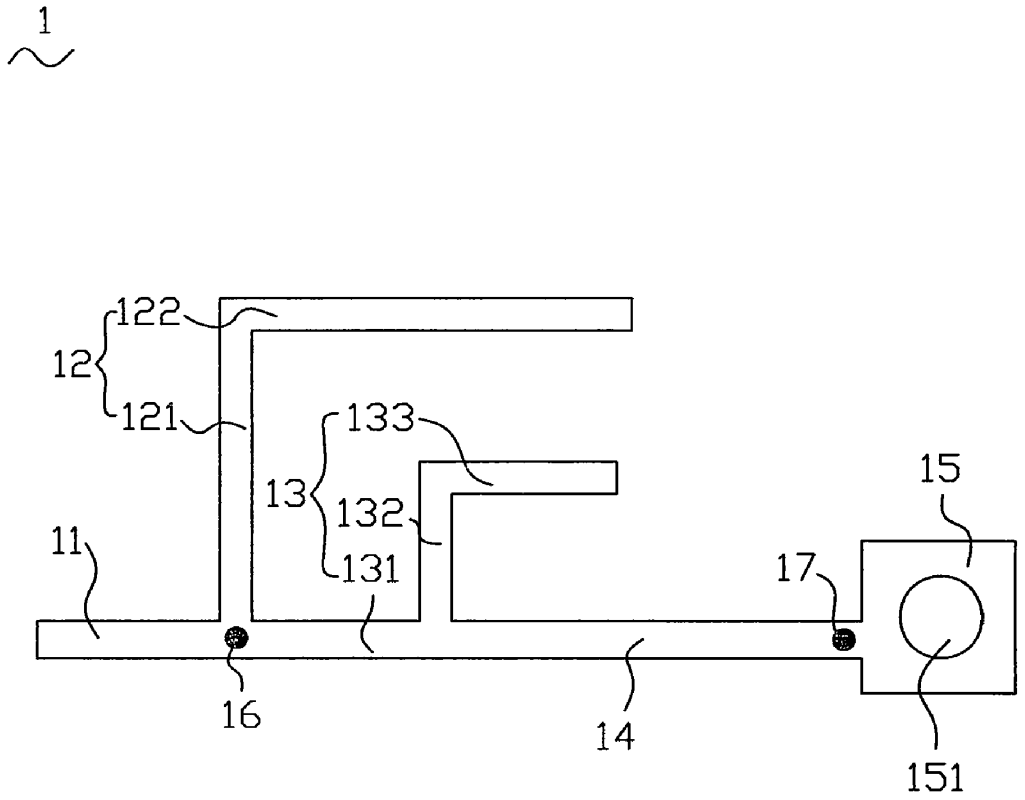
**Publication Classification**

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

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

(57) **ABSTRACT**

A dual-band antenna includes a first radiating portion, a second radiating portion and a third radiating portion. The second radiating portion includes a first section extending perpendicularly from a free end of the first radiating portion, and a second section extending substantially perpendicular to the first section and opposite to the first radiating portion from the first section. The third radiating portion includes a first segment extending in alignment with the first radiating portion from the free end of the first radiating portion, a second segment extending perpendicularly towards the second section from the first segment and spaced away from the first section and a third segment extending perpendicularly back to the first section from the second segment and spaced away from the second section. A feeding point is disposed at a junction of the first, second and third radiating portion.



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(19) **United States**

(12) **Patent Application Publication**

**Wu et al.**

(10) **Pub. No.: US 2010/0117918 A1**

(43) **Pub. Date: May 13, 2010**

(54) **DUAL-BAND ANTENNA**

(75) Inventors: **Hsin-Tsung Wu**, Tu-Cheng City (TW); **Kai Shih**, Tu-Cheng City (TW); **Yu-Yuan Wu**, Tu-Cheng City (TW)

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(73) Assignee: **Cheng Uei Precision Industry Co., Ltd.**

(21) Appl. No.: **12/267,930**

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

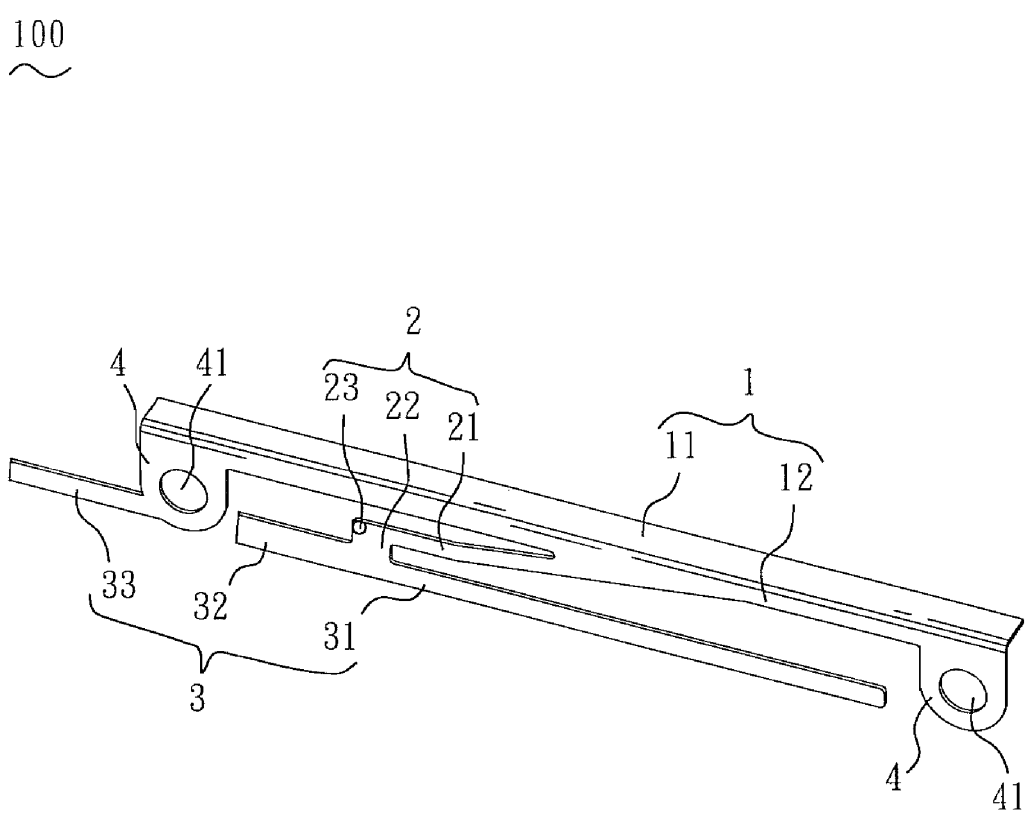
**Publication Classification**

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

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

(57) **ABSTRACT**

A dual-band antenna adapted for an Ultra-mobile Personal Computer has a grounding element including a first grounding portion of elongated plate shape and a second grounding portion extending substantially perpendicular to the first grounding portion from a long edge of the first grounding portion. A connecting element is connected with the second grounding portion. An installing element is connected with the second grounding portion and spaced away from the connecting portion. A radiating element includes a low frequency resonator extending from the connecting element, a high frequency resonator extending opposite to the low frequency resonator and towards the installing element from the connecting element, and an enhancing frequency resonator extending from an edge of the installing element back to the high frequency resonator. The low, high and enhancing frequency resonators are substantially aligned with each other and parallel to the second grounding portion.



US 20100117922A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2010/0117922 A1

(43) Pub. Date: May 13, 2010

Fukuda

(54) **ARRAY ANTENNA, RADIO COMMUNICATION APPARATUS, AND ARRAY ANTENNA CONTROL METHOD**

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(21) Appl. No.: **12/528,147**

(22) PCT Filed: **Dec. 11, 2007**

(86) PCT No.: **PCT/JP2007/073844**

§ 371 (c)(1),
(2), (4) Date: **Aug. 21, 2009**

(30) **Foreign Application Priority Data**

Feb. 28, 2007 (JP) ..... 2007-050774

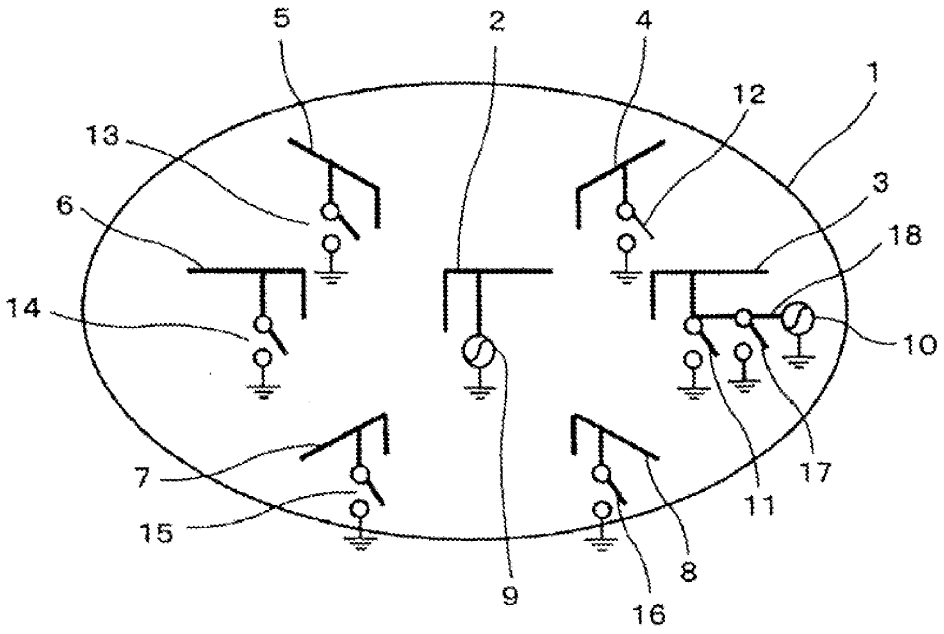
**Publication Classification**

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

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

(57) **ABSTRACT**

An array antenna includes a group of antenna elements and a switching section. The group of antenna elements has a configuration in which a plurality of antenna elements is arranged. The switching section has a plurality of switch elements capable of individually switching the feeding points of the antenna elements included in the group of antenna elements. By switching of the switch elements, the group of antenna elements is converted into an antenna for MIMO communication to transmit and receive a plurality of signals in parallel, or into a directional array antenna to control the directivity towards the direction at which the signals arrive.



US 20100123010A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2010/0123010 A1**

(43) **Pub. Date: May 20, 2010**

**SAKAMA**

(54) **ASSEMBLING STRUCTURE OF RADIO IC TAG**

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(21) Appl. No.: **12/608,194**

(22) Filed: **Oct. 29, 2009**

(30) **Foreign Application Priority Data**

Nov. 20, 2008 (JP) ..... 2008-296407

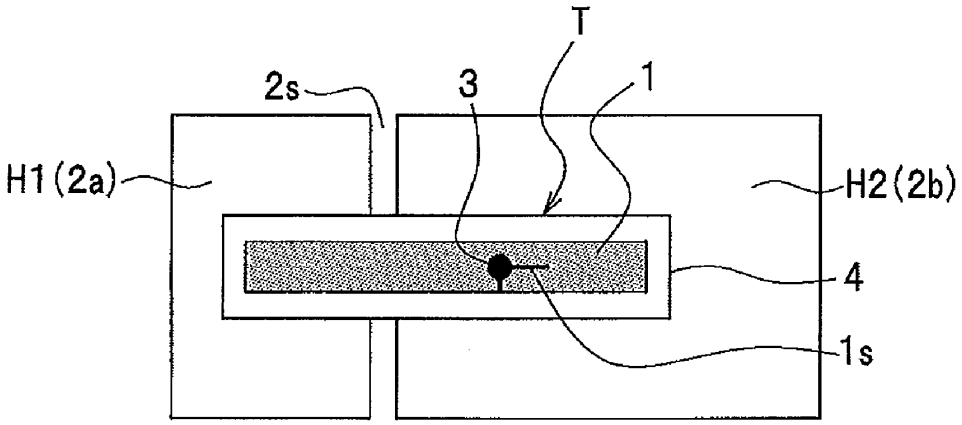
**Publication Classification**

(51) **Int. Cl.**
*G06K 19/07* (2006.01)

(52) **U.S. Cl.** ..... **235/492**

(57) **ABSTRACT**

In an assembling structure of a radio IC tag, the radio IC tag includes an IC chip for recording information therein and a first antenna connected to the IC chip for wirelessly transmitting or receiving information. The first antenna has a first gap for performing impedance matching. A conductive second antenna having a second gap is arranged over the IC chip, the first gap, and the first antenna.



US 20100123011A1

(19) **United States**

(12) **Patent Application Publication**

**Baba et al.**

(10) **Pub. No.: US 2010/0123011 A1**

(43) **Pub. Date: May 20, 2010**

(54) **RADIO-FREQUENCY IDENTIFICATION TAG**

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(21) Appl. No.: **12/612,412**

(22) Filed: **Nov. 4, 2009**

(30) **Foreign Application Priority Data**

Nov. 17, 2008 (JP) ..... 2008-293822

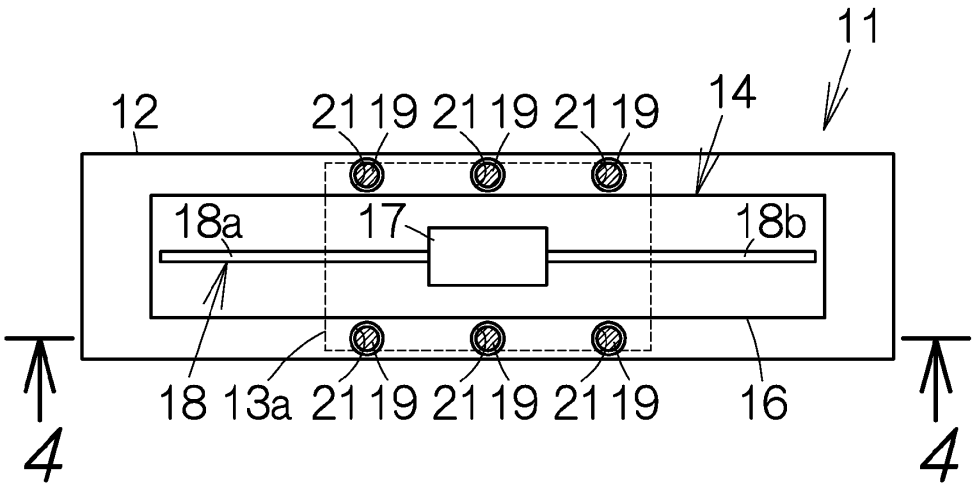
**Publication Classification**

(51) **Int. Cl.**
*G06K 19/067* (2006.01)

(52) **U.S. Cl.** ..... **235/492**; 235/488

(57) **ABSTRACT**

A radio-frequency identification (RFID) tag includes: a plate-shaped sealing piece made of an elastic material. An inlet is enclosed within the sealing piece. The inlet includes an electronic component and an antenna connected to the electronic component. A pair of reinforcing pieces are located respectively on the front and back surfaces of the sealing piece so as to sandwich the electronic component. The reinforcing pieces are made of a first material harder than the elastic material. A joint piece configured to couple the reinforcing pieces to each other. The joint piece is made of a second material harder than the elastic material.



US 20100123628A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2010/0123628 A1

(43) Pub. Date: May 20, 2010

Su et al.

(54) **MULTI-BAND ANTENNA**

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(21) Appl. No.: **12/271,058**

(22) Filed: **Nov. 14, 2008**

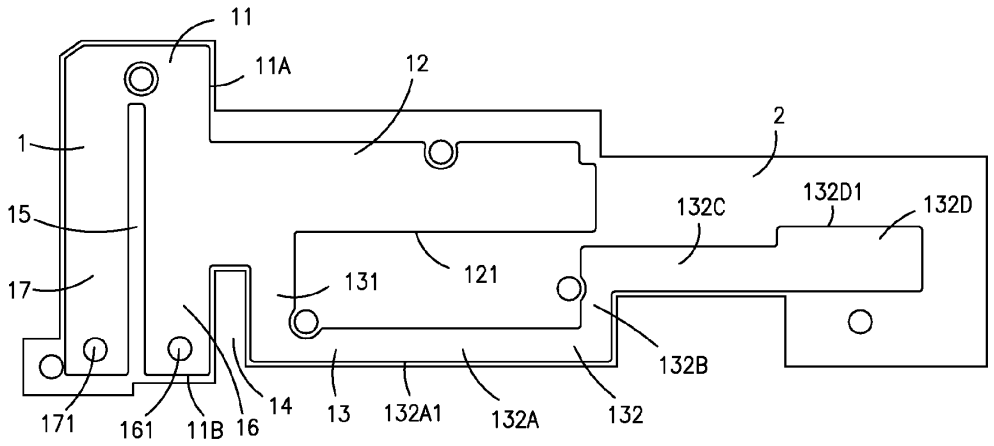
**Publication Classification**

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

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

(57) **ABSTRACT**

A multi-band antenna has a base plate which defines a slot longitudinally extending and penetrating through one edge of the base plate to divide the base plate into a feeding portion and a grounding portion. A first radiating portion extends substantially perpendicularly from the feeding portion. A second radiating portion includes a connecting section substantially perpendicularly extending from the first radiating portion and substantially parallel and adjacent to the base plate and a radiating part connected with the connecting section and opposite to the base plate. The radiating part has a first radiating strip, a second radiating strip, a third radiating strip and an extended radiating strip, all of which shows a substantial stair-shape in combination.



US 20100123629A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2010/0123629 A1

(43) Pub. Date: May 20, 2010

Lin et al.

(54) **DUAL-POLARIZED ANTENNA**

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(21) Appl. No.: **12/271,130**

(22) Filed: **Nov. 14, 2008**

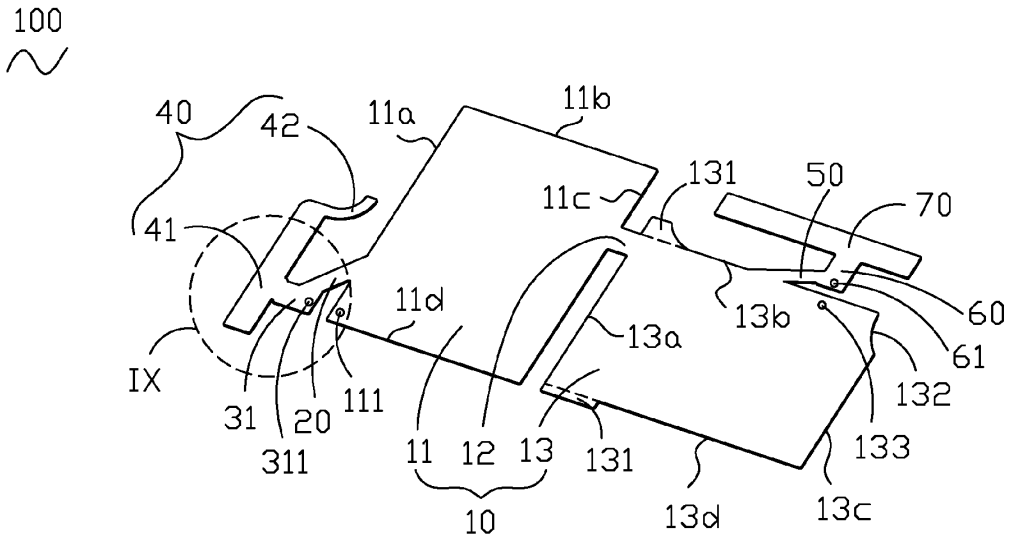
**Publication Classification**

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

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

(57) **ABSTRACT**

A dual-polarized antenna includes a grounding plate, a vertically polarized portion and a horizontally polarized portion. The vertically polarized portion has a first connecting portion extending from one edge of the grounding plate, a vertical radiating element spaced at the edge for forming a simulation capacitance therebetween, and a first feeding portion connected to the first connecting portion and the vertical radiating element. The horizontally polarized portion has a second connecting portion extending from another edge of the grounding plate substantially perpendicular to the edge of the grounding plate, a horizontal radiating element spaced at the another edge for forming another simulation capacitance therebetween, and a second feeding portion connected to the second connecting portion and the horizontal radiating element. The two simulation capacitances help to adjust bandwidth and input impedance of the dual-polarized antenna for improving the gain of the dual-polarized antenna.



US 20100123631A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2010/0123631 A1**

(43) **Pub. Date: May 20, 2010**

**Chang et al.**

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

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(21) Appl. No.: **12/503,084**

(22) Filed: **Jul. 15, 2009**

(30) **Foreign Application Priority Data**

Nov. 17, 2008 (TW) ..... 097144350

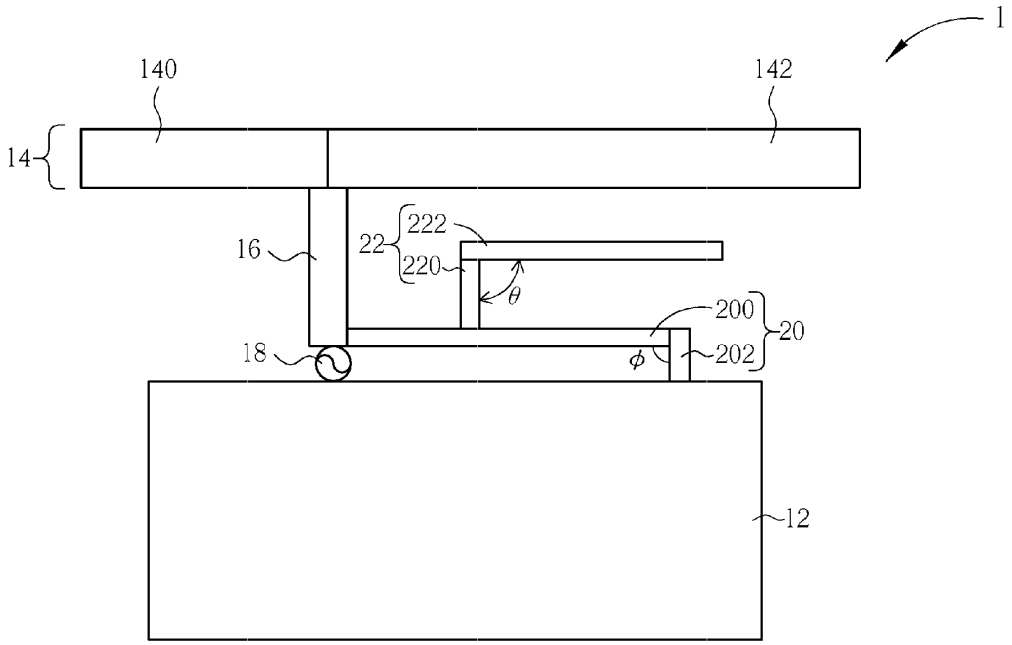
**Publication Classification**

(51) **Int. Cl.**
***H01Q 1/36*** (2006.01)
***H01Q 1/48*** (2006.01)
***H01Q 5/00*** (2006.01)

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

(57) **ABSTRACT**

A multi-band antenna for a wireless communication device includes a grounding unit coupled to a ground, a first radiating unit, a connecting unit having a first terminal coupled to the first radiating unit and a second terminal, a feeding unit coupled between the second terminal of the connecting unit and the grounding unit for receiving feeding signals, a shorting unit coupled between the second terminal of the connecting unit and the grounding unit, a second radiating unit coupled to the shorting unit.



US 20100123632A1

(19) **United States**

(12) **Patent Application Publication**

**Hill et al.**

(10) **Pub. No.: US 2010/0123632 A1**

(43) **Pub. Date: May 20, 2010**

(54) **MULTIBAND HANDHELD ELECTRONIC DEVICE SLOT ANTENNA**

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(21) Appl. No.: **12/274,311**

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

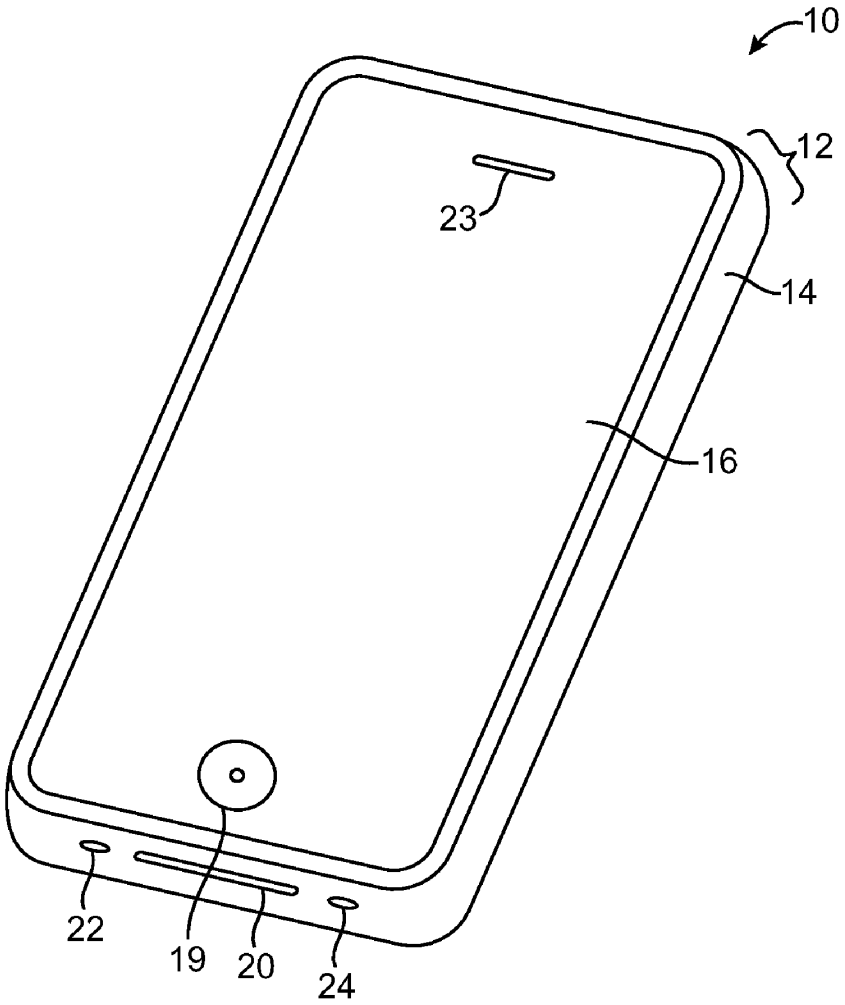
**Publication Classification**

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

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

(57) **ABSTRACT**

An electronic device such as a portable electronic device may have an antenna and associated wireless communications circuitry. The antenna may be a slot antenna having a dielectric slot opening. The slot opening may have a shape such as a U shape or an L shape in which elongated regions of the slot run parallel to the edges of the portable electronic device. The portable electronic device may have a housing with conductive sidewalls. The conductive sidewalls may help define the shape of the slot. Antenna feed arrangements may be used to feed the slot antenna in a way that excites harmonic frequencies and that supports multiband operation while being shielded from proximity effects.



US 20100123634A1

(19) **United States**

(12) **Patent Application Publication**

**Chiang**

(10) **Pub. No.: US 2010/0123634 A1**

(43) **Pub. Date: May 20, 2010**

(54) **BROADBAND ANTENNA AND AN ELECTRONIC DEVICE HAVING THE BROADBAND ANTENNA**

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(21) Appl. No.: **12/588,707**

(22) Filed: **Oct. 26, 2009**

(30) **Foreign Application Priority Data**

Nov. 14, 2008 (TW) ..... 097144215

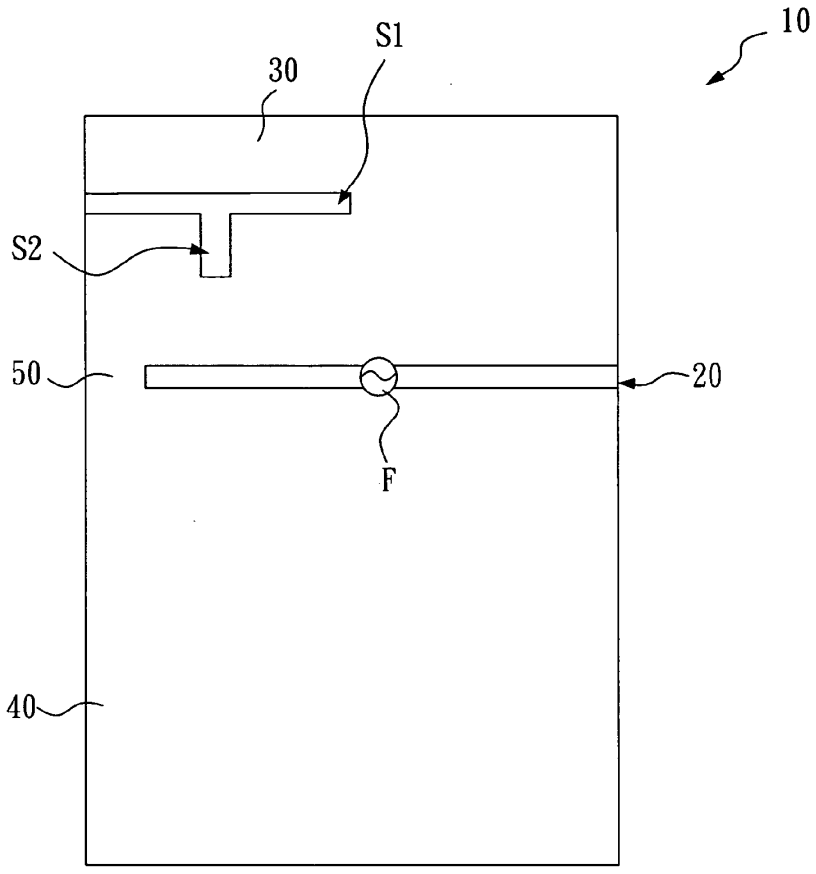
**Publication Classification**

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

(52) **U.S. Cl.** ..... **343/722**; 343/700 MS

(57) **ABSTRACT**

A broadband antenna for wireless signal transmission of an electronic device comprises a base board, a radiating element, a grounding element, a shorting element, and a feeding point. The radiating element, the grounding element, and the shorting element are disposed on the base board. The radiating element comprises a first slot and a second slot. The second slot is connected to the first slot substantially. The first slot and the second slot are used to adjust the operating band of the broadband antenna. The grounding element is used to ground the broadband antenna. The shorting element is used to connect the radiating element and the grounding element. The feeding point is disposed between an edge of the base board and the shorting element, and the horizontal extended range of the first slot does not exceed the position of the feeding point.



US 20100123635A1

(19) **United States**

(12) **Patent Application Publication**

**Lopez et al.**

(10) **Pub. No.: US 2010/0123635 A1**

(43) **Pub. Date: May 20, 2010**

(54) **TUNABLE METAMATERIAL ANTENNA STRUCTURES**

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

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(21) Appl. No.: **12/619,109**

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

**Related U.S. Application Data**

(60) Provisional application No. 61/116,232, filed on Nov. 19, 2008.

**Publication Classification**

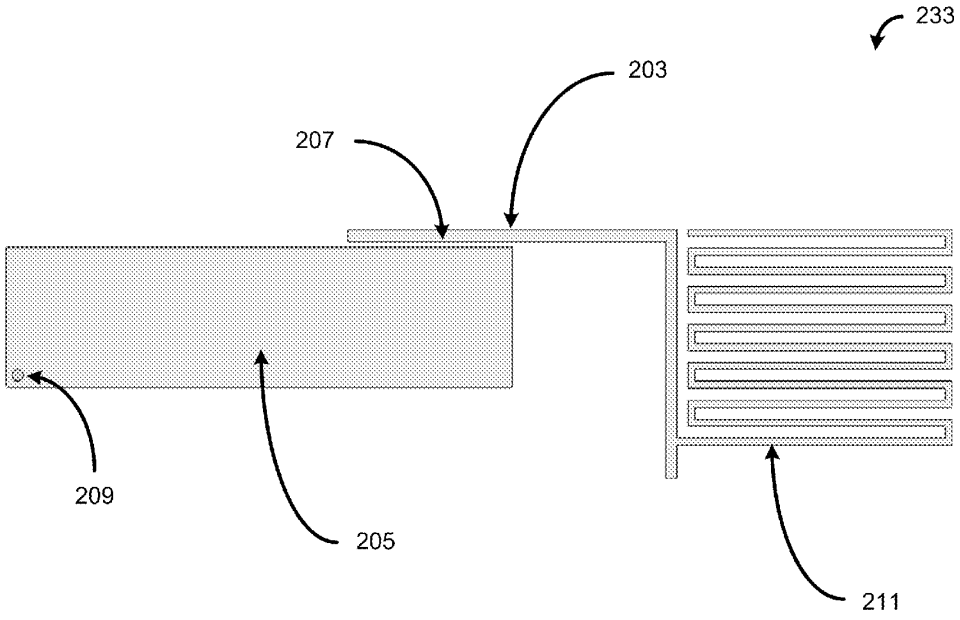
(51) **Int. Cl.**

| | |
|---|---|
| ***H01Q 1/38*** | (2006.01) |
| ***H01Q 1/00*** | (2006.01) |
| ***H01Q 19/06*** | (2006.01) |

(52) **U.S. Cl.** ..... **343/722**; 343/700 MS; 343/753

(57) **ABSTRACT**

Apparatus and techniques that provide tuning elements in antenna devices to tune frequencies of the antenna devices, including composite right and left handed (CRLH) metamaterial (MTM) antenna devices. Examples of the tuning elements for CRLH MTM antenna devices include feed line tuning elements, cell patch tuning elements, meandered stub tuning elements, via line tuning elements, and via pad tuning elements tuning elements that formed near corresponding antenna elements such as the feed line, cell patch, meander stub, via line and via pad, respectively.



US 20100123637A1

(19) **United States**

(12) **Patent Application Publication**

**CHENG et al.**

(10) **Pub. No.: US 2010/0123637 A1**

(43) **Pub. Date: May 20, 2010**

(54) **ANTENNA**

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(21) Appl. No.: **12/271,285**

(22) Filed: **Nov. 14, 2008**

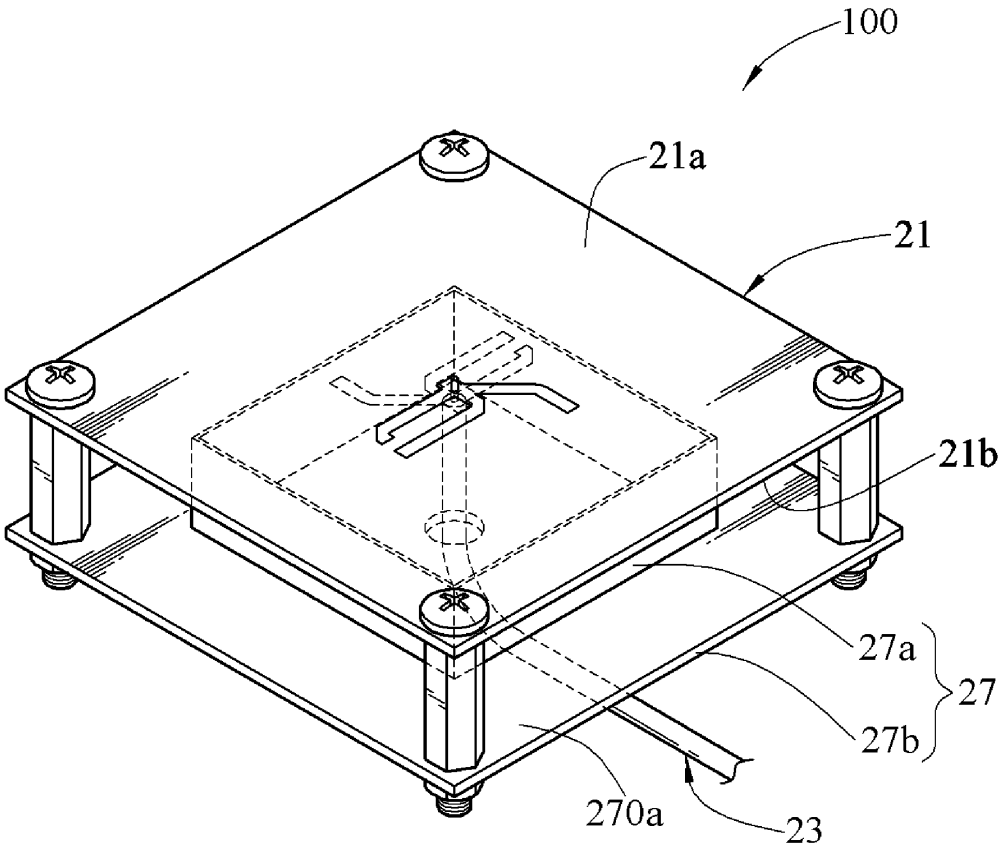
**Publication Classification**

(51) **Int. Cl.**
***H01Q 21/12*** (2006.01)

(52) **U.S. Cl.** ..... **343/812**

(57) **ABSTRACT**

An antenna includes a substrate, a signal feed portion, and a plurality of radiation units. The substrate has a first surface and a second surface. The signal feed portion is located on the substrate. The plurality of radiation units is located on the substrate, connected to the signal feed portion, and arranged in a radial shape. Each of the radiation units includes a radiation portion and a ground portion. The radiation portion is located on the first surface with one end connected to the signal feed portion. The ground portion is located on the second surface in symmetry with the radiation portion, with one end connected to the signal feed portion. A plurality of dipole antennas connected in parallel to the signal feed portion, so as to avoid a zero point generated on the single dipole antenna, such that a wave width of the antenna radiation has a large angle.



US 20100123638A1

(19) **United States**

(12) **Patent Application Publication**

**HUANG**

(10) **Pub. No.: US 2010/0123638 A1**

(43) **Pub. Date: May 20, 2010**

(54) **MONOPOLE ANTENNA**

(75) Inventor: **CHANG-CHING HUANG**, Tu-Cheng (TW)

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

(21) Appl. No.: **12/401,728**

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

(30) **Foreign Application Priority Data**

Nov. 18, 2008 (CN) ..... 200810305618.3

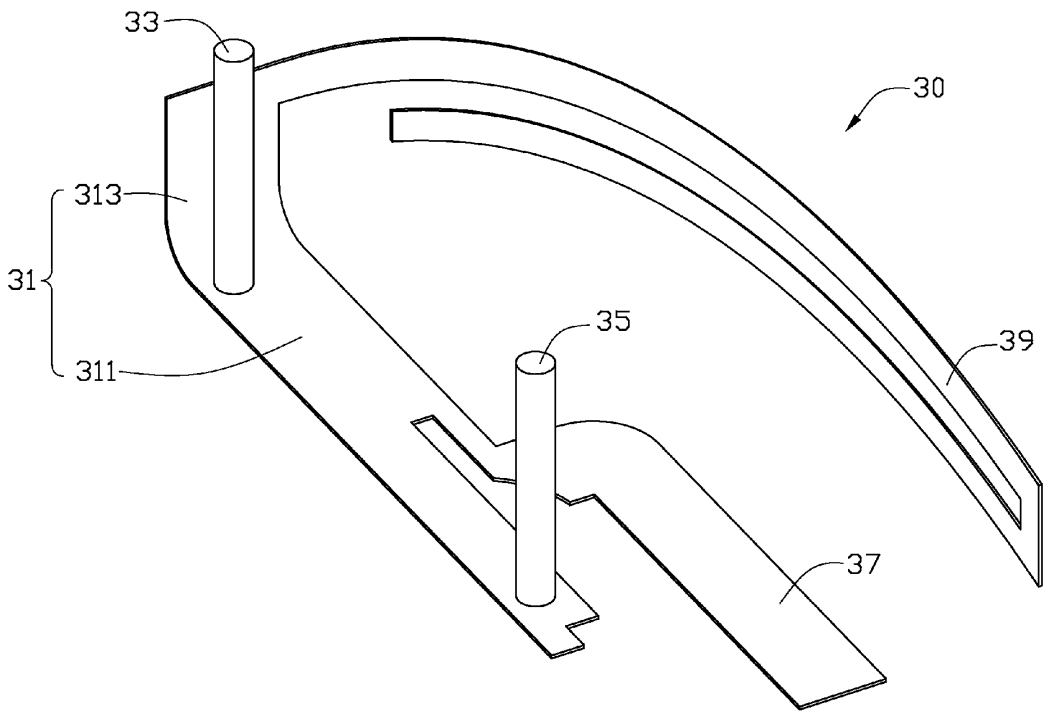
**Publication Classification**

(51) **Int. Cl.**
***H01Q 1/48*** (2006.01)
***H01Q 1/36*** (2006.01)

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

(57) **ABSTRACT**

The invention discloses a monopole antenna for assembly within a wireless communication device to transmit and exchange data signals. The monopole antenna includes a main body, a feed portion, a grounding portion, a first transmitting body and a second transmitting body. The feed portion and the grounding portion are disposed on the main body. A first transmitting body is a high frequency path extending outwardly from the main body and a second transmitting body is a low frequency path extending outwardly from the main body.



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(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2010/0123639 A1**

(43) **Pub. Date: May 20, 2010**

**TAI et al.**

(54) **ANTENNA ASSEMBLY WITH THREE-DIMENSION CONNECTING ELEMENT**

(75) Inventors: **LUNG-SHENG TAI**, Tu-Cheng (TW); **PO-KANG KU**, Tu-Cheng (TW)

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(21) Appl. No.: **12/619,694**

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

(30) **Foreign Application Priority Data**

Nov. 17, 2008 (TW) ..... 97144311

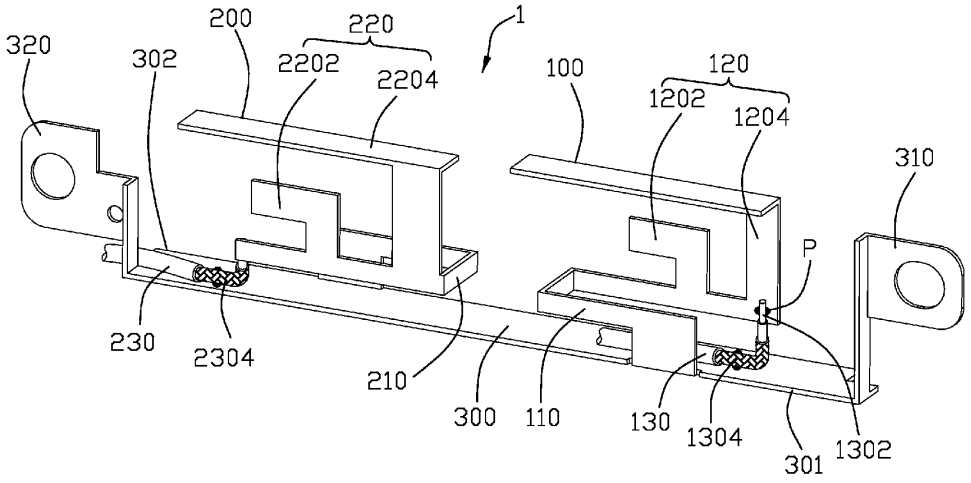
**Publication Classification**

(51) **Int. Cl.**
***H01Q 1/36*** (2006.01)
***H01Q 21/00*** (2006.01)
***H01Q 1/48*** (2006.01)

(52) **U.S. Cl.** ..... **343/846**; 343/893; 343/700 MS; 343/906

(57) **ABSTRACT**

An antenna assembly includes a grounding element with a first edge and a second edge, a first antenna and a second antenna. The first antenna and the second antenna respectively extend from the first side edge and the second side edge of the grounding element, and each includes a connecting element with an opening, a radiating element upward extending from the connecting element and a feeding line. The two openings of the two antennas respectively face two opposite directions. The radiating element of the first antenna is above the second side edge of the grounding element, and the radiating element of the second antenna is above the first side edge of the grounding element.



US 20100123640A1

(19) **United States**

(12) **Patent Application Publication**

**Hui et al.**

(10) **Pub. No.: US 2010/0123640 A1**

(43) **Pub. Date: May 20, 2010**

(54) **APPARATUS, METHOD AND COMPUTER PROGRAM FOR WIRELESS COMMUNICATION**

(75) Inventors: **Ping Hui**, British Columbia (CA); **Rong Bang An**, Beijing (CN); **Shu Liu**, Beijing (CN); **Wanbo Xie**, Beijing (CN)

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(73) Assignee: **Nokia Corporation**

(21) Appl. No.: **12/313,405**

(22) Filed: **Nov. 20, 2008**

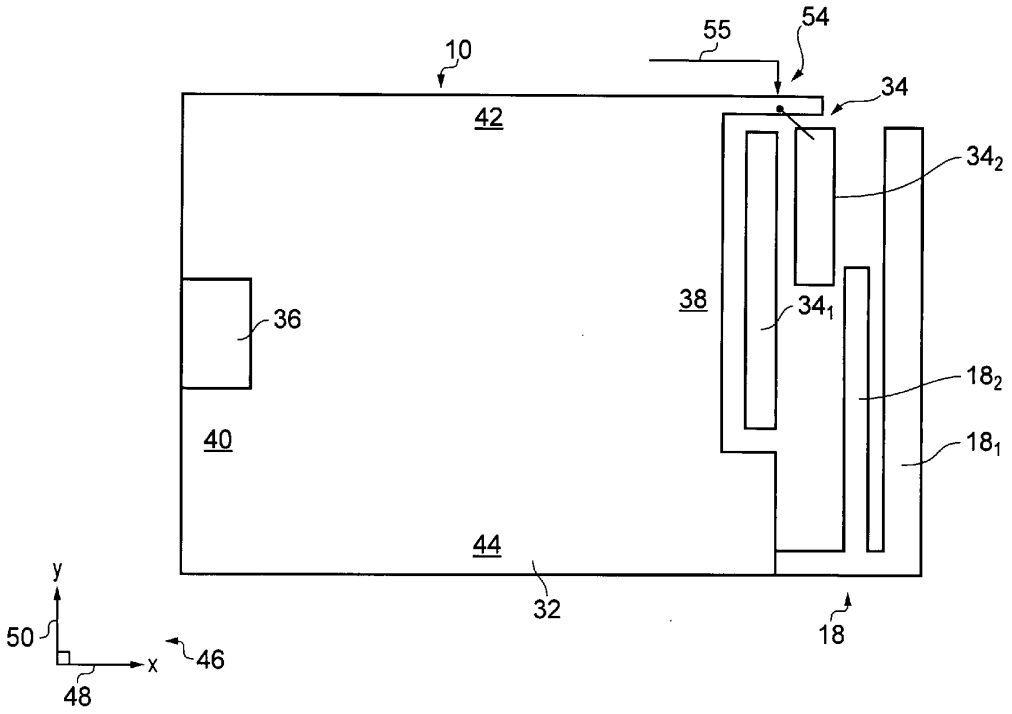
**Publication Classification**

(51) **Int. Cl.**
***H01Q 1/48*** (2006.01)
***G05B 19/42*** (2006.01)

(52) **U.S. Cl.** ..... **343/848**; 700/86

(57) **ABSTRACT**

An apparatus comprising: a ground plane configured to receive an antenna, operable in a first resonant frequency band, at a first end of the ground plane; and a member configured to electromagnetically couple with the antenna, provide the ground plane with an electrical dimension, in combination with the antenna, having a resonant mode at the first resonant frequency band, and to reduce current distribution at a second end of the ground plane, different to the first end.



US 20100123641A1

(19) **United States**

(12) **Patent Application Publication**

**HUNG**

(10) **Pub. No.: US 2010/0123641 A1**

(43) **Pub. Date: May 20, 2010**

(54) **MULTIBAND ANTENNA**

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

(21) Appl. No.: **12/486,020**

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

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**Publication Classification**

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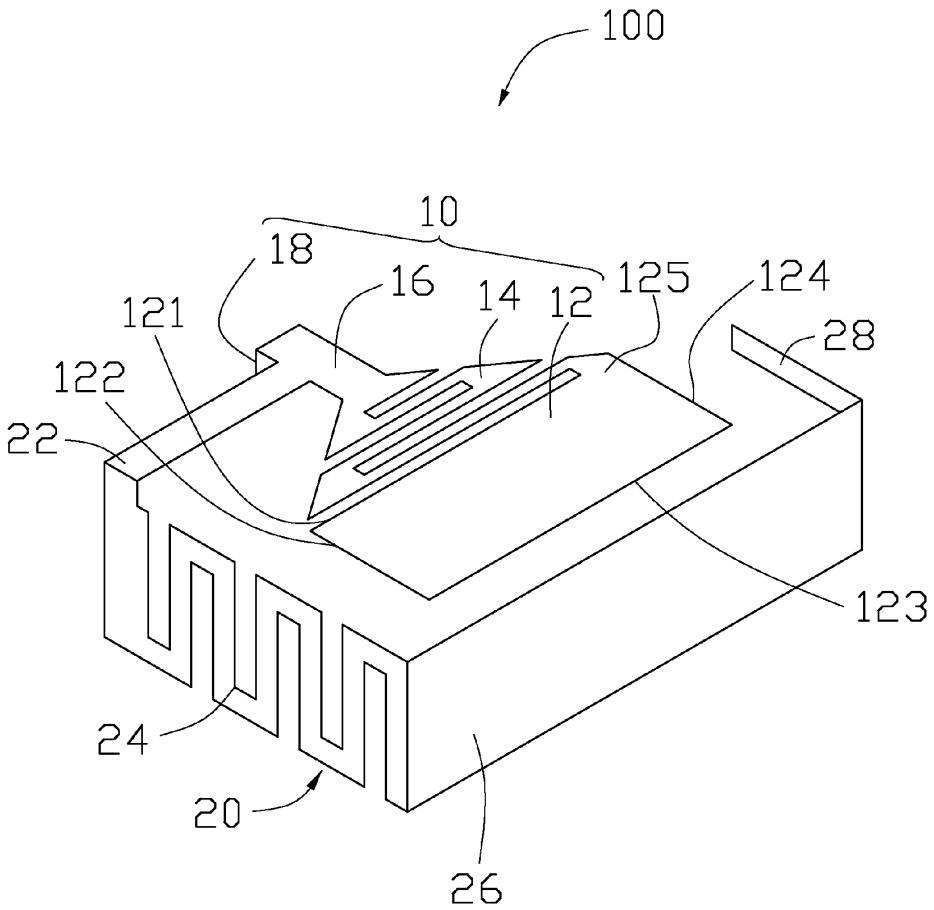
***H01Q 5/01*** (2006.01)
***H01Q 1/36*** (2006.01)

(52) **U.S. Cl.** ..... **343/893**; 343/700 MS

(57) **ABSTRACT**

A multiband antenna includes a first antenna unit for receiving/sending wireless signals having higher frequencies and a second antenna unit for receiving/sending wireless signals having lower frequencies than those frequencies received/sent by the first antenna unit. The first antenna unit includes a first main portion, a first resonating portion and a first connecting portion connected in order and positioned in a same plane. The second antenna unit includes a second connecting portion, a second resonating portion and a second main portion connected in order. The second connecting portion is coplanar with the first connecting portion, the second resonating portion is perpendicular to the second connecting portion, and the second main portion is perpendicular to both the first connecting portion and the second connecting portion.



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(19) **United States**

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**Sanz et al.**

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(43) **Pub. Date: May 20, 2010**

(54) **MULTI-BAND MONOPOLE ANTENNA FOR A MOBILE COMMUNICATIONS DEVICE**

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**Related U.S. Application Data**

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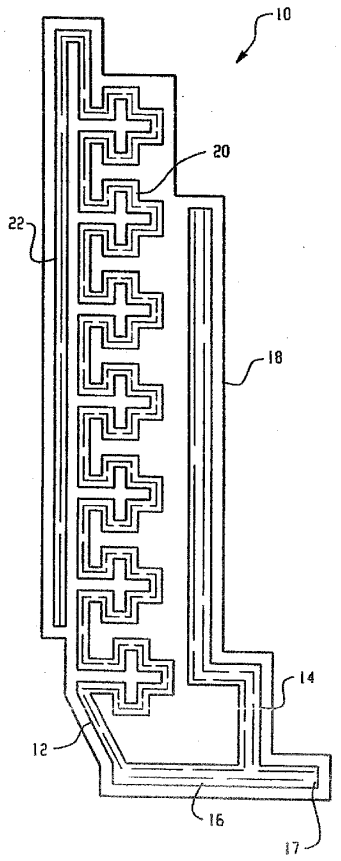
**Publication Classification**

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

(52) **U.S. Cl.** ..... **343/893**; 343/700 MS

(57) **ABSTRACT**

A multi-band monopole antenna for a mobile communications device includes a common conductor coupled to both a first radiating arm and a second radiating arm. The common conductor includes a feeding port for coupling the antenna to communications circuitry in a mobile communications device. In one embodiment, the first radiating arm includes a space-filling curve. In another embodiment, the first radiating arm includes a meandering section extending from the common conductor in a first direction and a contiguous extended section extending from the meandering section in a second direction.



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(19) United States

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Rao et al.

(54) **MULTIPLE FREQUENCY BAND ANTENNA ASSEMBLY FOR HANDHELD COMMUNICATION DEVICES**

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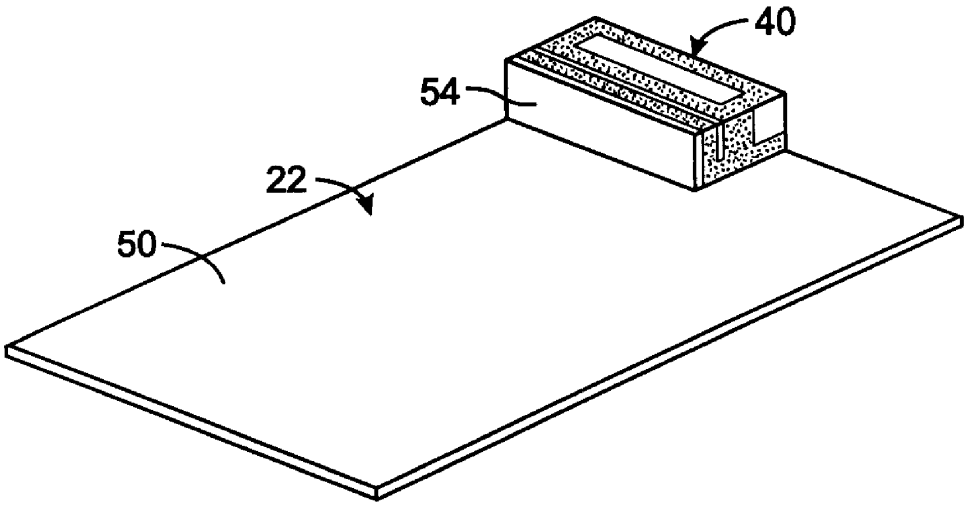
**Publication Classification**

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

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

(57) **ABSTRACT**

An antenna assembly has a plurality of conductive elements to enable use in multiple frequency bands assigned for a mobile wireless communications. The antenna assembly has a six-sided support frame non-electrically conductive material which provides external surfaces on which specific conductive patterns are formed with the patterns on different surface being selectively connected together. The support frame is mounted on one major surface of a dielectric substrate that has an opposite major surface with a conductive layer that serves as ground plane. A portion of the opposite major surface, on which the conductive layer is not applied, forms one surface of the support frame.



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(19) United States

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(43) Pub. Date: May 27, 2010

Ali et al.

(54) **LOW PROFILE, FOLDED ANTENNA ASSEMBLY FOR HANDHELD COMMUNICATION DEVICES**

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**Publication Classification**

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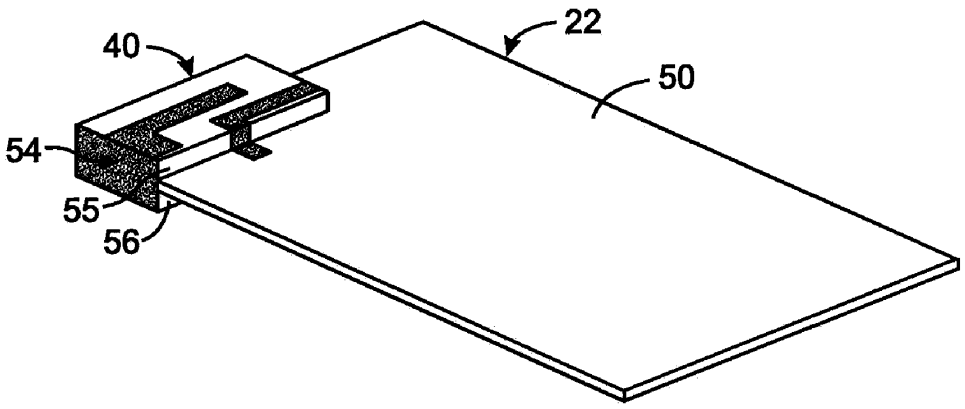
(52) **U.S. Cl.** ..... **343/700 MS**

(57) **ABSTRACT**

An antenna assembly is formed on a rectangular polyhedron support that has two sections projecting away from opposite sides of an electrically non-conductive substrate. An electrically conductive stripe wraps around the support and comprises a plurality of segments on different surfaces of the support. A conductive patch is located on two surfaces of the support to provide impedance matching between the antenna and a radio frequency circuit. By placing sections of the antenna assembly on both sides of the substrate and wrapping the conductive stripe around those sections, the space required to accommodate the antenna assembly within a housing of a communication device is reduced, as compared to some prior antenna designs.



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**HARIHARA et al.**

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(54) **ANTENNA DEVICE, RADIO COMMUNICATION EQUIPMENT, SURFACE-MOUNTED ANTENNA, PRINTED CIRCUIT BOARD, AND MANUFACTURING METHOD OF THE SURFACE-MOUNTED ANTENNA AND THE PRINTED CIRCUIT BOARD**

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(22) Filed: **Nov. 23, 2009**

(30) **Foreign Application Priority Data**

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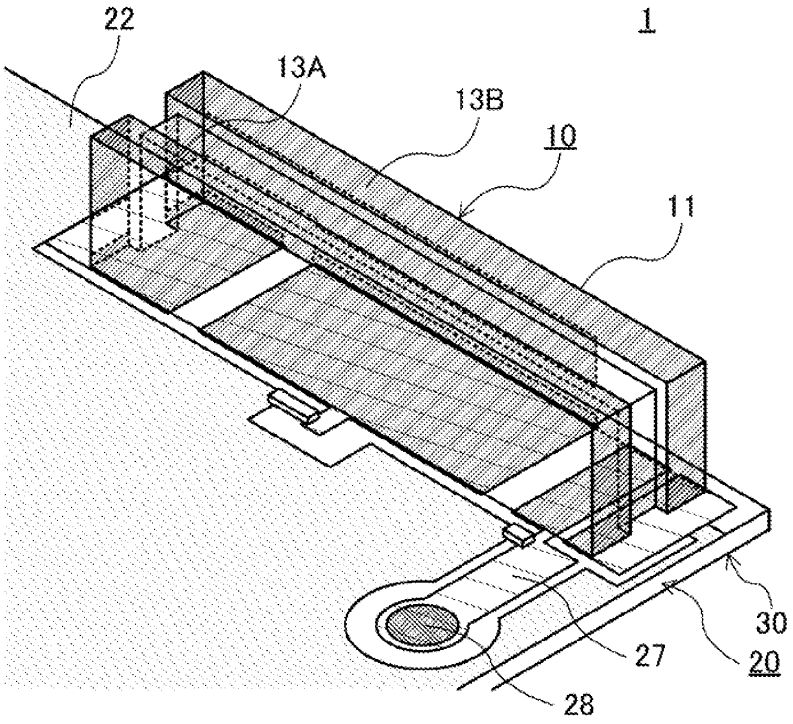
*H01P 11/00* (2006.01)

(52) **U.S. Cl.** ..... **343/700 MS**; 29/600

(57) **ABSTRACT**

An antenna device has a substrate having a power supply line, and a surface-mounted multiple-resonance antenna having a base and a conductor pattern formed on the base and provided on the substrate, wherein the conductor pattern includes two antenna conductor patterns and a plane conductor pattern which connects each of the antenna conductor patterns and the power supply line, the plane conductor pattern **16** includes a slit which controls the connection distance between at least a portion of each of the antenna conductor patterns and the power supply line, and the substrate does not have a conductor pattern in a region corresponding to the slit.

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(43) **Pub. Date: May 27, 2010**

**CHIANG et al.**

(54) **WIRELESS SIGNAL ANTENNA**

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(21) Appl. No.: **12/623,979**

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(30) **Foreign Application Priority Data**

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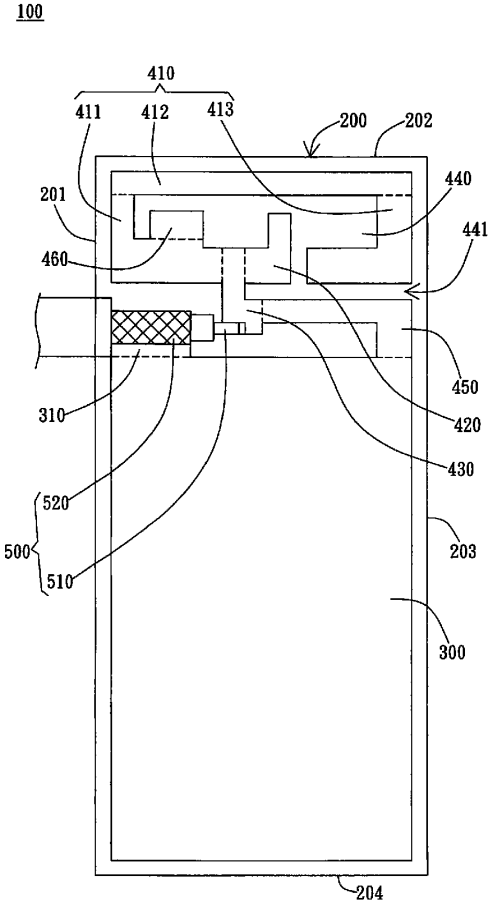
**Publication Classification**

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

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

(57) **ABSTRACT**

The invention discloses a wireless signal antenna including a substrate, a grounding element, a metal radiator element, a signal transmission line, and a ground connection part. The metal radiator element includes a first radiator unit, a second radiator unit, and a signal feed-in point. The ground connection part is electrically connected to the signal feed-in point and the grounding element. The first radiator unit is disposed on the substrate and bent to include a first radiator part, a second radiator part, and a third radiator part, wherein at least a part of the first radiator unit is disposed along edges of the substrate. The second radiator unit is disposed between the first radiator unit and the grounding element. The signal transmission line includes a signal line and a ground line respectively connected to the signal feed-in point and a layout area of the grounding element. The signal transmission line receives electrical signals from a signal source and then excites the metal radiator element to generate a first frequency band mode and a second frequency band mode.



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**Maruyama**

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**Publication Classification**

(51) **Int. Cl.**
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(52) **U.S. Cl.** ..... **343/787**; 343/848; 343/895

(57) **ABSTRACT**

A portable terminal includes a small-sized built-in antenna apparatus having an excellent electric performance. The built-in antenna apparatus includes a ground plate and an antenna unit. The ground plate includes a feed point. The antenna unit is disposed adjacent to an end of the ground plate. The antenna unit includes a reverse L-shaped antenna element. One end of the L-shaped antenna element is connected to the feed point and an opposite end of the L-shaped antenna has a helical shape. A magnetic piece is loaded at a portion where current distribution of the L-shaped antenna element is high, and a dielectric piece is loaded at a portion where current distribution of the L-shaped antenna element is low.