



US 20070095925A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0095925 A1**

(43) **Pub. Date: May 3, 2007**

(54) **RFID CHIP AND ANTENNA WITH IMPROVED RANGE**

Publication Classification

(75) Inventors: **Shengbo Zhu**, San Jose, CA (US); **Su Shiong Huang**, Bellevue, WA (US)

(51) **Int. Cl.**
G06K 19/06 (2006.01)

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

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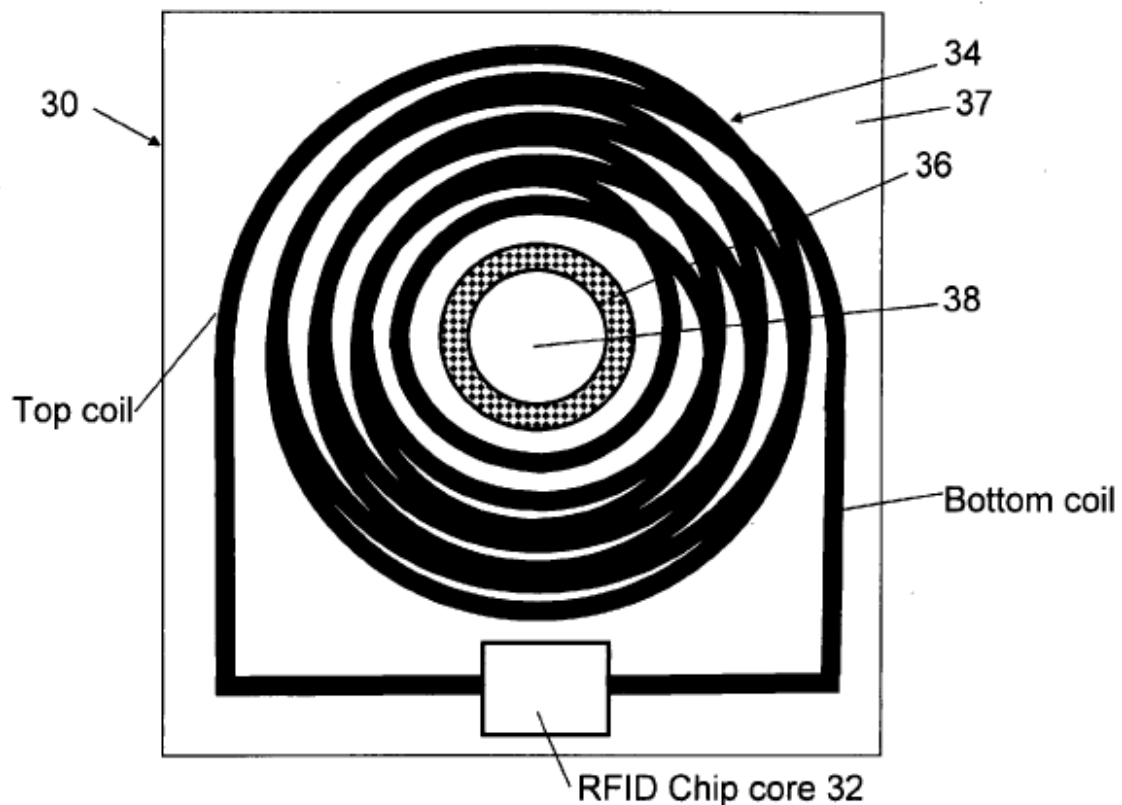
(57) **ABSTRACT**

A "coil-on-a-chip" RFID tag having an rfid integrated circuit and an antenna contemporaneously formed on a substrate. The antenna is a helical multiple layer, multi-turn coil having an axis of revolution oriented at an acute angle, preferably ninety degrees, with respect to the major body plane of the rfid integrated circuit. The coil has a central opening with an annular core of magnetically permeable material. The RFID tag has an increased operating range over known ID tags.

(73) Assignee: **Magnex Corporation**, San Jose, CA

(21) Appl. No.: **11/262,074**

(22) Filed: **Oct. 29, 2005**





US 20070096988A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0096988 A1**
(43) **Pub. Date: May 3, 2007**

(54) **SURFACE MOUNTABLE INVERTED-F ANTENNA AND ASSOCIATED METHODS**

Publication Classification

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

(75) Inventors: **Francis Eugene Parsche**, Palm Bay, FL (US); **Robert Patrick Maloney**, Palm Bay, FL (US); **Robert Nathan Lavallee**, West Melbourne, FL (US)

(57) **ABSTRACT**

A microstrip slot dipole antenna of the inverted F type, includes a coplanar feed, and is suitable for easy peel-and-stick adhesive mounting. The antenna includes a ground plane, a dielectric layer, a horizontal element and a pair of spaced apart vertical elements depending therefrom defining an inverted F antenna above the ground plane with the dielectric layer therebetween. The pair of vertical elements may be conductive vias. A first antenna feed point is on an upper surface of the horizontal element, and a second antenna feed point is on an upper surface of a second vertical element of the spaced apart vertical elements. The second feed point may be a conductive pad on the dielectric layer spaced apart from a first vertical element and insulated from the horizontal element.

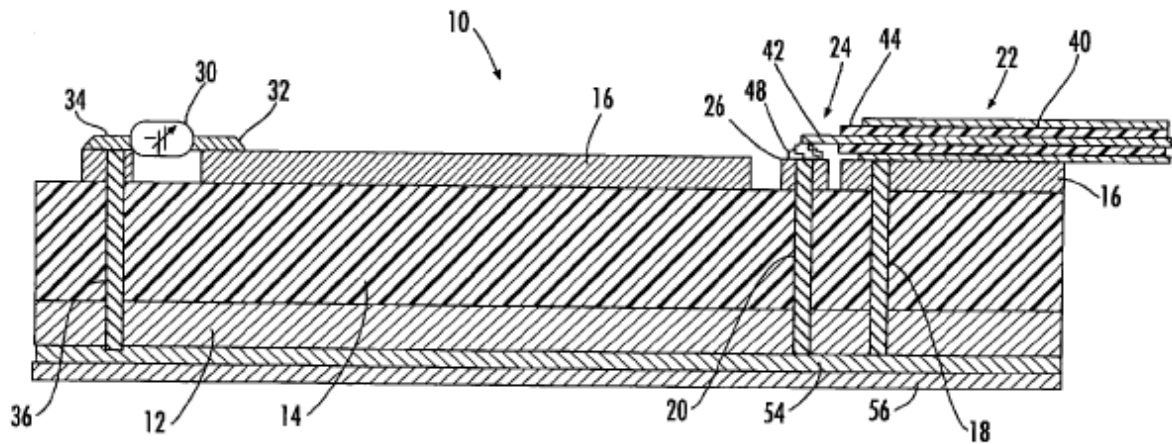
Correspondence Address:

CHRISTOPHER F. REGAN, ESQUIRE
ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, P.A.
P.O. Box 3791
Orlando, FL 32802-3791 (US)

(73) Assignee: **Harris Corporation**, Melbourne, FL (US)

(21) Appl. No.: **11/265,698**

(22) Filed: **Nov. 2, 2005**





US 20070096989A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0096989 A1**

(43) **Pub. Date: May 3, 2007**

(54) **CIRCULARLY POLARIZED ANTENNA**

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

(75) **Inventors: The-Nan Chang, Taipei City (TW);
Shih-Wei Lin, Taipei City (TW)**

(57) **ABSTRACT**

Correspondence Address:
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ALEXANDRIA, VA 22314

The present invention relates to techniques to excite a circularly polarized antenna and, more particularly, to a circularly polarized antenna having a QUAD-EMC unit structure. It comprises plural polarized antenna elements; a signal distributor; and a signal coupling element electrically coupled to the polarized antenna elements and electrically connected to the signal distributor; wherein, when the circularly polarized antenna is in a transmitting state, the signal coupling element sends the electrical signal from the signal distributor to the polarized antenna elements, and the polarized antenna elements transform the electrical signal into the circularly polarized signal and transmit the circularly polarized signal thereafter; when the circularly polarized antenna is in a receiving state, the polarized antenna elements receive the circularly polarized signal and transform the circularly polarized signal into the electrical signal, and the signal coupling element sends the electrical signal from the polarized antenna elements to the signal distributor.

(73) **Assignee: Tatung Company, Taipei City (TW)**

(21) **Appl. No.: 11/362,824**

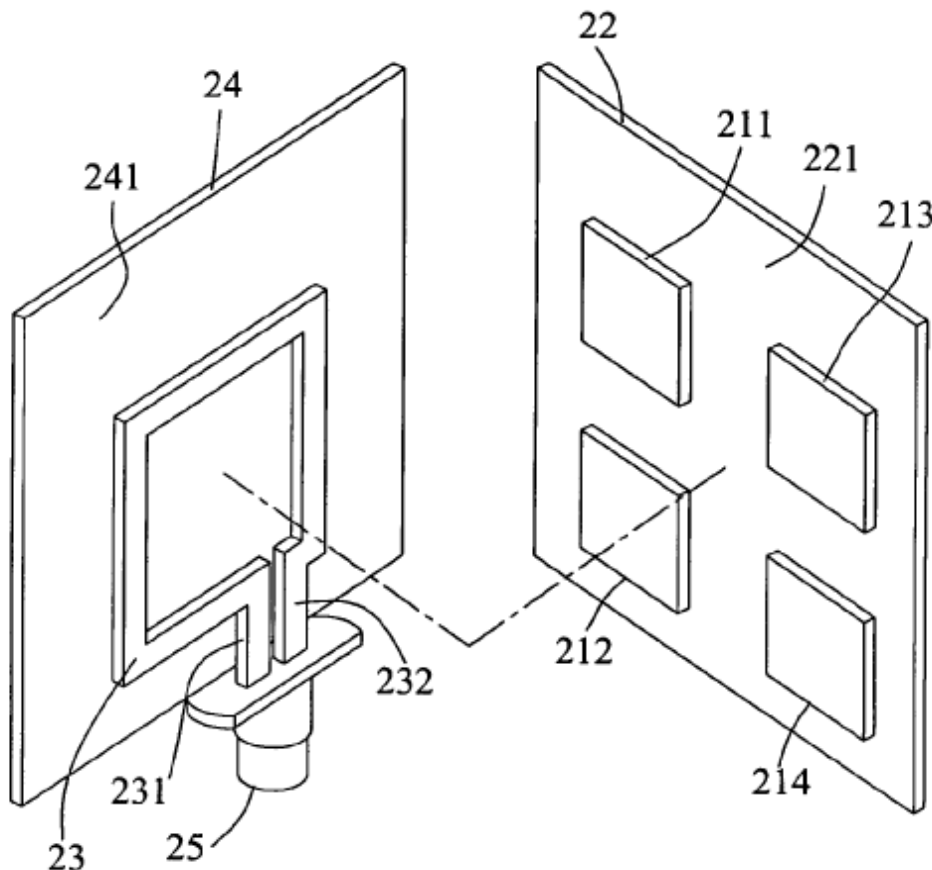
(22) **Filed: Feb. 28, 2006**

(30) **Foreign Application Priority Data**

Nov. 1, 2005 (TW)..... 094138300

Publication Classification

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





US 20070096990A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0096990 A1**

(43) **Pub. Date: May 3, 2007**

(54) **DUAL-POLARIZED FEED ANTENNA APPARATUS AND METHOD OF USE**

(75) Inventors: **Mohammed Sarehraz**, Tampa, FL (US); **Kenneth A. Buckle**, Tampa, FL (US); **Elias Stefanakos**, Tampa, FL (US); **Thomas Weller**, Lutz, FL (US); **D. Yogi Goswami**, Gainesville, FL (US)

Correspondence Address:
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(73) Assignee: **UNIVERSITY OF SOUTH FLORIDA**, Tampa, FL (US)

(21) Appl. No.: **11/534,781**

(22) Filed: **Sep. 25, 2006**

Related U.S. Application Data

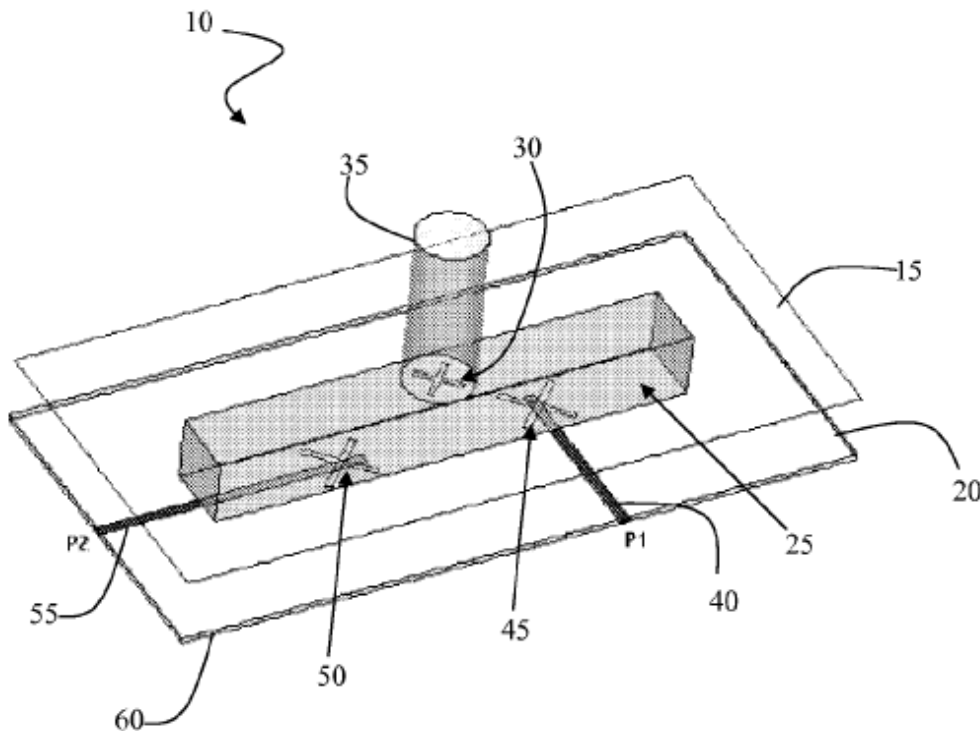
(60) Provisional application No. 60/720,331, filed on Sep. 23, 2005. Provisional application No. 60/720,296, filed on Sep. 23, 2005.

Publication Classification

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

(57) **ABSTRACT**

An antenna apparatus and method for the interception of randomly polarized electromagnetic waves utilizing a dual polarized antenna which is excited through a cross-slot aperture using two well-isolated orthogonal feeds.





US 2007009692A1

(19) **United States**

(12) **Patent Application Publication**
Fujii

(10) **Pub. No.: US 2007/009692 A1**

(43) **Pub. Date: May 3, 2007**

(54) **ANTENNA AND WIRING BOARD**

Publication Classification

(75) **Inventor: Tomoharu Fujii, Nagano (JP)**

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

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

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1500 K STREET, N.W.
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WASHINGTON, DC 20005-1209 (US)

(57) **ABSTRACT**

An antenna 1 which is incorporated in a multilayer wiring board 2 has: radiating elements 11-1, 11-2, 11-3, and 11-4 which are laid on faces of A-, B-, and C-layers of the wiring board 2, respectively; power supplying portions 12-1, 12-2, 12-3, and 12-4 which are laid on the faces of the layers, respectively to supply an electric power to the radiating elements 11-1, 11-2, 11-3, and 11-4; short-circuiting portions 13-1, 13-2, 13-3, and 13-4 which are laid on the faces of the layers, respectively to ground the radiating elements 11-1, 11-2, 11-3, and 11-4; and a connecting portion 14 which penetrates the A-, B-, and C-layers of the wiring board 2, and through which the power supplying portions 12-1, 12-2, 12-3, and 12-4 are electrically connected to each other.

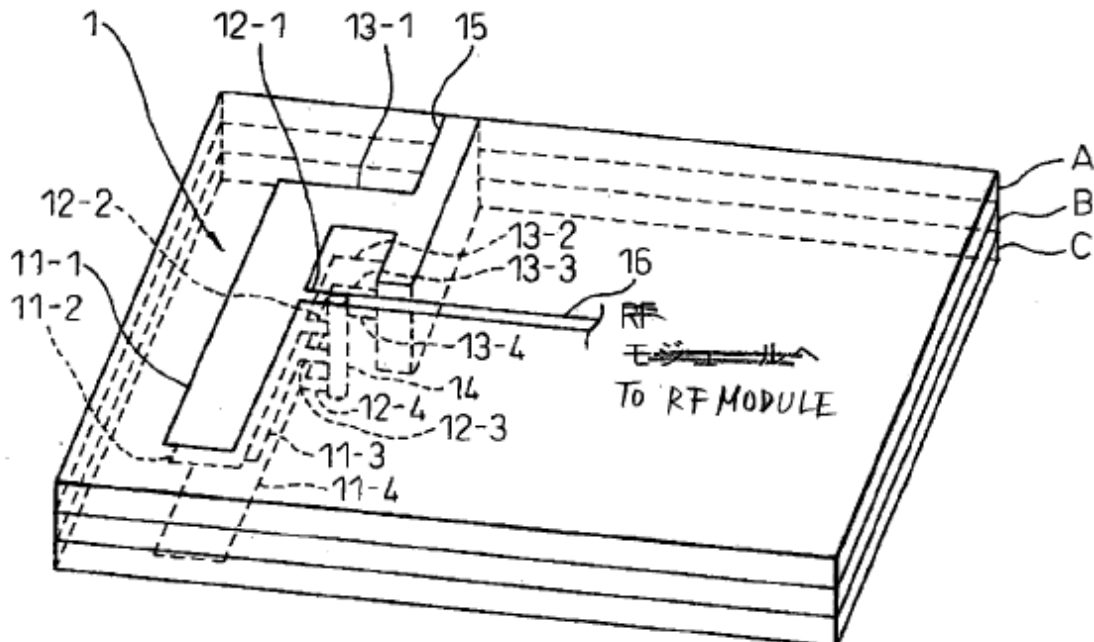
(73) **Assignee: Shinko Electric Industries Co. Ltd.**

(21) **Appl. No.: 11/586,624**

(22) **Filed: Oct. 26, 2006**

(30) **Foreign Application Priority Data**

Oct. 28, 2005 (JP) P.2005-314506





US 20070096993A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0096993 A1**

(43) **Pub. Date: May 3, 2007**

(54) **SMALL PLANAR ANTENNA WITH
ENHANCED BANDWIDTH AND SMALL
STRIP RADIATOR**

(75) Inventors: **Yuri Tikhov**, Suwon-si (KR);
Young-hoon Min, Anyang-si (KR);
Yong-jin Kim, Seoul (KR)

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SUGHRUE MION, PLLC
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WASHINGTON, DC 20037 (US)

(73) Assignee: **SAMSUNG ELECTRONICS CO.,
LTD.**

(21) Appl. No.: **11/639,247**

(22) Filed: **Dec. 15, 2006**

Related U.S. Application Data

(62) Division of application No. 11/207,725, filed on Aug. 22, 2005.

(30) **Foreign Application Priority Data**

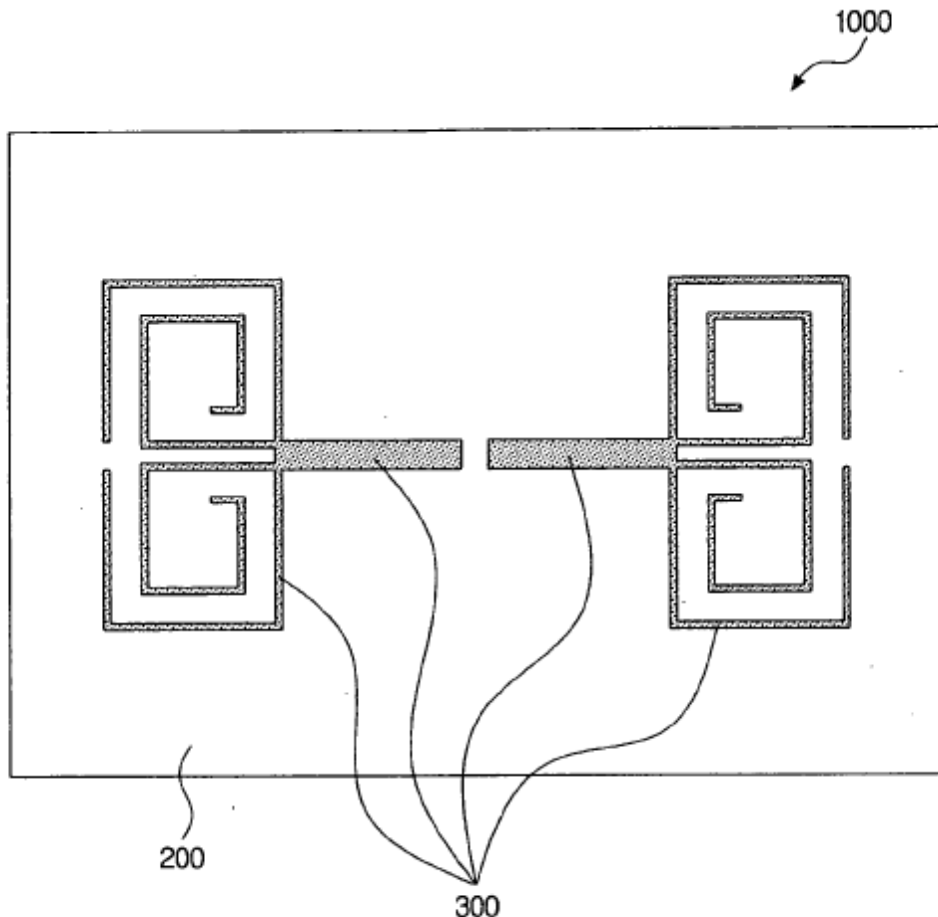
Aug. 21, 2004 (KR) 2004-66159
Jul. 8, 2005 (KR) 2005-61666

Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/700 MS; 343/770**

(57) **ABSTRACT**

A planar small antenna and a small strip radiator are provided which have increased bandwidth. The small strip radiator has a main strip pattern and a plurality of convoluted strip patterns terminating the main strip pattern at each end. The plurality of convoluted strip patterns are arranged in mirror-symmetrical arrangement with reference to the longitudinal axis of the main strip such that one pair of convoluted strip patterns is convoluted clockwise while another pair is convoluted counterclockwise. As a result, an electrically small antenna radiator requires less metal or conductive material than conventional radiators, and also can operate without adversely affecting the radiation characteristics of the antenna.





US 2007009698A1

(19) **United States**

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

(10) **Pub. No.: US 2007/009698 A1**
(43) **Pub. Date: May 3, 2007**

(54) **ANTENNAS**

(30) **Foreign Application Priority Data**

(75) Inventors: **Yuan Li Chang**, Taipei (TW); **Chih Ming Wang**, Taipei (TW)

Oct. 28, 2004 (TW)..... TW93132684

Correspondence Address:
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2210 MAIN STREET, SUITE 200
SANTA MONICA, CA 90405 (US)

Publication Classification

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

(73) Assignee: **WISTRON NEWEB CORP.**, TAIPEI
HSIEN (TW)

(57) **ABSTRACT**

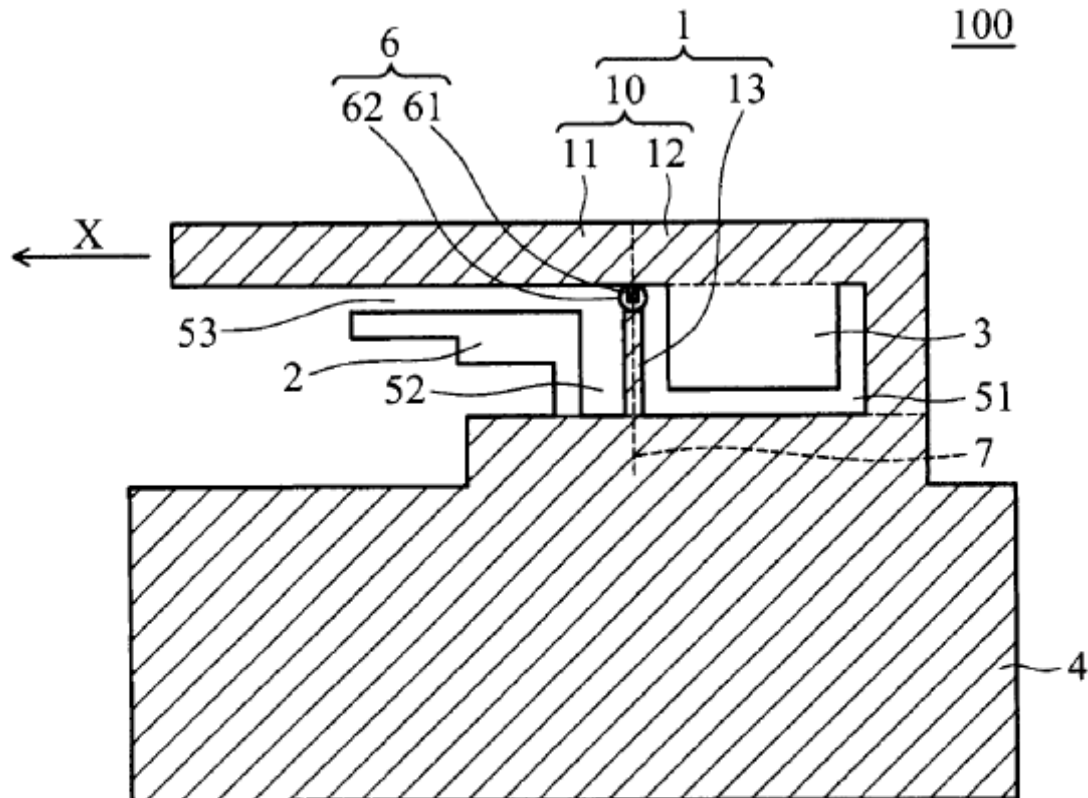
(21) Appl. No.: **11/564,226**

An antenna comprises a first metal element, a second metal element, a third metal element, a ground element and a cable. The first metal element and the second metal element are connected to the ground element. The third metal element is disposed on the first metal element. The cable is coupled to the first metal element. The antenna has three different resonant frequencies (a first resonant frequency, a second resonant frequency and a third resonant frequency) for transmitting three signals in different frequency bands.

(22) Filed: **Nov. 28, 2006**

Related U.S. Application Data

(62) Division of application No. 11/128,817, filed on May 12, 2005, now Pat. No. 7,170,450.





US 20070096999A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2007/0096999 A1**

Wang et al.

(43) **Pub. Date:**

May 3, 2007

(54) **ANTENNA FOR WWAN AND INTEGRATED ANTENNA FOR WWAN, GPS AND WLAN**

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

(76) **Inventors:** Chi-Yueh Wang, Kaohsiung (TW);
Cheng-Han Lee, Kaohsiung (TW);
Ching-Chia Mai, Kaohsiung (TW)

(57) **ABSTRACT**

Correspondence Address:
VOLENTINE FRANCO, & WHITT PLLC
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RESTON, VA 20190 (US)

The present invention relates to an integrated antenna for WWAN, GPS, and WLAN. The integrated antenna includes a ground metal plane, a WWAN antenna, and a WLAN antenna. The WWAN antenna is connected to the ground metal plane and includes a first radiating metal strip and a second radiating metal strip. The first and second radiating metal strips are used to induce a first resonance mode and a second resonance mode respectively. The WLAN antenna is connected to the ground metal plane and includes a third radiating metal strip and a fourth radiating metal strip. The third and fourth radiating metal strips are used to induce a third resonance mode and a fourth resonance mode respectively. The integrated antenna of the present invention can be used in WWAN and WLAN at the same time. The ground metal plane of the integrated antenna does not need to connect to a ground end of a wireless electronic device, and is used for grounding. Therefore, the integrated antenna can be mounted on any part of the wireless electronic device, and can have stable electrical characteristic.

(21) **Appl. No.:** 11/589,236

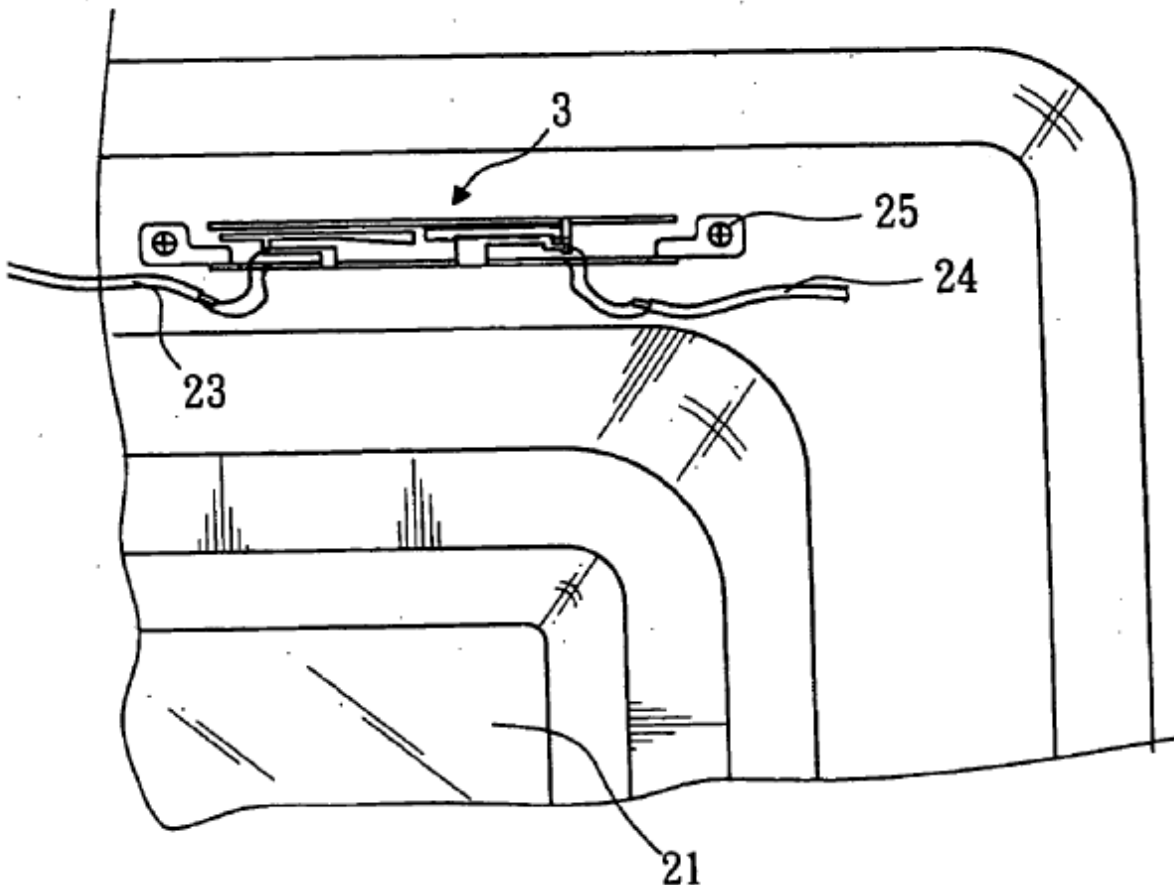
(22) **Filed:** Oct. 30, 2006

(30) **Foreign Application Priority Data**

Oct. 31, 2005 (TW)..... 094138184

Publication Classification

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





US 20070097001A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0097001 A1**
(43) **Pub. Date: May 3, 2007**

(54) **MOBILE ANTENNA MOUNTED ON A VEHICLE BODY**

(75) Inventors: **Yuji Sugimoto**, Kariya-shi (JP); **Toshihiro Hattori**, Okazaki-shi (JP); **Yoko Ichikawa**, Aichi-ken (JP); **Syuichi Kono**, Okazaki-shi (JP); **Koji Numata**, Toyokawa-shi (JP); **Masaaki Hisada**, Oobu-shi (JP); **Toru Yamazaki**, Chita-shi (JP)

Correspondence Address:
POSZ LAW GROUP, PLC
12040 SOUTH LAKES DRIVE
SUITE 101
RESTON, VA 20191 (US)

(73) Assignees: **DENSO CORPORATION**, Kariya-city (JP); **NIPPON SOKEN, INC.**, Nishio-city (JP)

(21) Appl. No.: **11/604,023**

(22) Filed: **Nov. 24, 2006**

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/139,038, filed on May 27, 2005.

(30) **Foreign Application Priority Data**

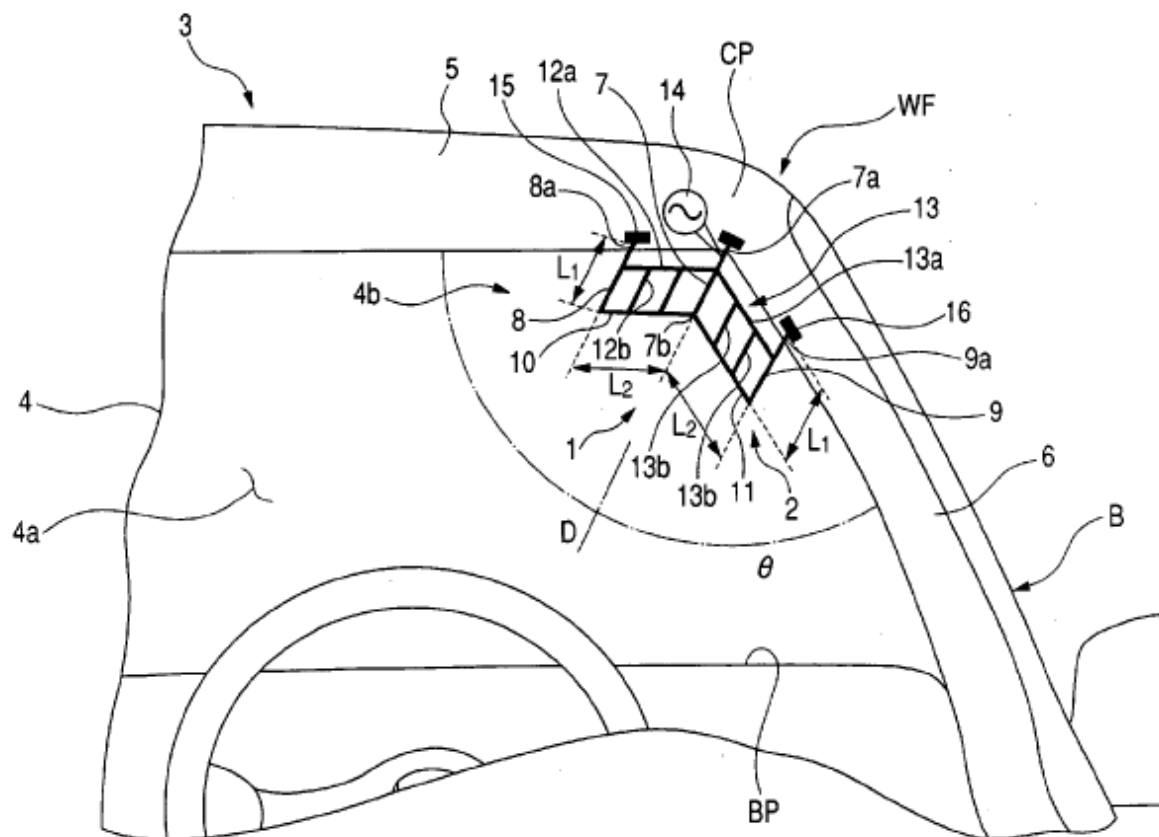
May 28, 2004 (JP)..... 2004-159255
Mar. 29, 2005 (JP)..... 2005-094901
Nov. 25, 2005 (JP)..... 2005-340443

Publication Classification

(51) **Int. Cl.**
H01Q 1/32 (2006.01)
(52) **U.S. Cl.** **343/713**

(57) **ABSTRACT**

In a mobile antenna, an electrically conductive antenna element has a first portion with one end and the other end extending therefrom. The one end of the first portion is arranged at least adjacent to any one of a first support portion, a second support portion, and a corner portion of a body of a vehicle. The one end of the first portion is electrically connected to a feeding point. The other end of the first portion is arranged along a surface of the window such that polarized surfaces formed by the antenna element are non-orthogonal to a polarized surface of each of a vertically polarized wave and a horizontally polarized wave in radio waves.





US 20070097006A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0097006 A1**
(43) **Pub. Date: May 3, 2007**

(54) **HIGH GAIN STEERABLE PHASED-ARRAY ANTENNA**

(52) **U.S. CL.** 343/770; 343/768

(75) **Inventors: Forrest J. Brown, Carson City, NV (US); Forrest Wolf, Reno, NV (US)**

(57) **ABSTRACT**

Correspondence Address:
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6114 LA SALLE AVENUE
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OAKLAND, CA 94611-2802 (US)

A high gain, steerable phased array antenna includes multiple oblong slots. For each of the oblong and preferably rectangular slots, an electrical microstrip feed line is disposed within a parallel plane to the slot, and extends in the short dimension of the slot across the center of its long dimension. The microstrip feed lines and corresponding oblong slots form magnetically coupled LC resonance elements. A main feed line couples with the microstrip feed lines. Delay circuitry is used to electronically steer the antenna by selectively changing signal phases on the microstrip feed lines. One or more processors operating based on program code continuously or periodically determine a preferred signal direction and control the delay circuitry to steer the antenna in the preferred direction. The preferred signal direction is determined based on a directional throughput determination.

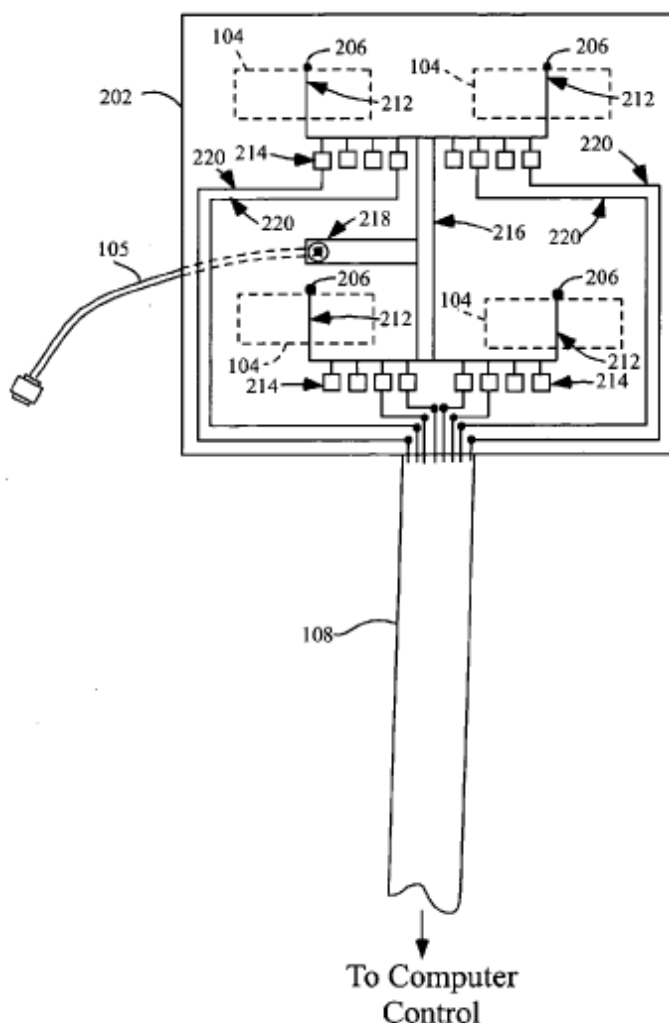
(73) **Assignee: Pinyon Technologies, Inc.**

(21) **Appl. No.: 11/055,490**

(22) **Filed: Feb. 9, 2005**

Publication Classification

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





US 20070097008A1

(19) **United States**

(12) **Patent Application Publication**
Chen

(10) **Pub. No.: US 2007/0097008 A1**

(43) **Pub. Date: May 3, 2007**

(54) **DIPOLE ANTENNA**

Publication Classification

(76) Inventor: **Chih-Lung Chen**, Taipei Hsien (TW)

(51) **Int. Cl.**
H01Q 9/28 (2006.01)

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

Correspondence Address:
**NORTH AMERICA INTELLECTUAL
PROPERTY CORPORATION
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(57) **ABSTRACT**

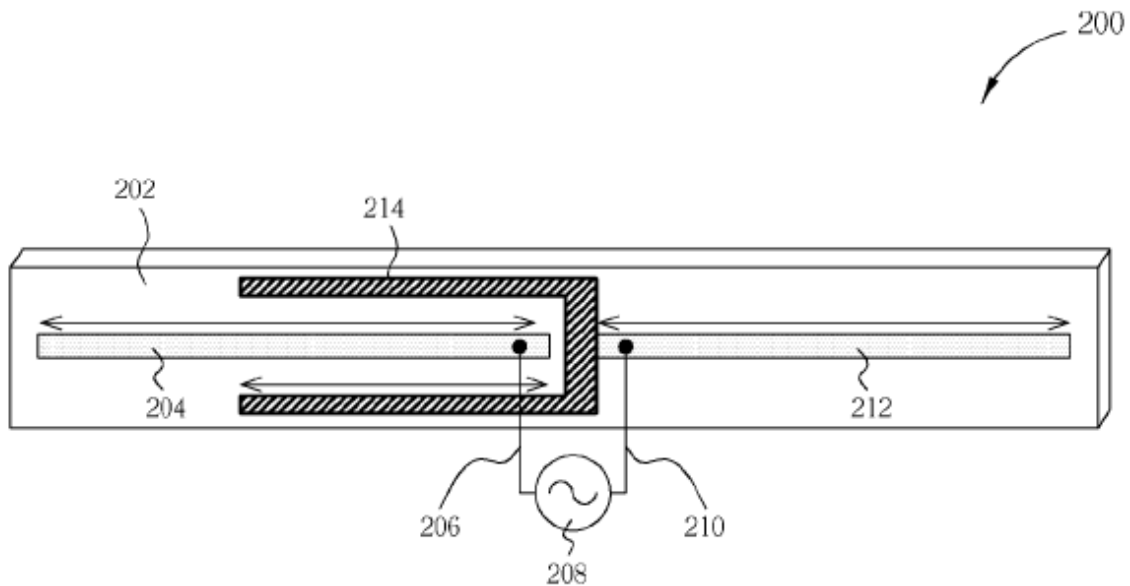
Disposing an additional sleeve-shaped structure, which is also called a sleeve, on a first radiator of both resonant radiators of a dipole antenna so that a cavity is formed between the additional radiator and a second resonant radiator of the dipole antenna. An effective bandwidth of the dipole antenna is increased significantly by a capacitance effect caused by the cavity so that more channels can be received by a general digital television broadband antenna while the dipole antenna is applied on the digital television broadband antenna.

(21) Appl. No.: **11/306,903**

(22) Filed: **Jan. 16, 2006**

(30) **Foreign Application Priority Data**

Nov. 3, 2005 (TW)..... 094138585





US 20070097009A1

(19) **United States**

(12) **Patent Application Publication**
Torres

(10) **Pub. No.: US 2007/0097009 A1**
(43) **Pub. Date: May 3, 2007**

(54) **PLANAR SLOT ANTENNA DESIGN USING OPTICALLY TRANSMISSIVE MATERIALS**

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

(76) **Inventor: Alfonso R Torres, Dayton, OH (US)**

(57) **ABSTRACT**

Correspondence Address:
Intellectual Property Group
Bose McKinney & Evans LLP
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135 North Pennsylvania Street
Indianapolis, IN 46204 (US)

(21) **Appl. No.: 11/554,684**

(22) **Filed: Oct. 31, 2006**

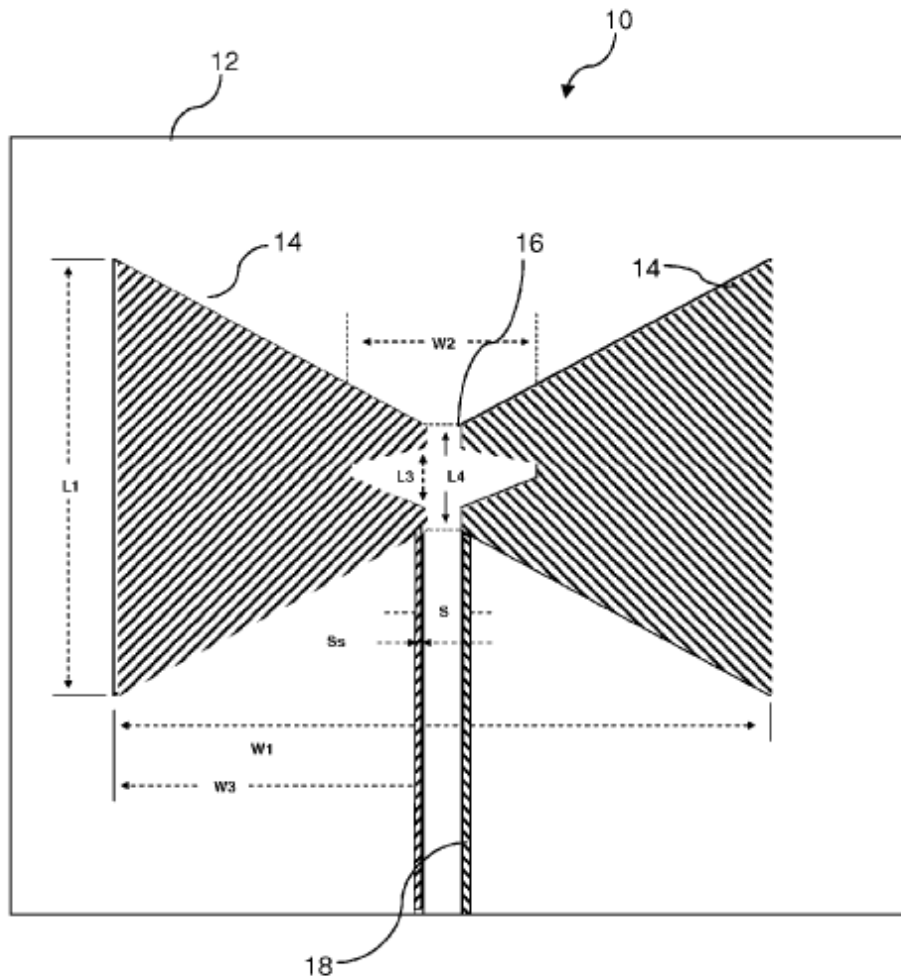
Related U.S. Application Data

(60) **Provisional application No. 60/732,429, filed on Nov. 1, 2005.**

Publication Classification

(51) **Int. Cl.**
H01Q 9/28 (2006.01)

An optically transmissive antenna including an optically transmissive aperture for a slot-type configuration antenna fabricated on a high transmission substrate; coplanar waveguide feedlines formed on the substrate, the coplanar waveguide feedlines defining a center portion and an exterior portion; a first connection point for connecting the center portion to a first conductor; and a second connection point for connecting the exterior portion to a second conductor. The substrate can be rigid or flexible. Also a method of making the antenna including the steps of selecting a high transmission substrate; sputtering the substrate with a highly transparent conductive layer; removing the highly transparent conductive layer from the substrate to form an aperture and a pair of coplanar waveguide feedlines for the antenna. The antenna can be connected using micro-coaxial cable.





US 20070097012A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0097012 A1**
(43) **Pub. Date: May 3, 2007**

(54) **DUAL HEMISPHERE ANTENNA**

Publication Classification

(76) Inventors: **John Sanelli**, Seven Hills, OH (US);
Stephen V. Saliga, Akron, OH (US);
David M. Theobald, Akron, OH (US)

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

(52) **U.S. Cl.** **343/893; 343/841**

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TUCKER, ELLIS & WEST LLP
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CLEVELAND, OH 44115-1414 (US)

(57) **ABSTRACT**

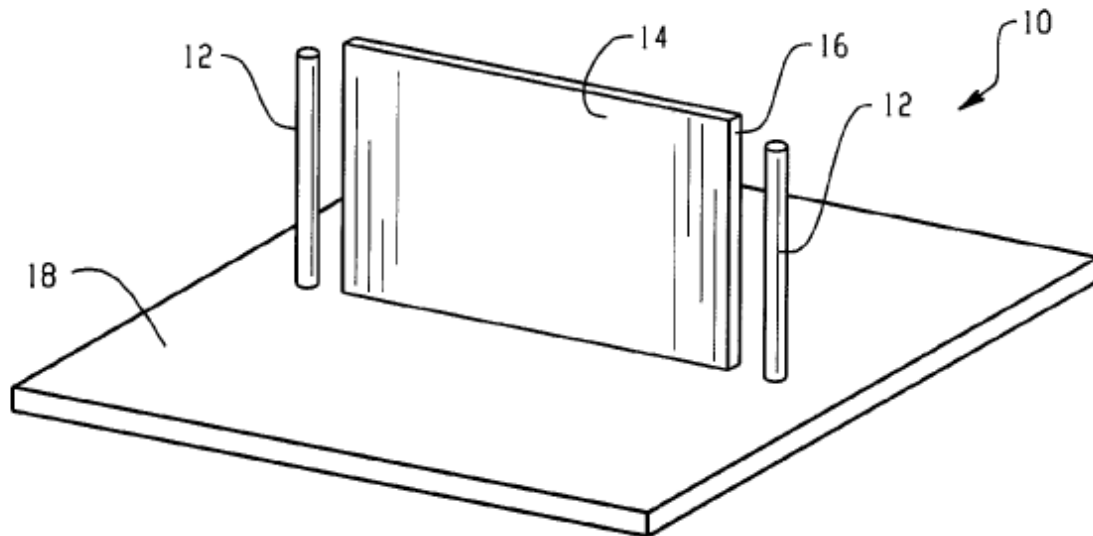
A wireless device is disclosed, including an antenna system comprising one or more antenna elements for sending and receiving a wireless signal. One or more conductive members are included, having an edge displaced from and substantially directed toward the at least one antenna element, and cooperating therewith to establish a multiplicity of hemispherical beam patterns for a wireless signal. Embodiments with a multiplicity of antenna elements exhibit a high degree of isolation between said antenna elements.

(21) Appl. No.: **11/567,553**

(22) Filed: **Dec. 6, 2006**

Related U.S. Application Data

(63) Continuation of application No. 10/686,233, filed on Oct. 15, 2003.





US 20070103308A1

(19) **United States**

(12) **Patent Application Publication**
Chiu

(10) **Pub. No.: US 2007/0103308 A1**

(43) **Pub. Date: May 10, 2007**

(54) **ANTENNA STRUCTURE FOR THE RADIO
FREQUENCY IDENTIFICATION TAG**

Publication Classification

(75) Inventor: **Chien-Chih Chiu**, Gueishan Township
(TW)

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

(52) **U.S. Cl.** **340/572.7**

Correspondence Address:
EGBERT LAW OFFICES
412 MAIN STREET, 7TH FLOOR
HOUSTON, TX 77002 (US)

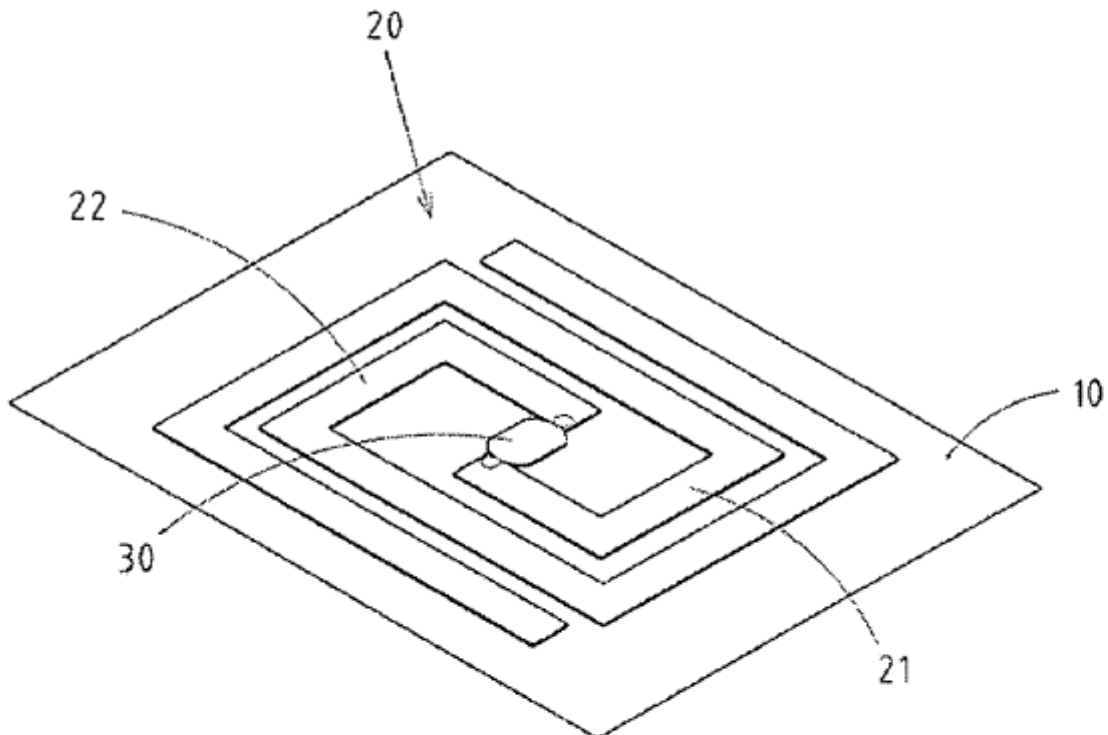
(57) **ABSTRACT**

An antenna structure for the RFID Tag includes a carrier with an antenna attached to a surface thereof, the antenna being made of conductive material. The antenna is connected to an IC chip electronically. The antenna has a first and second radiating body connected to the IC chip separately. The first and second radiating body is connected to the IC chip and expanded in a coil until a proper length is reached. Thus, the first and second radiating body is spaced properly to construct a coiled antenna.

(73) Assignee: **Wha Yu Industrial Co., Ltd.**, Hsinchu
City (TW)

(21) Appl. No.: **11/262,013**

(22) Filed: **Oct. 31, 2005**





US 20070103367A1

(19) **United States**

(12) **Patent Application Publication**
Wang

(10) **Pub. No.: US 2007/0103367 A1**

(43) **Pub. Date: May 10, 2007**

(54) **SLOT AND MULTI-INVERTED-F COUPLING
WIDEBAND ANTENNA AND ELECTRONIC
DEVICE THEREOF**

Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** 343/700 MS; 343/767

(76) **Inventor: Chih-Ming Wang, Hsinchu City (TW)**

(57) **ABSTRACT**

Correspondence Address:
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Suite 250
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Irvine, CA 92618 (US)

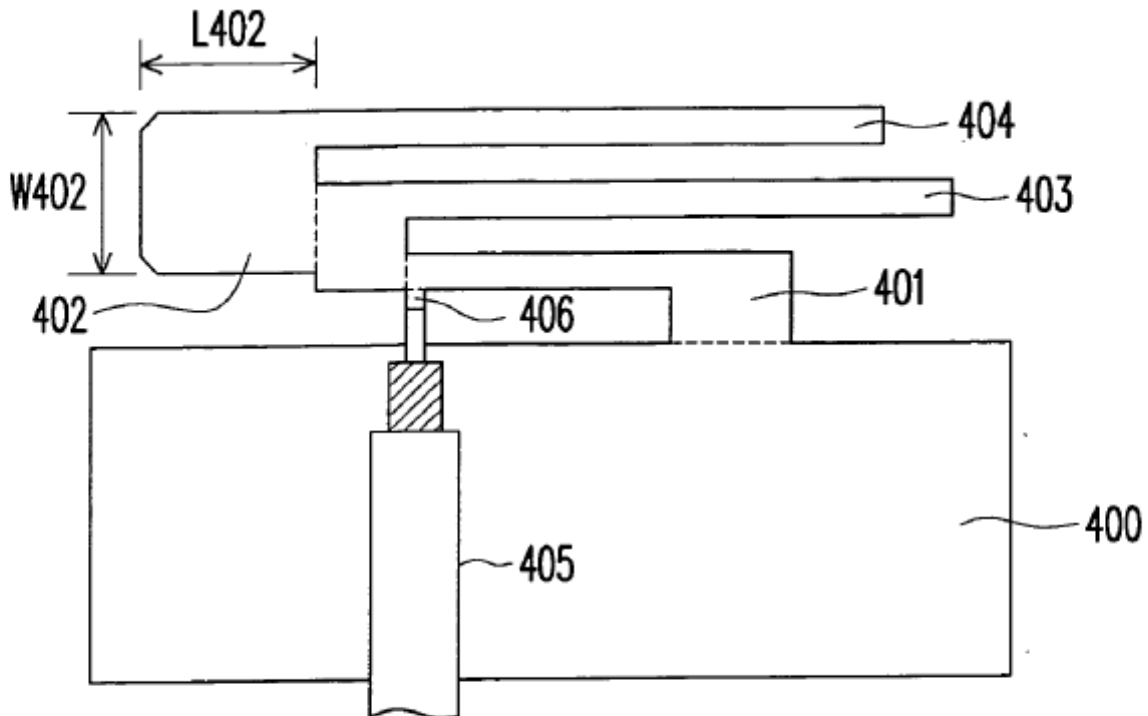
A slot and multi-inverted-F coupling wideband antenna and an electronic device using the aforementioned wideband antenna are disclosed. The antenna includes at least a ground portion, a first radiation portion, a second radiation portion, a third radiation portion, a fine tuning metal portion, and a transmission cable. The first radiation portion is electrically coupled to the ground portion. The fine tuning metal portion is electrically coupled to the first radiation portion. The second radiation portion is electrically coupled to the fine tuning metal portion and forms a first inverted-F antenna with the first radiation portion. The third radiation portion is electrically coupled to the fine tuning metal portion and forms a second inverted-F antenna with the first radiation portion. The transmission cable is electrically coupled to one of the first radiation portion and the fine tuning metal portion.

(21) **Appl. No.: 11/340,144**

(22) **Filed: Jan. 25, 2006**

(30) **Foreign Application Priority Data**

Nov. 9, 2005 (TW)..... 94139234





US 20070103368A1

(19) **United States**

(12) **Patent Application Publication**

Chang et al.

(10) **Pub. No.:** US 2007/0103368 A1

(43) **Pub. Date:** **May 10, 2007**

(54) **REFLECTING BOARD WITH VARIABLE SLOT SIZE FOR A MICROSTRIP REFLECTARRAY ANTENNA**

Publication Classification

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

(75) **Inventors:** **The-Nan Chang**, Taipei City (TW);
Bor-Tsong Chen, Taipei City (TW)

(57) **ABSTRACT**

The present invention relates to a reflecting board for a microstrip reflectarray antenna and, more particularly, to a reflecting board with variable slot size that can improve the design flexibilities of the reflecting board and reduce the sensitivity to the manufacturing tolerances of the microstrip reflectarray antenna. The reflecting board comprises a bottom substrate having a first lower surface, and a top substrate. Plural first microstrip antenna patches, and plural second microstrip antenna patches with rectangular slots are disposed on the upper surface and the second lower surface of the top substrate, respectively. The area of the second microstrip antenna patches is larger than that of the first microstrip antenna patches. Besides, the ratio of the maximum border-length of the rectangular slot to the maximum border-length of the corresponding second microstrip antenna patch is identical for each second microstrip antenna on the second lower surface of the top substrate.

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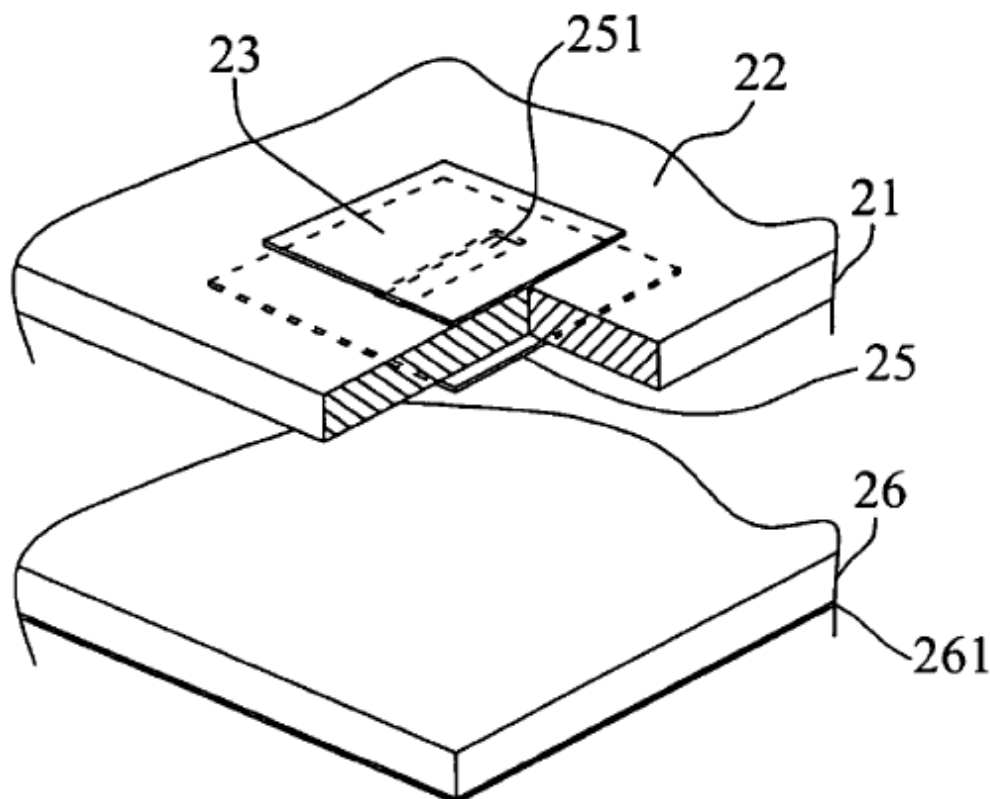
(73) **Assignee:** **Tatung Company**, Taipei City (TW)

(21) **Appl. No.:** **11/362,779**

(22) **Filed:** **Feb. 28, 2006**

(30) **Foreign Application Priority Data**

Nov. 9, 2005 (TW)..... 094139304





US 20070103369A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0103369 A1**

Ratni et al.

(43) **Pub. Date: May 10, 2007**

(54) **PLANAR ANTENNA APPARATUS FOR ULTRA WIDE BAND APPLICATIONS**

(57) **ABSTRACT**

(75) Inventors: **Mohamed Ratni**, Esslingen (DE);
Dragan Krupzevic, Stuttgart (DE)

Correspondence Address:
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
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(73) Assignee: **Sony Deutschland GmbH**, Berlin (DE)

(21) Appl. No.: **11/529,371**

(22) Filed: **Sep. 29, 2006**

(30) **Foreign Application Priority Data**

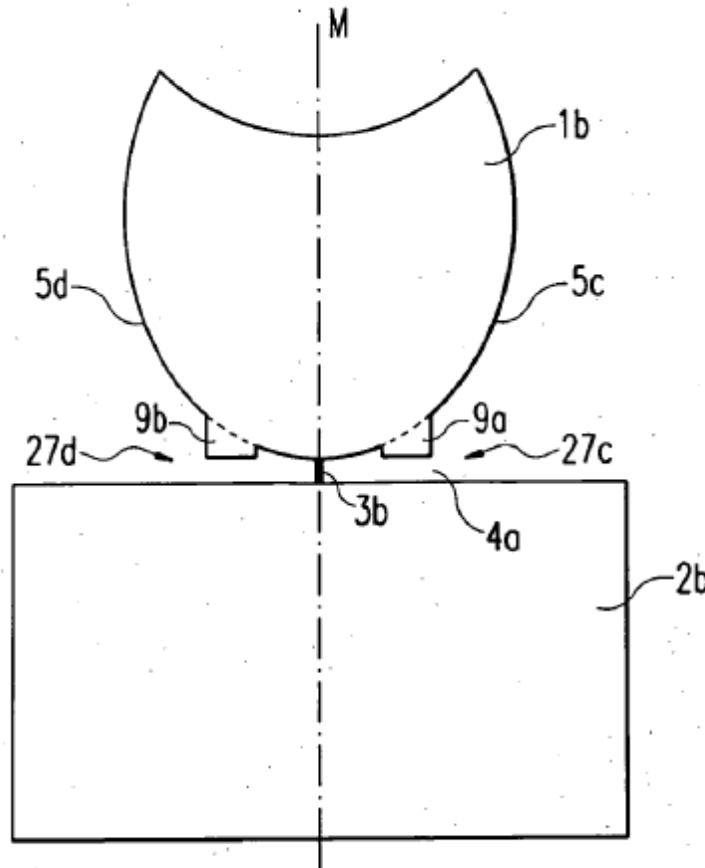
Nov. 9, 2005 (EP)..... 05 024 462.3

Publication Classification

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

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

The present invention relates to the field of microwave antenna and particularly to transmitting and receiving planar antenna design having an omni-directional radiation pattern for ultra wideband (UWB) applications. The object is to provide a planar antenna design for UWB system which is capable of transmitting/receiving microwave signals within the UWB frequency band, capable of a simple planar feeding and a printed low-cost manufacturing antenna, achieves a significant cost reduction by simultaneously applying antenna layout prints while manufacturing classical radio frequency (RF) front-end chip circuits and capable to cope with symmetrical omni-directional transmitting/receiving signals. It is solved by an antenna apparatus for a wireless electronic equipment operable to transmit and/or receive electromagnetic waves in ultra wideband technology comprising at least one radiator device operable to transmit and/or receive an electromagnetic wave, a ground plane device operable to reflect an electromagnetic wave transmitted and/or received by the radiator device and a feeding device operable to supply signals from and/or to the radiator device, characterised in that the radiator device and the ground plane device are arranged along a common symmetry axis and are planar on the same plane, whereby the radiator device tapers towards the ground plane device.





US 20070103370A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0103370 A1**

Hung et al.

(43) **Pub. Date: May 10, 2007**

(54) **MULTI-BAND ANTENNA**

(30) **Foreign Application Priority Data**

Nov. 4, 2005 (TW)..... 94138687

(75) Inventors: **Chen-Ta Hung**, Tu-Cheng (TW);
Shu-Yean Wang, Tu-Cheng (TW);
Hsien-Sheng Tseng, Tu-Cheng (TW)

Publication Classification

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

Correspondence Address:

WEI TE CHUNG
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1650 MEMOREX DRIVE
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(57) **ABSTRACT**

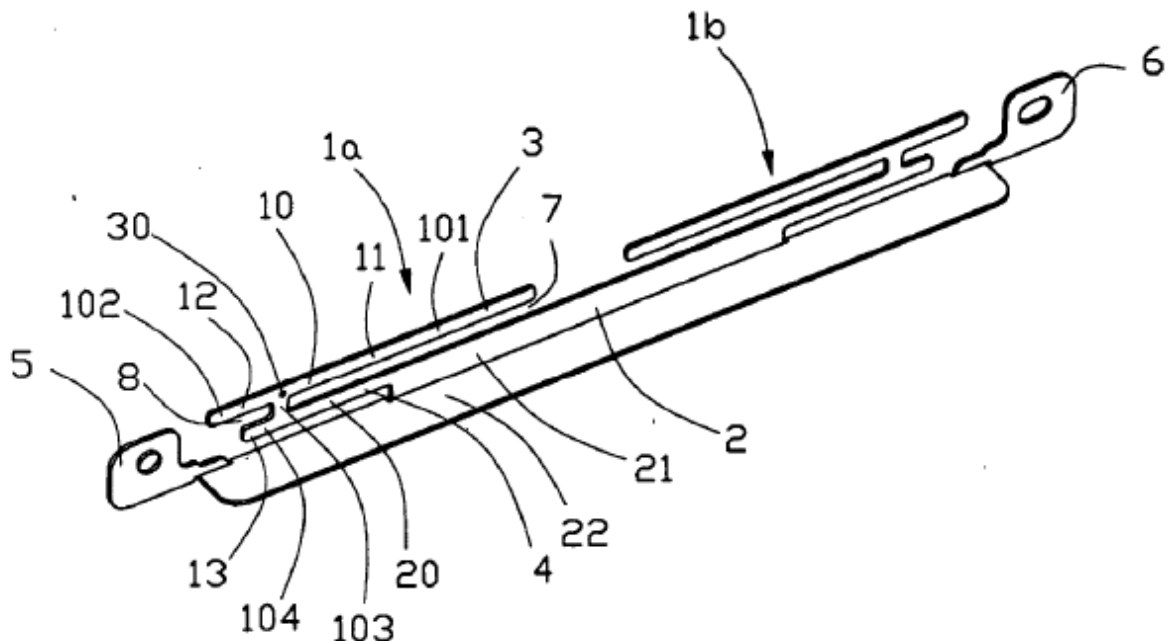
A multi-band antenna (1) includes a first antenna (1a), a second antenna (1b) and a grounding element (2). The first antenna (1a) includes a radiating element (10), a connecting element (20) connecting the radiating element (10) and the grounding element (2) and a feeding line. The radiating element (10) includes a first radiating section (11) working at a lower frequency, a second radiating (12) section working at a higher frequency and a third radiating section (13).

(73) Assignee: **HON HAI PRECISION IND. CO., LTD.**

(21) Appl. No.: **11/593,213**

(22) Filed: **Nov. 6, 2006**

1





US 20070103371A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2007/0103371 A1**

Kim et al.

(43) **Pub. Date:**

May 10, 2007

(54) **BUILT-IN ANTENNA HAVING CENTER FEEDING STRUCTURE FOR WIRELESS TERMINAL**

(30) **Foreign Application Priority Data**

Jun. 13, 2003 (KR) 10-2003-0038221

(75) Inventors: **Byung-Nam Kim**, Gyeonggi-do (KR);
Seung-Yong Lee, Gyeonggi-do (KR)

Publication Classification

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WASHINGTON, DC 20043-9998 (US)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
(52) **U.S. Cl.** **343/702; 343/895**

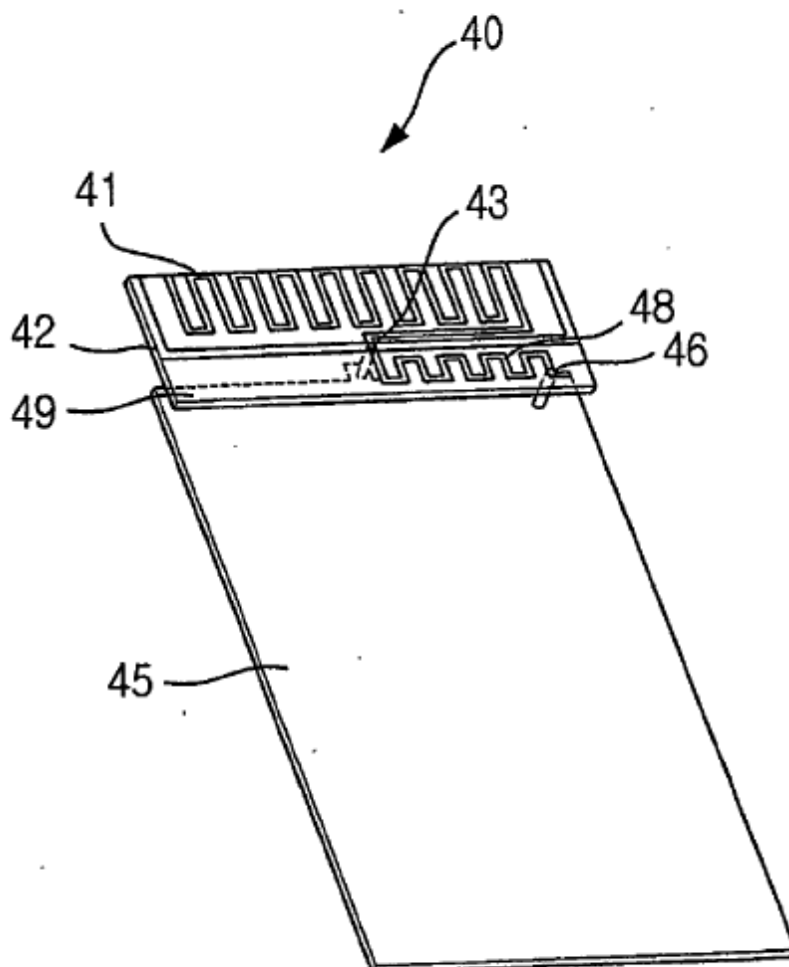
(73) Assignee: **Ace Technology**, Namdong-gu, Incheo (KR)

(57) **ABSTRACT**

(21) Appl. No.: **10/560,381**
(22) PCT Filed: **Nov. 12, 2003**
(86) PCT No.: **PCT/KR03/02436**

A built-in antenna having a center feed structure for wireless terminal. The antenna includes: a feeding means for providing an electromagnetic signal; and a radiating means for radiating the electromagnetic signal, wherein the feeding means is located on a point ranging from a midpoint of the antenna. The antenna radiates a nondirectional signal and can be embedded in a wireless terminal.

§ 371(c)(1),
(2), (4) Date: **Dec. 13, 2005**





US 20070103373A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0103373 A1**

(43) **Pub. Date: May 10, 2007**

(54) **MINIATURIZED INTEGRATED MONOPOLE ANTENNA**

Publication Classification

(75) Inventors: **Richard Wallace**, Jaerfaella (SE); **Are Bjorneklett**, Vaesteras (SE)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
(52) **U.S. Cl.** **343/702; 343/713**

(57) **ABSTRACT**

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Indianapolis, IN 46204 (US)

The invention is related to a monopole antenna provided for short-range applications, having a conductive pattern arranged on a dielectric substrate. The conductive pattern has a first straight radiating element connected to an antenna feeding point, a second straight radiating element arranged essentially parallel to the first radiating element and interconnected to it, and further a third straight radiating element arranged between the first and second radiating elements and essentially parallel to both of the first and second radiating elements and interconnected to the second radiating element. The electric and magnetic fields of the first and the third radiating elements are thereby interacting constructively. The invention is also related to an integrated circuit having such monopole antenna, and a method for manufacturing such monopole antenna.

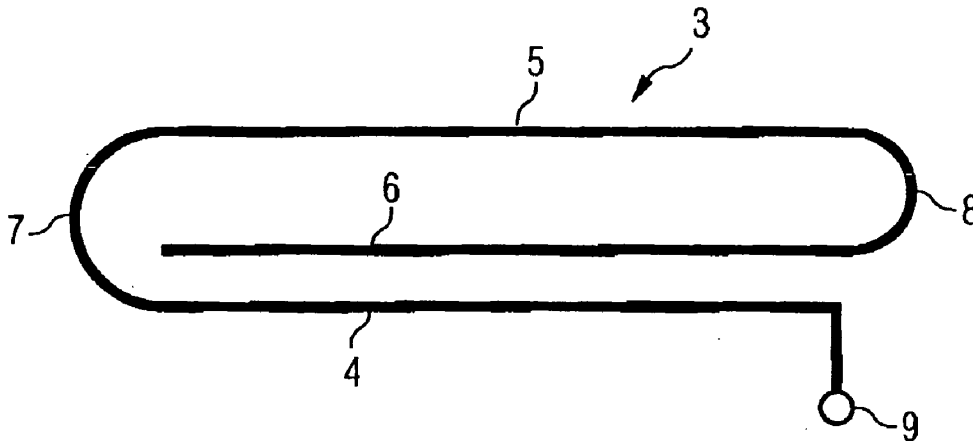
(73) Assignee: **Infineon Technologies AG**, Munich (DE)

(21) Appl. No.: **11/522,097**

(22) Filed: **Sep. 15, 2006**

(30) **Foreign Application Priority Data**

Sep. 15, 2005 (EP) 05020115.1





US 20070103375A1

(19) **United States**
(12) **Patent Application Publication**
Laubner et al.

(10) **Pub. No.: US 2007/0103375 A1**
(43) **Pub. Date: May 10, 2007**

(54) **MULTIBAND ANTENNAS AND DEVICES**

Publication Classification

(76) Inventors: **Thomas S. Laubner**, Merrimac, MA (US); **Robert Schilling**, Londonderry, NH (US)

(51) **Int. Cl.**
H01Q 1/32 (2006.01)
(52) **U.S. Cl.** **343/713; 343/702**

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(57) **ABSTRACT**

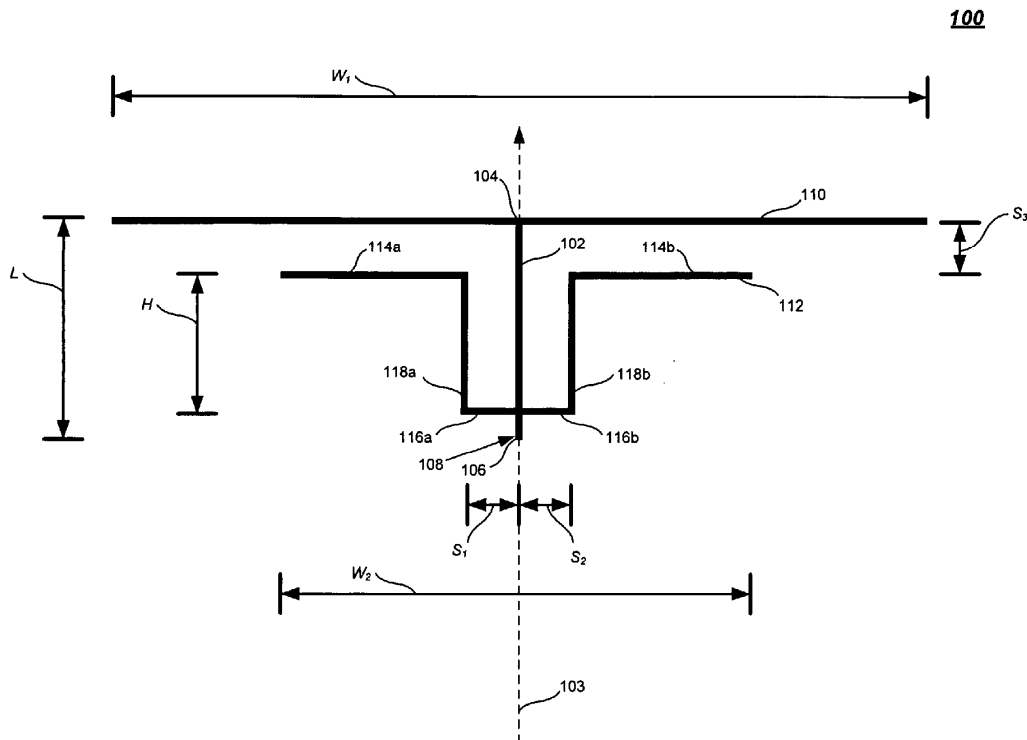
(21) Appl. No.: **11/532,942**

(22) Filed: **Sep. 19, 2006**

Related U.S. Application Data

(60) Provisional application No. 60/734,403, filed on Nov. 8, 2005.

An apparatus includes an antenna (e.g., a monopole), a first load, and a second load. The antenna, which extends substantially along an axis, has a first end and a second end. The first load is coupled to the antenna at the first end, while the second load is coupled to the antenna between the first end and the second end. Both the first and second loads are symmetrical with reference to the axis. The apparatus is arranged to operate in at least two frequency bands, such as the AMPS band from about 824 MHz to 894 MHz and the PCS band from about 1850 MHz to 1990 MHz.



100



US 20070103376A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0103376 A1**

(43) **Pub. Date: May 10, 2007**

(54) **MICROSTRIP LOG-PERIODIC ANTENNA
ARRAY HAVING GROUNDED
SEMI-COPLANAR
WAVEGUIDE-TO-MICROSTRIP LINE
TRANSITION**

Related U.S. Application Data

(60) Provisional application No. 60/617,454, filed on Oct. 8, 2004.

Publication Classification

(51) **Int. Cl.**
H01Q 11/10 (2006.01)
(52) **U.S. Cl.** **343/792.5**

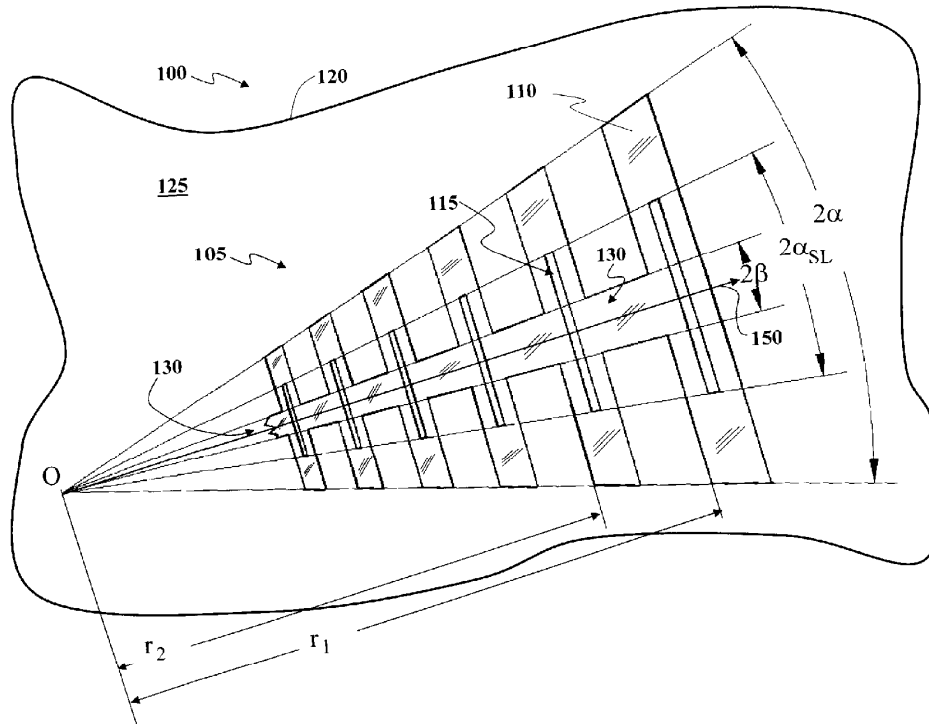
(76) Inventors: **Mark Russell Goldberg**, Simi Valley, CA (US); **Harold Kregg Hunsberger**, Simi Valley, CA (US)

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(57) **ABSTRACT**

A log-periodic antenna having a layer of dielectric media interposed between a microstrip log-periodic portion and a slot log-periodic portion is described. Also described are antenna embodiments having a curvilinear, electrically conductive feed line and a substantially co-extensive curvilinear slot transmission line and additional embodiments including an array of two or more log-periodic antennas.

(21) Appl. No.: **11/163,119**
(22) Filed: **Oct. 5, 2005**





US 20070103377A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0103377 A1**

(43) **Pub. Date: May 10, 2007**

(54) **ANTENNA SYSTEM WITH A CONTROLLED DIRECTIONAL PATTERN, A TRANSCEIVER AND A NETWORK PORTABLE COMPUTER**

(30) **Foreign Application Priority Data**

Mar. 27, 2002 (RU)..... 2002108661

Publication Classification

(75) Inventors: **Oleg Y. Abramov**, St. Petersburg (RU);
Alexander G. Kashkarov, St. Petersburg (RU);
Farid I. Nagaav, St. Petersburg (RU)

(51) **Int. Cl.**
H01Q 19/10 (2006.01)

(52) **U.S. Cl.** **343/818; 343/819**

(57) **ABSTRACT**

The invention is related to antenna systems and transceiving equipment for network portable computers. The antenna system comprises a flat substrate (2), carrying at least two directional flat antennas oriented in a fan-like fashion (3), and a commutation switch (6) to control the directional pattern of the antenna system. The commutation switch is made so as to make it possible to switch on to one or two or more antennas simultaneously. The transceiving device comprises the antenna system (1), a reception/transmission switch (12), a transmitter (14), a receiver (16), an antenna system operation control unit (18) to control the operation of the antenna system in omnidirectional mode, directional scanning mode or stationary directional mode, and a controller (17). It can also be supplemented with a signal quality evaluation unit (20) and a signal identification unit (21). The network portable computer incorporates the transceiving device, the antenna system for which is fixed to the computer case by a hinge.

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(73) Assignee: **AIRGAIN, INC.**, CARLSBAD, CA (US)

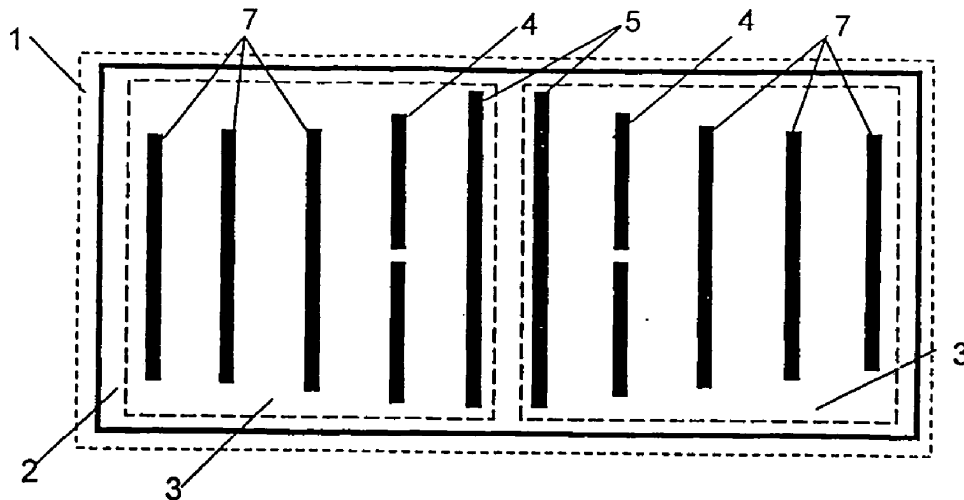
(21) Appl. No.: **10/510,157**

(22) PCT Filed: **Mar. 24, 2003**

(86) PCT No.: **PCT/RU03/00119**

§ 371(c)(1),

(2), (4) Date: **Oct. 5, 2004**





US 20070103378A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0103378 A1**

(43) **Pub. Date: May 10, 2007**

(54) **ANTENNA DEVICE WITH A CONTROLLED DIRECTIONAL PATTERN AND A PLANAR DIRECTIONAL ANTENNA**

Publication Classification

(51) **Int. Cl.**
H01Q 19/30 (2006.01)

(52) **U.S. Cl.** **343/819**

(76) Inventors: **Oleg Jurievich Abramov**, St. Petersburg (RU); **Aleksandr Germanovich Kashkarov**, St. Petersburg (RU); **Farid Ibragimovich Nagaev**, St. Petersburg (RU)

(57) **ABSTRACT**

The invention relates to antenna systems used in local wireless communications networks. The antenna system includes planar directional antennas (1), each of which is made as a dielectric plate (2), with an active element (5) of the antenna (1) mounted on said plate. The surface of the plate (2) that faces the active element is metallized and serves as a reflector (6) of the antenna (1). The plates (2) are interconnected along their edges in such a way as to form lateral facets of a hollow frame (9) of the device. The end face (10) is made as a dielectric plate (11) with the external surface metallized and can also contain an active element (12) of the antenna (13). An antenna commutation switch (14) connected to a switch control unit (16) and to active elements (5) of the antennas (1) is mounted on the inner surface of the end face (10) of the frame (9). Active element (5) is mounted on said plate by means of pins cut in the body of the active element (5) and bent during mounting. This invention permits to manufacture structurally simple and inexpensive antennas and antenna systems based on printed circuits and to exclude manual operations from the manufacturing and assembly of said antennas and antenna systems.

Correspondence Address:
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SAN DIEGO, CA 92101 (US)

(21) Appl. No.: **10/536,547**

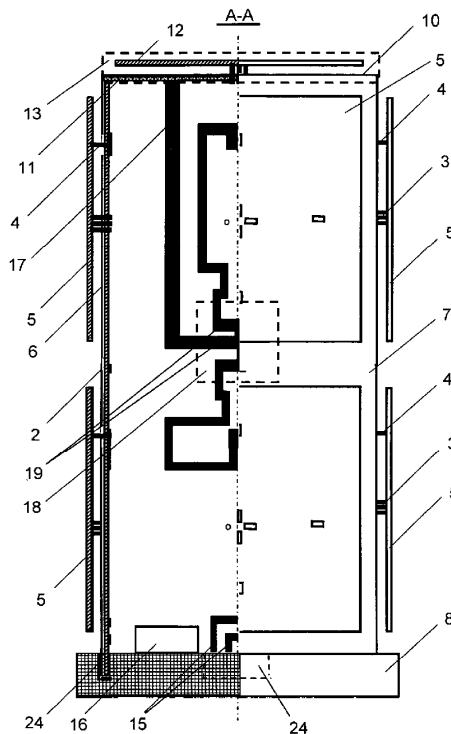
(22) PCT Filed: **Dec. 2, 2003**

(86) PCT No.: **PCT/RU03/00542**

§ 371(c)(1),
(2), (4) Date: **Jan. 22, 2007**

(30) **Foreign Application Priority Data**

Dec. 2, 2002 (RU) 2002132846





US 20070107671A1

(19) **United States**

(12) **Patent Application Publication**
Goetzl

(10) **Pub. No.: US 2007/0107671 A1**

(43) **Pub. Date: May 17, 2007**

(54) **SEAL FOR PET COLLAR ANTENNA**

Publication Classification

(75) Inventor: **Brent Andrew Goetzl**, Orinda, CA
(US)

(51) **Int. Cl.**
A01K 15/02 (2006.01)
A01K 27/00 (2006.01)

(52) **U.S. Cl.** **119/859**

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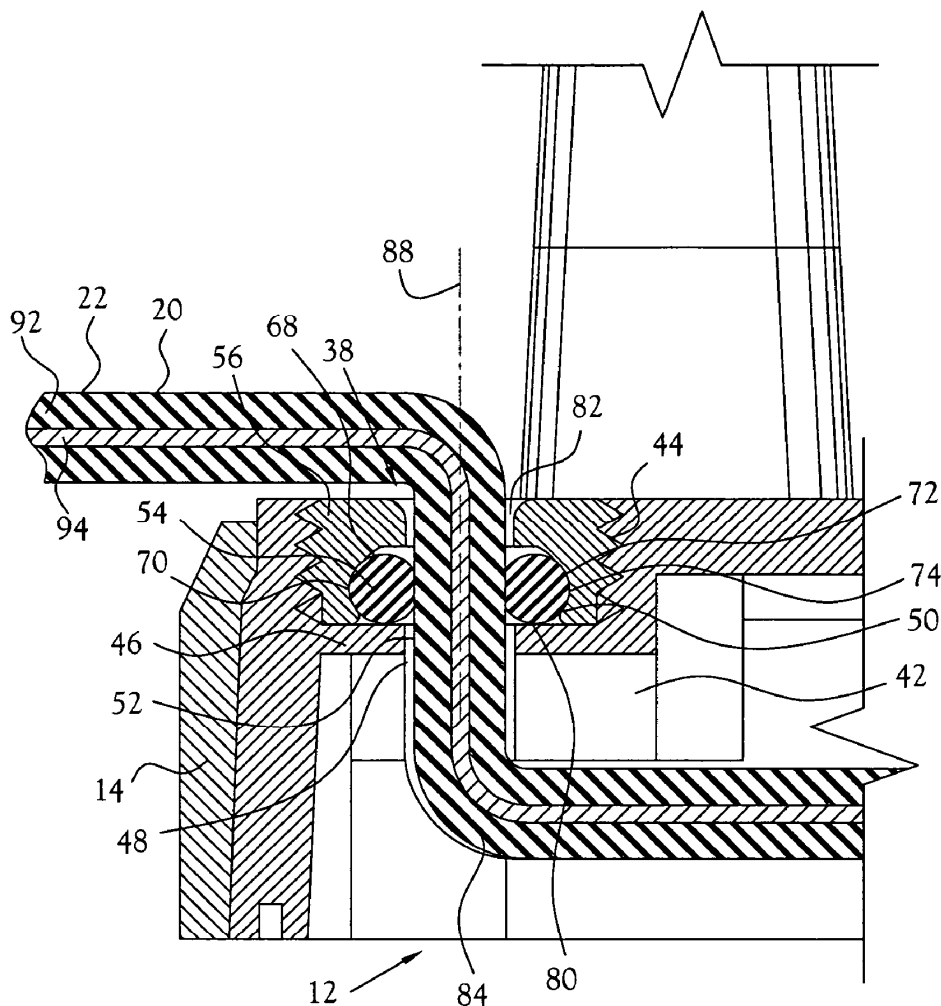
(57) **ABSTRACT**

An antenna mounting for an animal collar including an O-ring and associated retainer disposed in an opening through the housing of a radio frequency receiver. The O-ring is compressed into multiple sealing locations between the circumference of the antenna and its surrounding structure to create a resilient hermetic seal between the antenna and such surrounding structure, and to resiliently suspend the antenna within the opening in the housing.

(73) Assignee: **Radio Systems Corporation**, Knoxville, TN

(21) Appl. No.: **11/274,019**

(22) Filed: **Nov. 15, 2005**





US 20070109194A1

(19) **United States**

(12) **Patent Application Publication**
Biddulph

(10) **Pub. No.: US 2007/0109194 A1**

(43) **Pub. Date: May 17, 2007**

(54) **PLANAR ANTI-REFLECTIVE
INTERFERENCE ANTENNAS WITH
EXTRA-PLANAR ELEMENT EXTENSIONS**

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

(75) **Inventor: Stuart Biddulph, Provo, UT (US)**

(57) **ABSTRACT**

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Salt Lake City, UT 84145-0898 (US)

Disclosed herein are wireless products adapted to be positioned in a normal or resting position, that also include an antenna composed of a set of elements arranged in a plane in a radially symmetrical configuration providing a reduction in the susceptibility of reflected waves having the potential to cancel or weaken a main wave or signal, the plane positioned with respect to the normal position to direct a main communication line with a second wireless device into the plane and provide reception of a main and/or secondary signal at a plurality of phases. One exemplary product is a wireless conferencing device configured to rest on a tabletop, the antenna array oriented in a horizontal plane. Detailed information on various example embodiments of the inventions are provided in the Detailed Description below, and the inventions are defined by the appended claims.

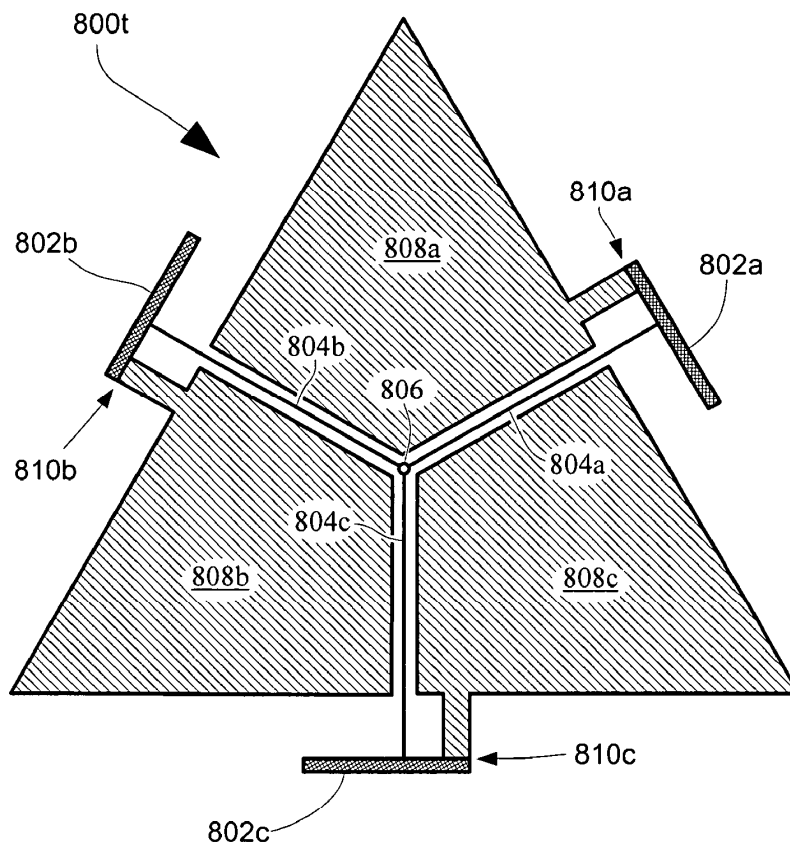
(73) **Assignee: ClearOne Communications, Inc.**

(21) **Appl. No.: 11/274,644**

(22) **Filed: Nov. 15, 2005**

Publication Classification

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





US 20070109195A1

(19) **United States**

(12) **Patent Application Publication**
Tseng

(10) **Pub. No.: US 2007/0109195 A1**

(43) **Pub. Date: May 17, 2007**

(54) **ULTRA WIDE BANDWIDTH PLANAR ANTENNA**

Publication Classification

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

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

(75) **Inventor: Kuo-Hua Tseng, Kaohsiung (TW)**

(57) **ABSTRACT**

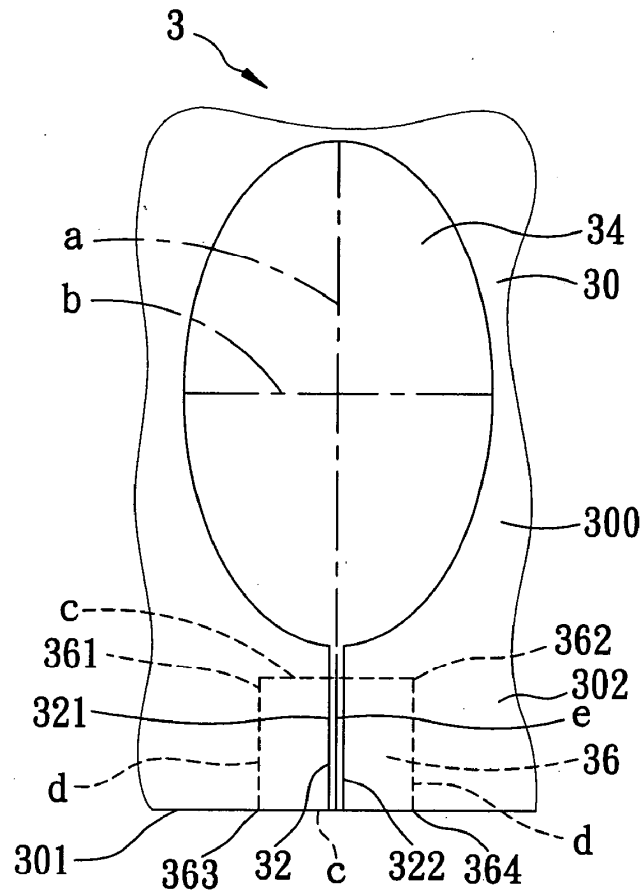
Correspondence Address:
Ladas & Parry
Suite 2100
5670 Wilshire Boulevard
Los Angeles, CA 90036-5679 (US)

A planar antenna, which is operable within the ultra wide bandwidth, includes a dielectric substrate, an elliptical radiating element, a feeding element, and a grounding element. The dielectric substrate has opposite first and second surfaces. The elliptical radiating element is formed on the first surface of the dielectric substrate, and has major and minor axes. The ratio of the major axis to the minor axis is between 1.25 and 1.7. The feeding element is formed on the first surface of the dielectric substrate, and is coupled to the radiating element. The grounding element is formed on the second surface of the dielectric substrate, and is coupled to the feeding element.

(73) **Assignee: UNIVERSAL SCIENTIFIC INDUSTRIAL CO., LTD.**

(21) **Appl. No.: 11/281,639**

(22) **Filed: Nov. 16, 2005**





US 20070109196A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0109196 A1**

(43) **Pub. Date: May 17, 2007**

(54) **AN EMC METAL-PLATE ANTENNA AND A COMMUNICATION SYSTEM USING THE SAME**

Publication Classification

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

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

(76) Inventors: **Chia-Lun Tang**, Miaoli County (TW);
Kin-Lu Wong, Kaohsiung City (TW);
Chih-Ming Su, Taipei City (TW)

(57) **ABSTRACT**

Correspondence Address:
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE
7 FLOOR-1, NO. 100
ROOSEVELT ROAD, SECTION 2
TAIPEI 100 (TW)

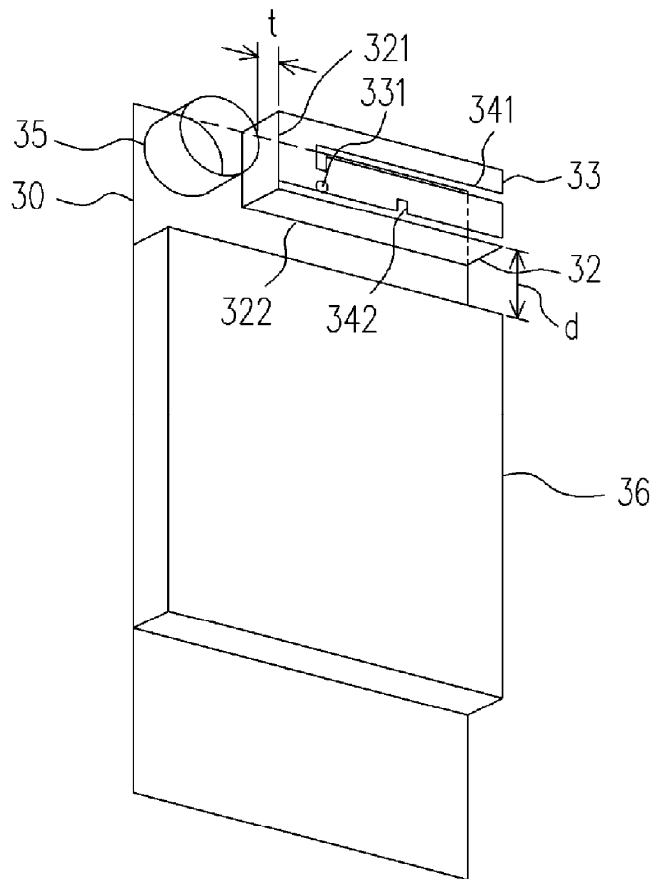
An EMC (electromagnetic compatible) antenna having a shielding metal wall to effectively reduce the possible coupling with nearby electronic elements is presented. The antenna includes: a ground plane, a bent ground plate, and a radiating plate. The bent ground plate is vertically connected to the ground plane and functions as an effective shielding metal wall to eliminate or greatly reduce the possible EM coupling between the antenna and nearby electronic elements. The radiating plate is used to generate the operating resonant mode of the antenna and is generally parallel to the ground plane. The radiating plate is also electrically connected to and encircled by the bent ground plane.

(21) Appl. No.: **11/307,070**

(22) Filed: **Jan. 23, 2006**

(30) **Foreign Application Priority Data**

Nov. 15, 2005 (TW)..... 94140042





US 20070109198A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0109198 A1**

(43) **Pub. Date: May 17, 2007**

(54) **MULTI BAND INDOOR ANTENNA**

Related U.S. Application Data

(75) Inventors: **Ofer Saban**, Quidron (IL); **Benny Almog**, Beit Arye (IL)

(60) Provisional application No. 60/735,867, filed on Nov. 14, 2005.

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Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/700 MS; 343/895**

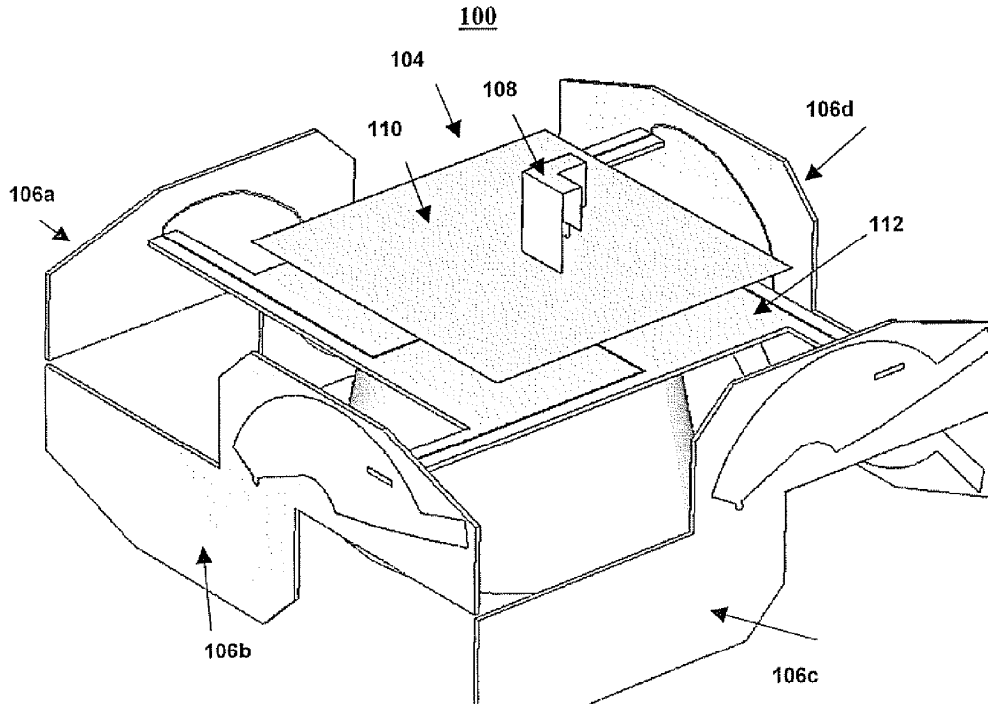
(73) Assignee: **MOBILE ACCESS NETWORKS LTD.**, Lod (IL)

(57) **ABSTRACT**

A wide band indoor antenna includes a low band section with four modified spiral (MSE) elements, a high band section with a bent folded monopole (BFM) radiator mounted on a ground plane and a feeding plate for feeding the low band section and the high band section via a diplexer. The BFM radiator mounted on the ground plane can serve independently as a high frequency monopole antenna

(21) Appl. No.: **11/558,913**

(22) Filed: **Nov. 12, 2006**





US 20070109199A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0109199 A1**

(43) **Pub. Date: May 17, 2007**

(54) **MULTI-BAND ANTENNA WITH
LOW-PROFILE**

(30) **Foreign Application Priority Data**

Nov. 14, 2005 (TW)..... 94139851

(75) Inventors: **Chen-Ta Hung**, Tu-Cheng (TW);
Shu-Yean Wang, Tu-Cheng (TW);
Lung-Sheng Tai, Tu-Cheng (TW)

Publication Classification

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

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

Correspondence Address:

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(57) **ABSTRACT**

A multi-band antenna includes a radiating element, a connecting element and a grounding element; the radiating element is made from a metal plate, and includes a first radiating portion and a second radiating portion having an end connect to one end of the first radiating portion. The first radiating portion, the second radiating portion and the connecting element is on the same planar, and the first radiating portion and the second radiating portion surround a rectangle rim.

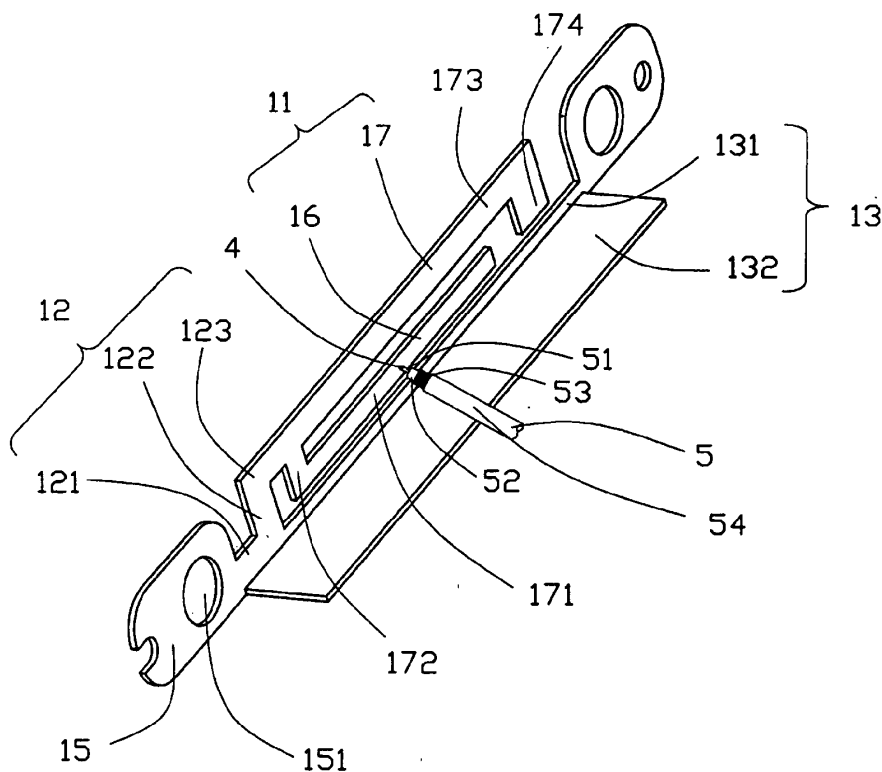
(73) Assignee: **HON HAI PRECISION IND. CO.,
LTD.**

(21) Appl. No.: **11/599,644**

(22) Filed: **Nov. 14, 2006**

10

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US 20070109200A1

(19) **United States**
 (12) **Patent Application Publication** (10) **Pub. No.: US 2007/0109200 A1**
 Su (43) **Pub. Date: May 17, 2007**

(54) **MULTI-BAND ANTENNA**

Publication Classification

(75) Inventor: **Wen-Fong Su, Tu-Cheng (TW)**

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

Correspondence Address:
WEI TE CHUNG
FOXCONN INTERNATIONAL, INC.
1650 MEMOREX DRIVE
SANTA CLARA, CA 95050 (US)

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

(57) **ABSTRACT**

(73) Assignee: **HON HAI PRECISION IND. CO., LTD.**

A multi-band antenna used in an electronic device, including a radiating element, a grounding element, a connecting element connecting the radiating element and the grounding element, a feeding cap, and an installing element. The feeding cap locates at the feeding point according to calculation. An inner conductor of a feeding line (no shown) of the multi-band antenna in accordance with the present invention is capable of being soldered inerrably at the feeding cap, accordingly, the multi-band antenna can achieve a good performance of operation.

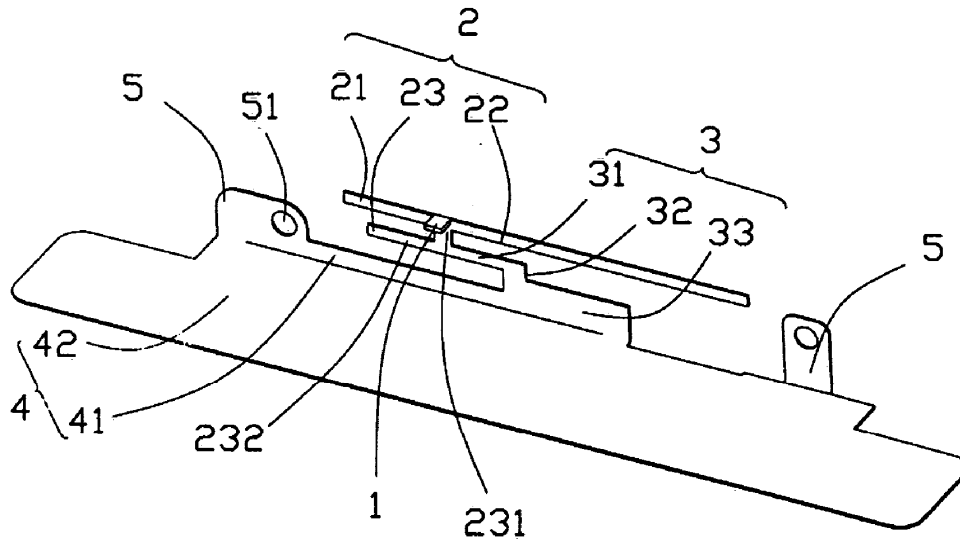
(21) Appl. No.: **11/599,659**

(22) Filed: **Nov. 14, 2006**

(30) **Foreign Application Priority Data**

Nov. 14, 2005 (TW)..... 94139847

10
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US 20070109201A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0109201 A1**

(43) **Pub. Date: May 17, 2007**

(54) **PROXIMITY-COUPLED FOLDED-J ANTENNA**

Publication Classification

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

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

(75) Inventors: **Stanislav Licul**, Plantation, FL (US);
Pha C. Nguyen, Lake Worth, FL (US);
Lorenzo A. Ponce De Leon, Lake Worth, FL (US)

(57) **ABSTRACT**

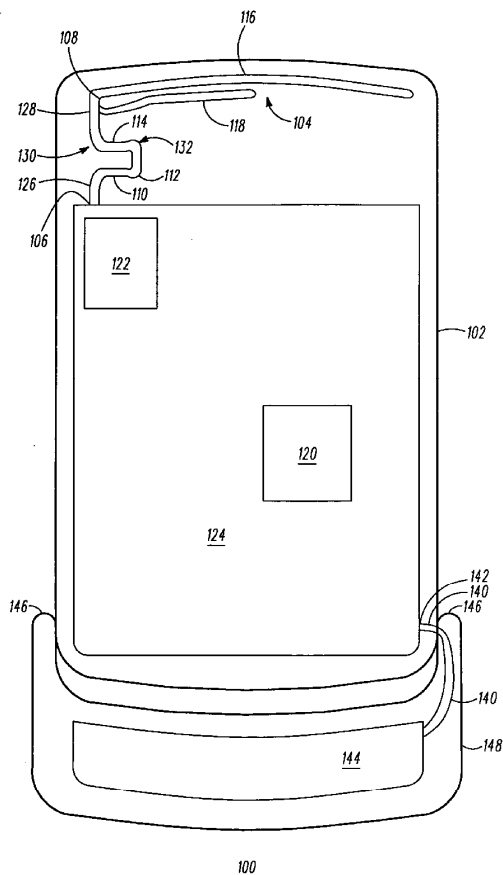
Correspondence Address:
FLEIT, KAIN, GIBBONS, GUTMAN, BONGINI & BIANCO P.L.
551 N.W. 77TH STREET, SUITE 111
BOCA RATON, FL 33487 (US)

A Proximity Coupled-Folded-J Antenna PC-FJA (104) includes a ground plane (240), first resonant element (352) with a "J" shape that resonates at a first radio frequency, a second resonant element (350) positioned within the "J" shape and that resonates at a second radio frequency, and a third resonant element (118) with a portion that is substantially parallel to and removed from the plane of the "J" shape and that resonates at a third radio frequency. The PC-FJA (104) has a fourth resonant element (130) with a loop (132) in a plane perpendicular to and removed from the plane of the "J" shape. The fourth resonant element (130) resonates at a fourth radio frequency. These elements are ohmically coupled to a connection arm (108). The ground plane (240) is removed from PC-FJA (104) and is perpendicular to the plane of the "J" shape.

(73) Assignee: **MOTOROLA, INC., SCHAUMBURG, IL**

(21) Appl. No.: **11/273,973**

(22) Filed: **Nov. 14, 2005**





US 20070109202A1

(19) **United States**

(12) **Patent Application Publication**
Vance

(10) **Pub. No.: US 2007/0109202 A1**

(43) **Pub. Date: May 17, 2007**

(54) **MULTI-FREQUENCY BAND ANTENNA
DEVICE FOR RADIO COMMUNICATION
TERMINAL HAVING WIDE HIGH-BAND
BANDWIDTH**

(76) Inventor: **Scott Vance**, Staffanstorp (SE)

Correspondence Address:
**MYERS BIGEL SIBLEY & SAJOVEC
PO BOX 37428
RALEIGH, NC 27627 (US)**

(21) Appl. No.: **11/274,557**

(22) Filed: **Nov. 15, 2005**

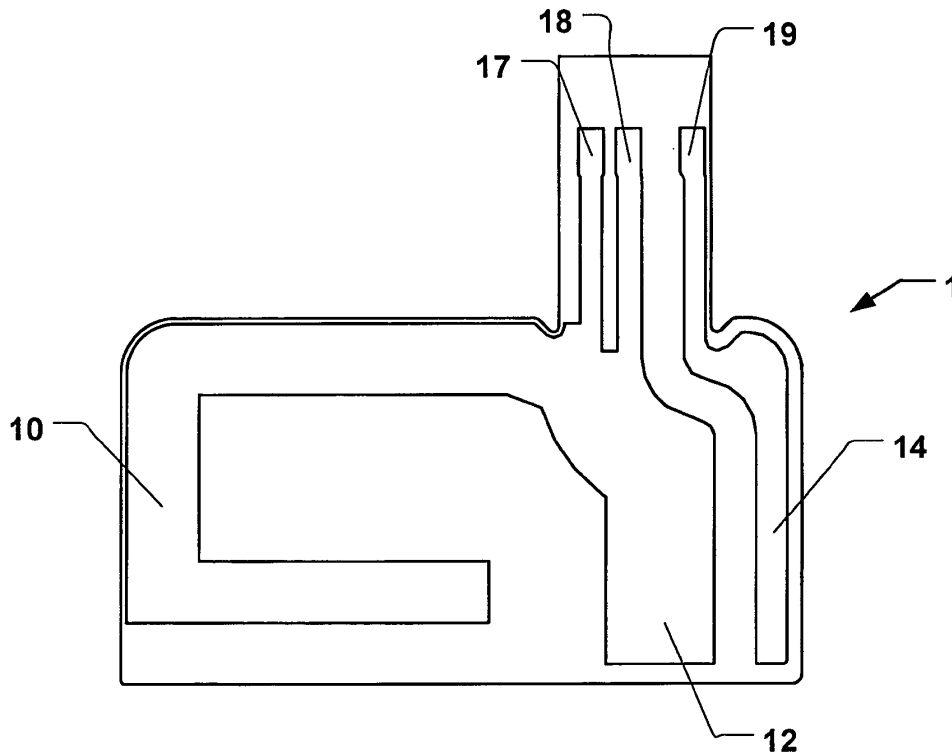
Publication Classification

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

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

(57) **ABSTRACT**

A multi-band radio antenna device for a radio communication terminal is disclosed. The antenna has an integral feed and ground structure electrically connected to a first radiating antenna element and a second radiating element. The first radiating element comprises a first continuous trace of conductive material and has a continuous trace has a first branch tuned to radiate at first frequencies in a first frequency band, and a second branch, which is tuned to radiate in a second frequency band at second frequencies approximately equal to or less than two times the first frequencies. The second radiating antenna element comprises a second continuous trace of conductive material, wherein the second continuous trace has a third branch, which is tuned to resonate in a third frequency band at third frequencies that are higher than the second frequencies, and which is capacitively coupled to the feed and ground structure and arranged substantially adjacent to the second branch. The first branch comprises a first section, composing approximately $\frac{1}{3}$ to $\frac{2}{3}$ of the total length of the first branch, wherein the first section is essentially straight and connected to said feed and ground structure at a first end thereof, and a second section in direct connection to a second end of said first section that is tightly meandered.





US 20070109203A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0109203 A1**

(43) **Pub. Date: May 17, 2007**

(54) **RESONANT FREQUENCY TUNABLE ANTENNA APPARATUS**

(30) **Foreign Application Priority Data**

Aug. 5, 2005 (KR)..... 10-2005-0071583

(75) Inventors: **Il Hwan Park**, Suwon (KR); **Hyun Hak Kim**, Kyungki-Do (KR); **Yong Bum Lee**, Suwon (KR); **Jong Lae Kim**, Ansan (KR)

Publication Classification

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

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

(57) **ABSTRACT**

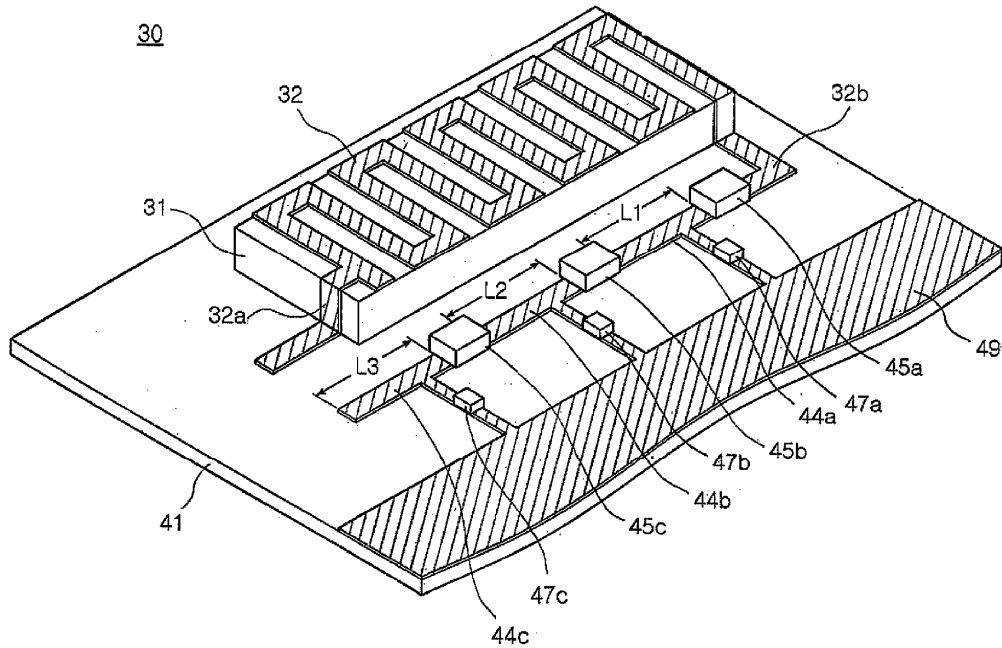
In a tunable antenna apparatus, a dielectric block is mounted on a printed circuit board. A radiation pattern has a feeding part formed on the dielectric block and connected commonly to a feeding source and a variable DC power. Also, a connecting pattern extends from the radiation pattern onto the printed circuit board. In addition, at least one tuning pattern is formed on the printed circuit board and connected in series to the connecting pattern via at least one switching device.

Correspondence Address:
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1700 DIAGONAL ROAD
SUITE 300
ALEXANDRIA, VA 22314 (US)

(73) Assignee: **Samsung Electro-Mechanics Co., Ltd.**,
KYUNGKI-DO (KR)

(21) Appl. No.: **11/462,622**

(22) Filed: **Aug. 4, 2006**





US 20070109207A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0109207 A1**

(43) **Pub. Date: May 17, 2007**

(54) **SERIGRAPHED ANTENNA FOR A MOTOR VEHICLE**

(30) **Foreign Application Priority Data**

Feb. 6, 2004 (FR)..... 0401141

(75) Inventors: **Alessandro Mondadori**, Poissy (FR);
Didier Viratelle, Voisins-le-Bretonneux (FR)

Publication Classification

Correspondence Address:
CASELLA & HESPOS
274 MADISON AVENUE
NEW YORK, NY 10016

(51) **Int. Cl.**
H01Q 1/32 (2006.01)

(52) **U.S. Cl.** **343/713; 343/704**

(73) Assignee: **Societe De Composants Electriques**, Evreux (FR)

(57) **ABSTRACT**

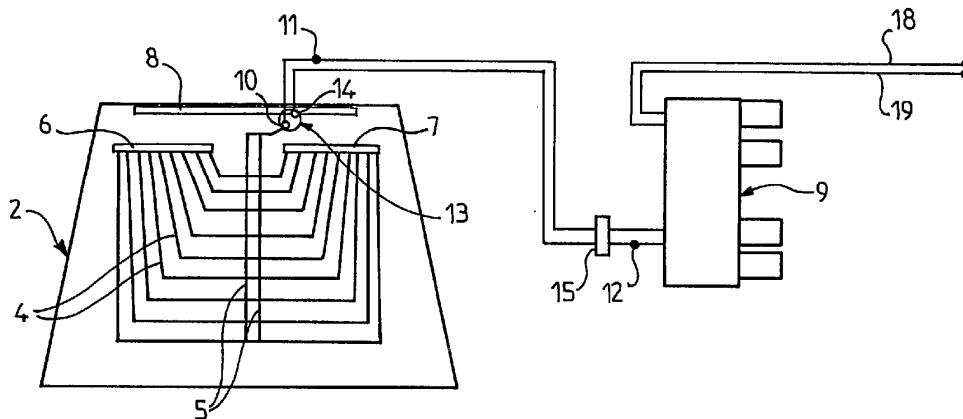
(21) Appl. No.: **10/588,244**

(22) PCT Filed: **Feb. 7, 2005**

(86) PCT No.: **PCT/FR05/00269**

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

The antenna FM2 comprises a serigraphed aerial on the rear opening window (2) of a station wagon and consists of a defrosting network (4) with two superposed symmetrical vertical lines (5). A thick ground line (8) is serigraphed onto the rear window (2) and a two-wire cable (11, 12) joins the aerial FM2 to an electronic housing (9). On a quarter panel window of the vehicle, the aerial is serigraphed in the form of an F-shape of the servitude antenna and joined by a two-wire cable (19, 20) to an electronic housing (9). The serigraphed antenna for a rear window and for a quarter panel window of a station wagon provides excellent reception in both FM and servitude mode.





US 20070109208A1

(19) **United States**

(12) **Patent Application Publication**
Turner

(10) **Pub. No.: US 2007/0109208 A1**

(43) **Pub. Date: May 17, 2007**

(54) **ANTENNA IN A SHIELDED ENCLOSURE**

Publication Classification

(75) Inventor: **James B. Turner**, Monroe, WA (US)

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

(52) **U.S. Cl.** **343/718; 343/841**

Correspondence Address:
MICROSOFT CORPORATION
ONE MICROSOFT WAY
REDMOND, WA 98052-6399 (US)

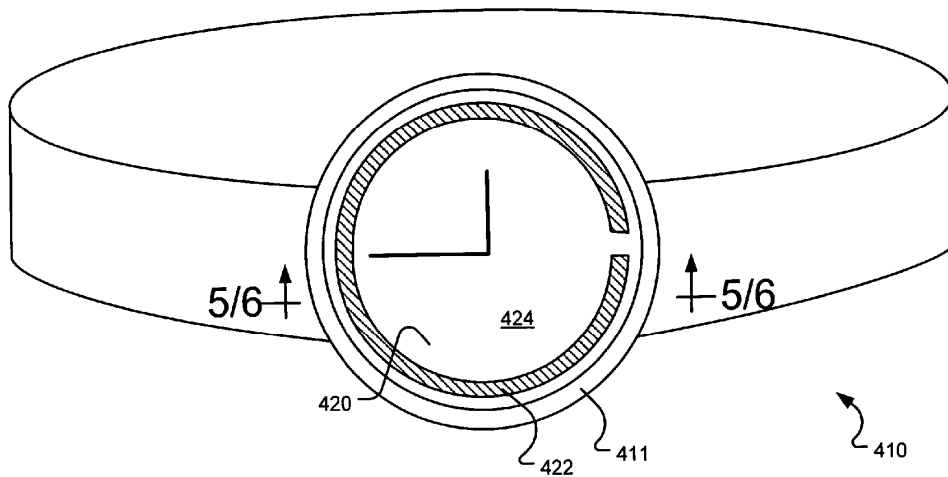
(57) **ABSTRACT**

An antenna disposed within a shielded enclosure, the antenna being disposed adjacent an electromagnetically transmissive closure member which covers a non-shielded aperture in the shielded enclosure. The electromagnetically transmissive closure member may, depending upon its dielectric properties, provide electromagnetic amplification for the antenna disposed thereunder to increase the effective signal propagation or reception.

(73) Assignee: **Microsoft Corporation**, Redmond, WA

(21) Appl. No.: **11/280,898**

(22) Filed: **Nov. 16, 2005**





US 20070115177A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115177 A1**

(43) **Pub. Date: May 24, 2007**

(54) **ANTENNA STRUCTURE AND
COMMUNICATION APPARATUS
INCLUDING THE SAME**

Publication Classification

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

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

(76) Inventors: **Kazunari Kawahata**, Machida-shi (JP);
Junichi Kurita, Fleet (GB)

(57) **ABSTRACT**

In an antenna structure including a feeding radiation electrode and a non-feeding radiation electrode that are electromagnetically coupled to each other, due to formation of a main slit, the feeding radiation electrode includes a U-turn portion in the middle of a path circumventing the main slit from a feeding end to an open end. A sub-slit for forming an open stub that is connected to the U-turn portion and that provides the U-turn portion with electrostatic capacitance is formed in the feeding radiation electrode. By changing a value of the electrostatic capacitance to be provided by the open stub to the U-turn portion of the feeding radiation electrode, variable control of a higher-order resonant frequency F2 of the feeding radiation electrode 2 can be achieved while suppressing fluctuations in a resonant state (for example, a fundamental resonant frequency F1 and a Q-value) of a fundamental resonant frequency band of the feeding radiation electrode, in an electromagnetic coupling state between the feeding radiation electrode and the non-feeding radiation electrode, and in an impedance matching state.

Correspondence Address:

OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK, NY 100368403

(21) Appl. No.: **10/581,803**

(22) PCT Filed: **Nov. 30, 2004**

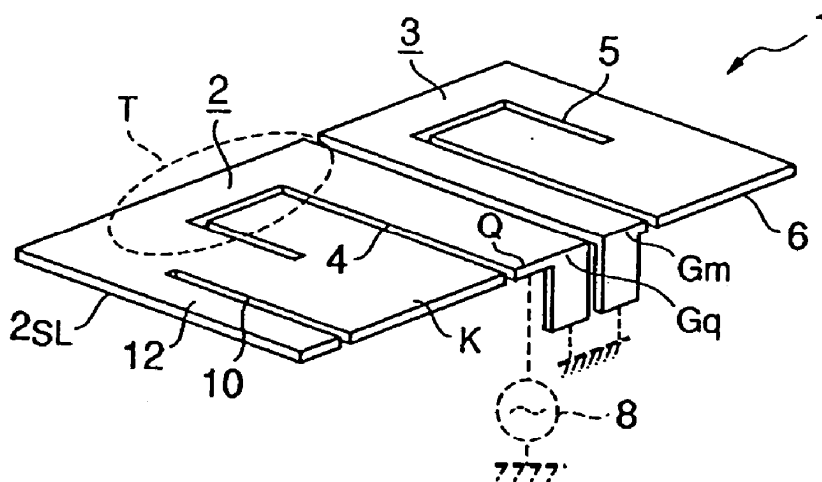
(86) PCT No.: **PCT/JP04/17788**

§ 371(c)(1),

(2), (4) Date: **Jan. 8, 2007**

(30) **Foreign Application Priority Data**

Dec. 2, 2003 (JP) 2003-402544





US 20070115178A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115178 A1**

(43) **Pub. Date: May 24, 2007**

(54) **WIDE FREQUENCY BAND PLANAR ANTENNA**

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

(76) Inventors: **Sheng-Yuan Chi**, Taipei County (TW);
Shyh-Jong Chung, Hsinchu City (TW);
Yu-Cheng Chen, Tainan City (TW)

(57) **ABSTRACT**

Correspondence Address:
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE
7 FLOOR-1, NO. 100
ROOSEVELT ROAD, SECTION 2
TAIPEI 100 (TW)

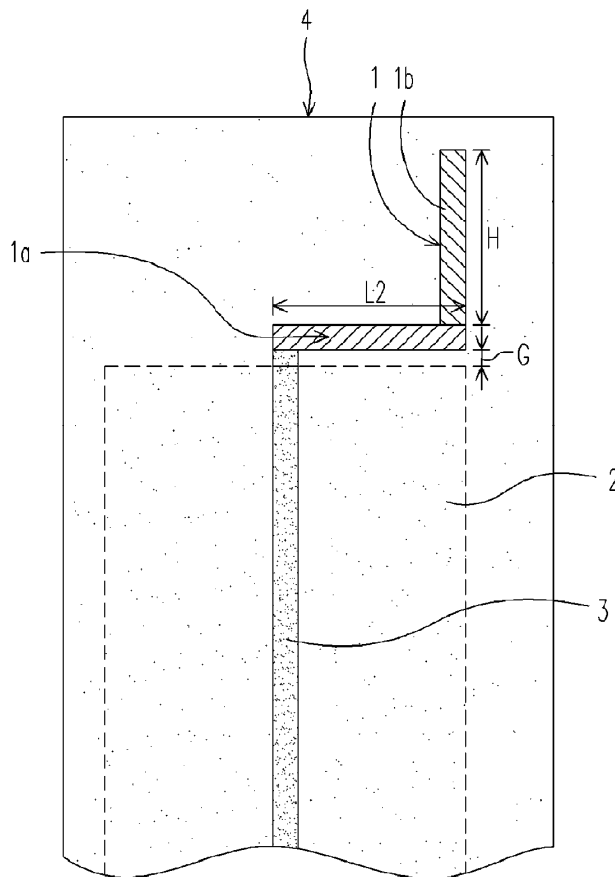
A wide frequency band planar antenna comprises an elongated portion, substantially parallel to a circumferential edge of a ground pattern and comprising one end connected to a feeding transmission line, wherein there is a gap between the elongated portion and the circumferential edge of the ground pattern; a body stub and an impedance-matching-adjusting pattern for adjusting an impedance matching between the wide frequency band planar antenna and the feeding transmission line; wherein the gap value is less than 2 mm so as to enable the wide frequency band antenna to operate at a wide range of frequencies ranging from 2.3 GHz to near 6 GHz, thereby allowing the wide frequency band antenna to be applied in both WiFi LAN and WiMAX MAN.

(21) Appl. No.: **11/164,482**

(22) Filed: **Nov. 24, 2005**

Publication Classification

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





US 20070115179A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115179 A1**

(43) **Pub. Date: May 24, 2007**

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

Related U.S. Application Data

(75) Inventors: **Chia-Lun TANG**, Miaoli (TW);
Kin-Lu WONG, Kaohsiung (TW);
Saou-wen SU, Taipei (TW)

(60) Provisional application No. 60/739,628, filed on Nov. 23, 2005.

Publication Classification

Correspondence Address:
AKIN GUMP STRAUSS HAUER & FELD
L.L.P.
ONE COMMERCE SQUARE
2005 MARKET STREET, SUITE 2200
PHILADELPHIA, PA 19103 (US)

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

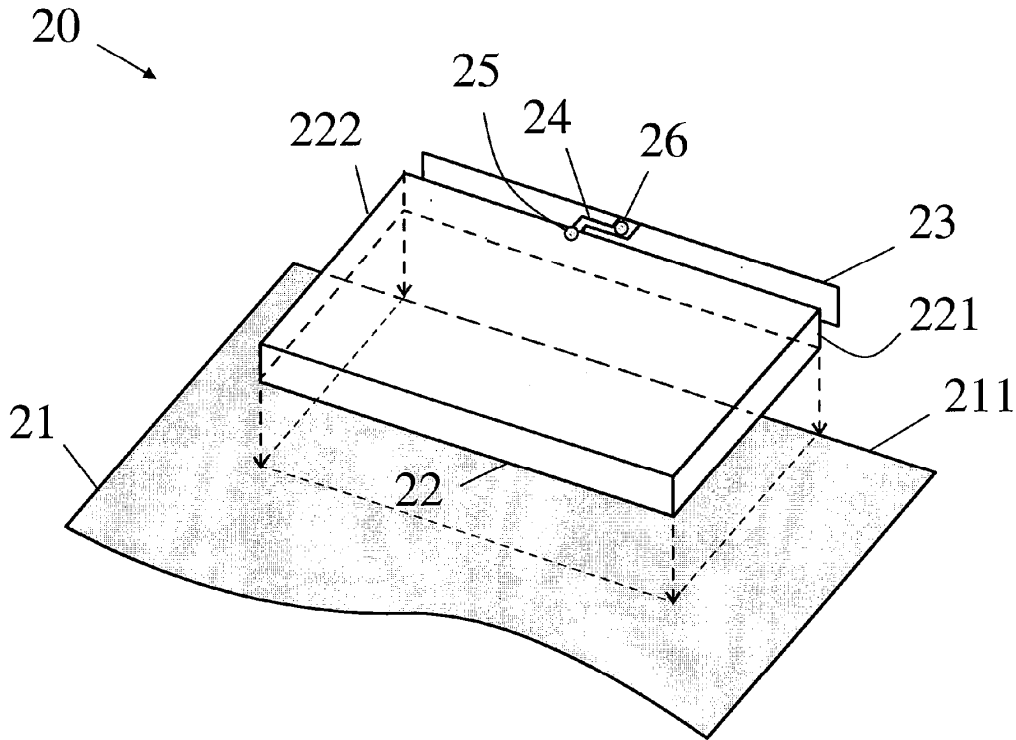
(57) **ABSTRACT**

(73) Assignee: **Industrial Technology Research Institute**, Hsinchu (TW)

A mobile device includes a ground plane, a conductive housing disposed on the ground plane including a sidewall, a first conductive strip spaced apart from the conductive housing, and a second conductive strip electrically connecting the first conductive strip to the conductive housing.

(21) Appl. No.: **11/279,588**

(22) Filed: **Apr. 13, 2006**





US 20070115181A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115181 A1**

(43) **Pub. Date: May 24, 2007**

(54) **MONOPOLE ANTENNA APPLICABLE TO MIMO SYSTEM**

Publication Classification

(75) Inventors: **Se-hyun Park**, Suwon-si (KR);
Byung-tae Yoon, Suwon-si (KR);
Young-eil Kim, Suwon-si (KR);
Young-min Moon, Seoul (KR)

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

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

(57) **ABSTRACT**

A monopole antenna capable of implementing an MMIO system, which includes a ground part formed of plate metal, a monopole antenna element connected to one side of the ground part and formed of strips bent multiple times, an auxiliary antenna element connected to one side of the ground part and disposed adjacent to the monopole antenna element to electrically connect to the monopole antenna element, and a short-circuit part interconnecting the monopole antenna element and the auxiliary antenna element. Accordingly, the monopole antenna element is bent multiple times so that the antenna can become compact in less than half a width compared to the conventional antenna, and when the MIMO system is constructed, the interference between the respective antennas can be reduced so that the array antenna can become compact in size.

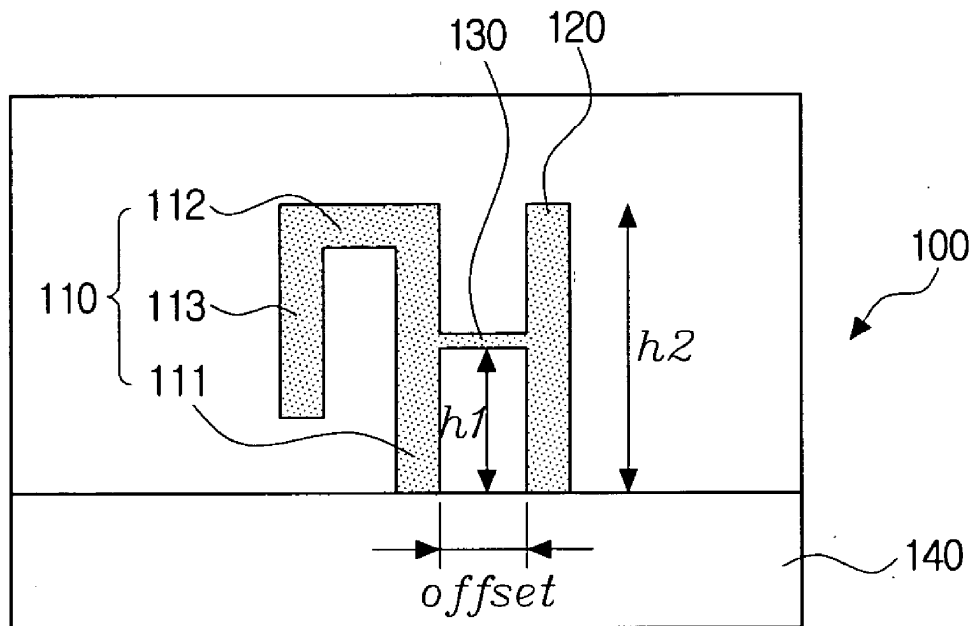
(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**

(21) Appl. No.: **11/489,457**

(22) Filed: **Jul. 20, 2006**

(30) **Foreign Application Priority Data**

Nov. 23, 2005 (KR) 10-2005-0112272





US 20070115182A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115182 A1**

(43) **Pub. Date: May 24, 2007**

(54) **CHIP ANTENNA**

(30) **Foreign Application Priority Data**

(75) Inventors: **Yen-Ming Chen**, Taipei City (TW);
Chao-Wei Wang, Taipei City (TW);
Chang-Fa Yang, Taipei City (TW);
Shun-Iian Lin, Taipei City (TW);
Chuan-Lin Hu, Sijhih City (TW);
Chung-Lun Liao, Sijhih City (TW);
Yu-Wei Chen, Sijhih City (TW)

Nov. 14, 2005 (TW)..... 94139939

Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/700 MS; 343/702; 343/895**

(57) **ABSTRACT**

A chip antenna has a dielectric material layer, a first meandered strip, a second meandered strip and several bended strips. The first meandered strip is meandered in one direction and disposed on the dielectric material layer. The second meandered strip is meandered in another direction and disposed on the dielectric material layer. The first meandered strip is connected to the second meandered strip. The bended strips are connected to the turns of the meandered strips.

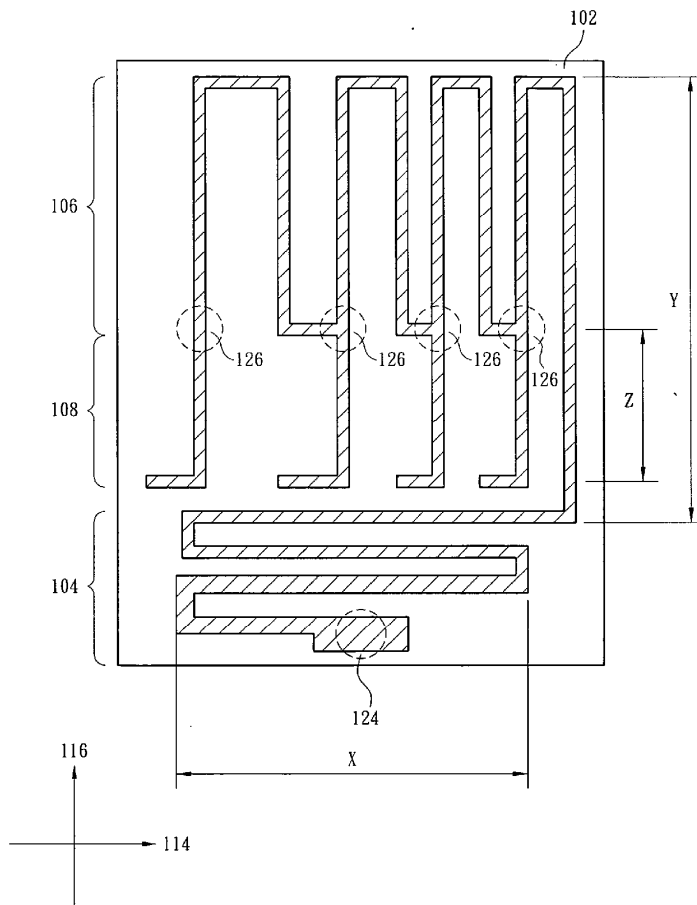
Correspondence Address:
BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747 (US)

(73) Assignee: **Chant Sincere Co., Ltd.**

(21) Appl. No.: **11/598,019**

(22) Filed: **Nov. 13, 2006**

100





US 20070115183A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115183 A1**

(43) **Pub. Date: May 24, 2007**

(54) **ANTENNA FOR ENHANCING BANDWIDTH AND ELECTRONIC DEVICE HAVING THE SAME**

(30) **Foreign Application Priority Data**

Nov. 24, 2005	(KR)	10-2005-113147
Nov. 24, 2005	(KR)	10-2005-113152
Mar. 29, 2006	(KR)	10-2006-28608

(75) Inventors: **Hong-Teuk Kim**, Gyeonggi-Do (KR);
Kyung-Hack Yi, Seoul (KR); **Ho-Seon Lee**, Chungcheongnam-Do (KR)

Publication Classification

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

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

Correspondence Address:
LEE, HONG, DEGERMAN, KANG & SCHMADEKA
801 S. FIGUEROA STREET
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LOS ANGELES, CA 90017 (US)

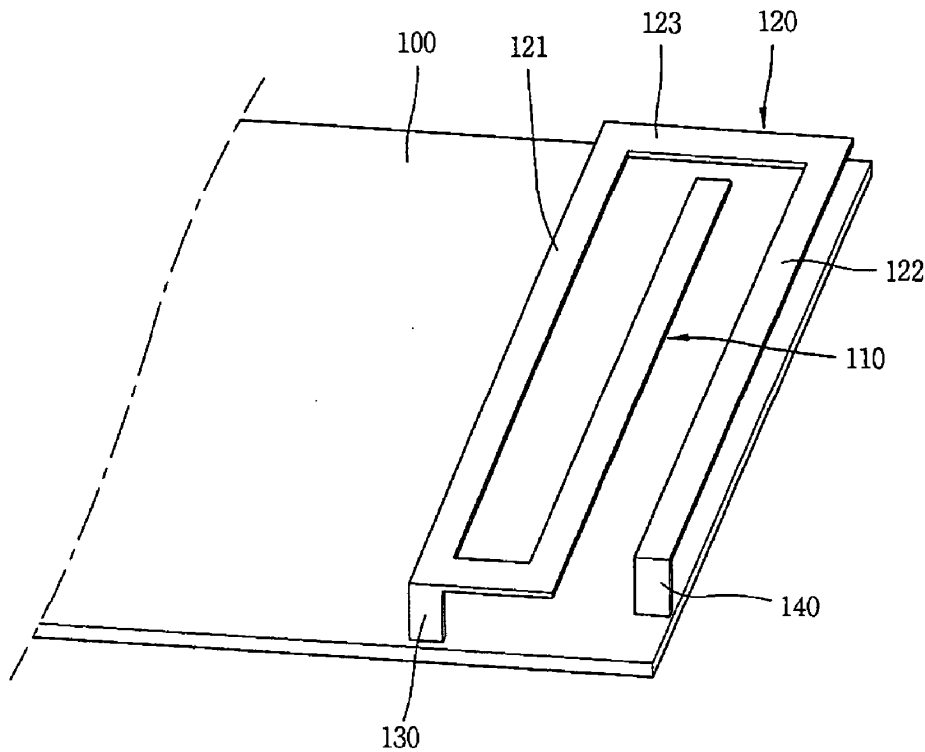
(57) **ABSTRACT**

An antenna comprises a high frequency antenna body, and a low frequency antenna body electrically connected to a point of the high frequency antenna body where a high frequency current distribution is minimized. By independently designing a high frequency bandwidth and a low frequency bandwidth from each other, an antenna having an optimum function in a desired frequency band can be easily fabricated.

(73) Assignee: **LG ELECTRONICS INC.**

(21) Appl. No.: **11/604,122**

(22) Filed: **Nov. 22, 2006**





US 20070115184A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115184 A1**

(43) **Pub. Date: May 24, 2007**

(54) **MULTI-BAND ANTENNA**

Related U.S. Application Data

(75) Inventors: **Hung-Yue Chang**, Taipei Hsien (TW);
Chen-Hsing Fang, Taipei Hsien (TW);
Wei-Li Cheng, Taipei Hsien (TW);
Chih-Lung Chen, Taipei Hsien (TW)

(62) Division of application No. 11/161,999, filed on Aug. 25, 2005.

(30) **Foreign Application Priority Data**

Jan. 21, 2005 (TW)..... 94101770

Correspondence Address:

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7 FLOOR-1, NO. 100
ROOSEVELT ROAD, SECTION 2
TAIPEI 100 (TW)

Publication Classification

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

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

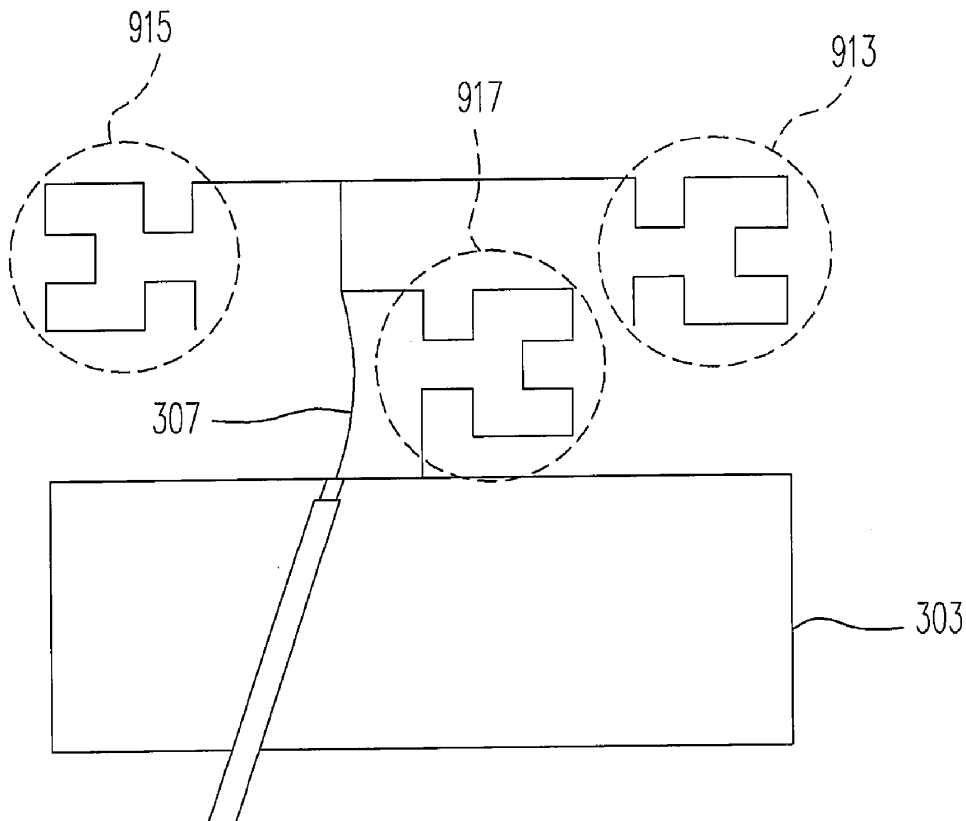
(57) **ABSTRACT**

(73) Assignee: **WISTRON NEWEB CORP.**, Taipei Hsien (TW)

The present invention provides a multi-band antenna to which the arrangement of Koch fractal antenna is applied. The multi-band antenna is designed in triangular shape whose area is smaller than the general antenna structure. By using the arrangement of Koch fractal antenna, the area of the inverted-F dual-band antenna can be reduced efficiently, so as to enhance more usability.

(21) Appl. No.: **11/624,221**

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





US 20070115185A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115185 A1**

(43) **Pub. Date: May 24, 2007**

(54) **ANTENNA FOR A PORTABLE COMMUNICATION DEVICE EQUIPPED WITH A HINGE**

(30) **Foreign Application Priority Data**

Sep. 16, 2003 (EP) 03020907

(76) Inventors: **Zhinong Ying**, Lund (SE); **Goran Schack**, Ahus (SE); **Mats Kleverman**, Helsingborg (SE)

Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

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

Correspondence Address:
MYERS BIGEL SIBLEY & SAJOVEC, P.A.
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(57) **ABSTRACT**

(21) Appl. No.: **10/572,197**

(22) PCT Filed: **Aug. 12, 2004**

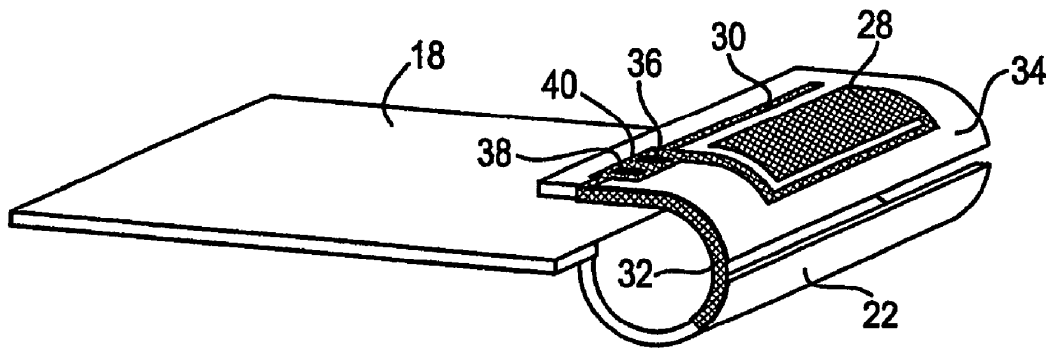
(86) PCT No.: **PCT/EP04/09030**

§ 371(c)(1),
(2), (4) Date: **Mar. 15, 2006**

Related U.S. Application Data

(60) Provisional application No. 60/505,391, filed on Sep. 23, 2003.

A portable communication device and an antenna system include a part having a ground plane located within and extending through the part. A hinging section is joined to the part and stretches along an end of the part for providing rotation of the part in relation to another part around an axis and providing a hinge cavity inside the hinging section surrounding the axis. An antenna element is at least partly provided inside the hinge cavity and the ground plane extends from the part into the hinge cavity at a distance from the antenna element.





US 20070115186A1

(19) **United States**

(12) **Patent Application Publication**
Vance

(10) **Pub. No.: US 2007/0115186 A1**

(43) **Pub. Date: May 24, 2007**

(54) **FREQUENCY BAND SWITCHING OF AN ANTENNA ARRANGEMENT**

(57) **ABSTRACT**

(76) Inventor: **Scott L. Vance**, Staffanstorp (SE)

Correspondence Address:
MYERS BIGEL SIBLEY & SAJOVEC, P.A.
P.O. BOX 37428
RALEIGH, NC 27627 (US)

(21) Appl. No.: **11/286,903**

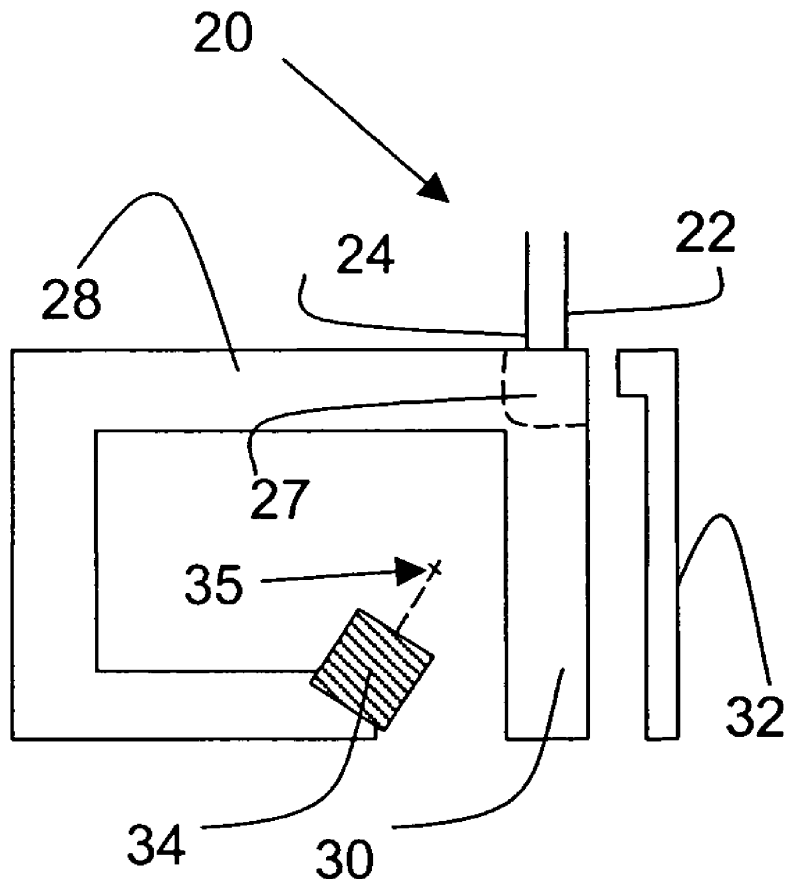
(22) Filed: **Nov. 23, 2005**

Publication Classification

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

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

A portable communication device includes an antenna arrangement in its interior. The antenna arrangement comprises at least one first radiating antenna element dimensioned for radiation in a first frequency band, and a first mechanically movable extension element, movable between at least two different fixed positions and being connected to the first radiating antenna element in at least one of the positions for radiating together with the first radiating antenna element. When the extension element is being moved from one position to another, it adjusts the electrical length of the combined first radiating antenna and extension element for enhancing radiation in a second frequency band. In this way a small sized multiband antenna arrangement is provided that keeps the efficiency of the different bands high.





US 20070115189A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115189 A1**

(43) **Pub. Date: May 24, 2007**

(54) **MULTIPLE-BAND ANTENNA WITH SHARED SLOT STRUCTURE**

Publication Classification

(75) Inventors: **Geyi Wen**, Waterloo (CA); **Perry Jarmuszewski**, Waterloo (CA); **Adrian M. Cooke**, Kitchener (CA)

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

Correspondence Address:

ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST P.A.
1401 CITRUS CENTER 255 SOUTH ORANGE AVENUE
P.O. BOX 3791
ORLANDO, FL 32802-3791 (US)

(57) **ABSTRACT**

A multiple-band antenna having first and second operating frequency bands is provided. The antenna includes a first patch structure associated primarily with the first operating frequency band, a second patch structure electrically coupled to first patch structure and associated primarily with the second operating frequency band, a first slot structure disposed between a first portion of the first patch structure and the second patch structure and associated primarily with the first operating frequency band, and a second slot structure disposed between a second portion of the first patch structure and the second patch structure and associated with both the first operating frequency band and the second operating frequency band. A mounting structure for the multiple-band antenna is also provided, and includes a first surface and a second surface opposite to and overlapping the first surface. The first and second patch structures are mounted to the first surface, and a feeding point and a ground point, respectively connected to the first and second patch structures, are mounted to the second surface.

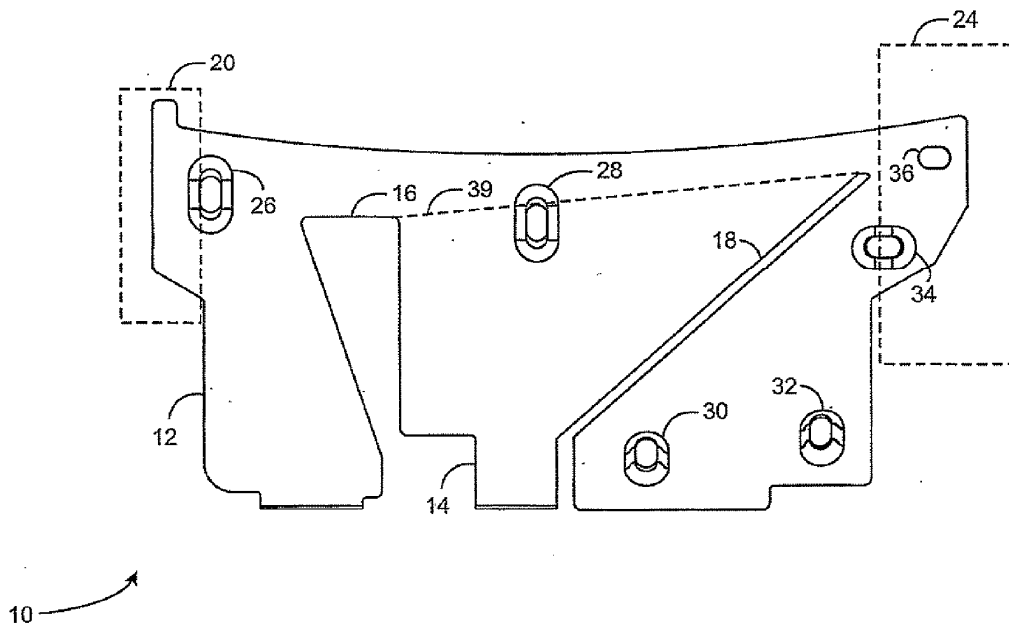
(73) Assignee: **Research In Motion Limited**, Waterloo (CA)

(21) Appl. No.: **11/533,020**

(22) Filed: **Sep. 19, 2006**

Related U.S. Application Data

(63) Continuation of application No. 10/537,189, filed on Jun. 2, 2005, now Pat. No. 7,151,493, filed as 371 of international application No. PCT/CA02/01943, filed on Dec. 6, 2002.





US 20070115193A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115193 A1**

(43) **Pub. Date: May 24, 2007**

(54) **CIRCULAR POLARIZATION ANTENNA**

(30) **Foreign Application Priority Data**

(75) Inventors: **Philippe Minard**, Saint Medard Sur Ille (FR); **Ali Louzir**, Rennes (FR); **Franck Thudor**, Rennes (FR); **Francoise Le Bolzer**, Rennes (FR)

Dec. 19, 2001 (FR)..... 01/16469

Publication Classification

Correspondence Address:
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THOMSON LICENSING LLC
PATENT OPERATIONS
PO BOX 5312
PRINCETON, NJ 08543-5312 (US)

(51) **Int. Cl.**
H01Q 13/12 (2006.01)
(52) **U.S. Cl.** **343/769; 343/768**

(57) **ABSTRACT**

(73) Assignee: **THOMSON LICENSING**

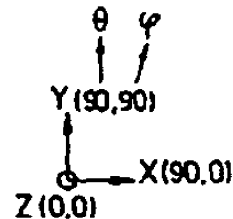
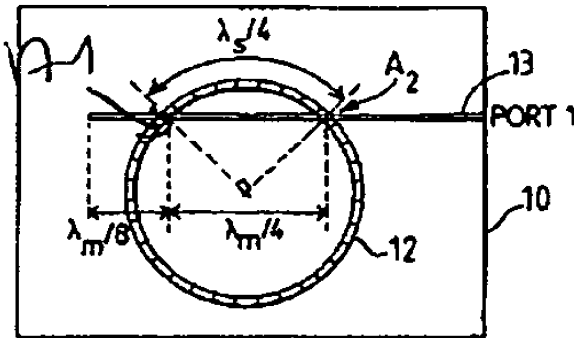
(21) Appl. No.: **11/654,891**

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

The present invention relates to a device for the reception and/or the transmission of electromagnetic signals comprising at least one means of reception and/or of transmission of electromagnetic signals, consisting of an antenna of the slot type (12) and a feed line (13) coupled electromagnetically with the slot of the antenna so as to connect the means of reception and/or of transmission of electromagnetic signals to means of utilization of the signals, the feed line being coupled electromagnetically with the slot at two points (A1, A2) chosen such that the electromagnetic waves exhibit a circular polarization

Related U.S. Application Data

(62) Division of application No. 10/499,638, filed on Apr. 18, 2005, filed as 371 of international application No. PCT/FR02/04376, filed on Dec. 19, 2002.





US 20070115194A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0115194 A1**

(43) **Pub. Date: May 24, 2007**

(54) **ANTENNA STRUCTURE**

Publication Classification

(75) Inventors: **Jia-Jiu Song**, Taipei County (TW);
Sheng-Hsiung Yang, Hsinchu County
(TW); **Jr-Ren Jeng**, Taipei City (TW);
Mu-Kun Hsueh, Kaohsiung City (TW)

(51) **Int. Cl.**
H01Q 13/00 (2006.01)
(52) **U.S. Cl.** **343/773; 343/700 MS; 343/775**

Correspondence Address:
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PO BOX 747
FALLS CHURCH, VA 22040-0747 (US)

(57) **ABSTRACT**

An antenna structure including a ground plate, a hollow bolt, and a conductive conical dome is provided. The hollow bolt passes through the ground plate, and a signal wire is laid in the hollow bolt. An insulator is disposed between the signal wire and the hollow bolt for providing electrical isolation therebetween. The conductive conical dome is connected with one end of the signal wire. The hollow bolt and a nut are provided to fix the antenna on a wall or a ceiling. Since the signal wire is laid in the hollow bolt, the signal wire can be connected to a signal source only by connecting a signal cable to the hollow bolt.

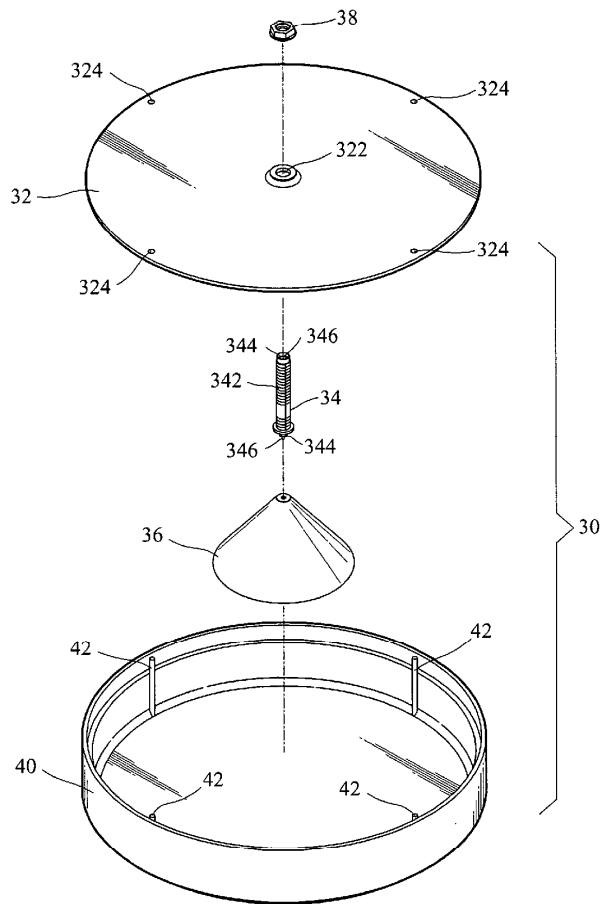
(73) Assignee: **SmartAnt Telecom Co., Ltd.**

(21) Appl. No.: **11/600,883**

(22) Filed: **Nov. 17, 2006**

(30) **Foreign Application Priority Data**

Nov. 18, 2005 (TW)..... 094220085





US 20070115199A1

(19) **United States**

(12) **Patent Application Publication**
Apostolos

(10) **Pub. No.: US 2007/0115199 A1**

(43) **Pub. Date: May 24, 2007**

(54) **CAVITY EMBEDDED MEANDER LINE
LOADED ANTENNA AND METHOD AND
APPARATUS FOR LIMITING VSWR**

Publication Classification

(51) **Int. Cl.**
H01Q 9/28 (2006.01)
(52) **U.S. Cl.** 343/795; 343/705

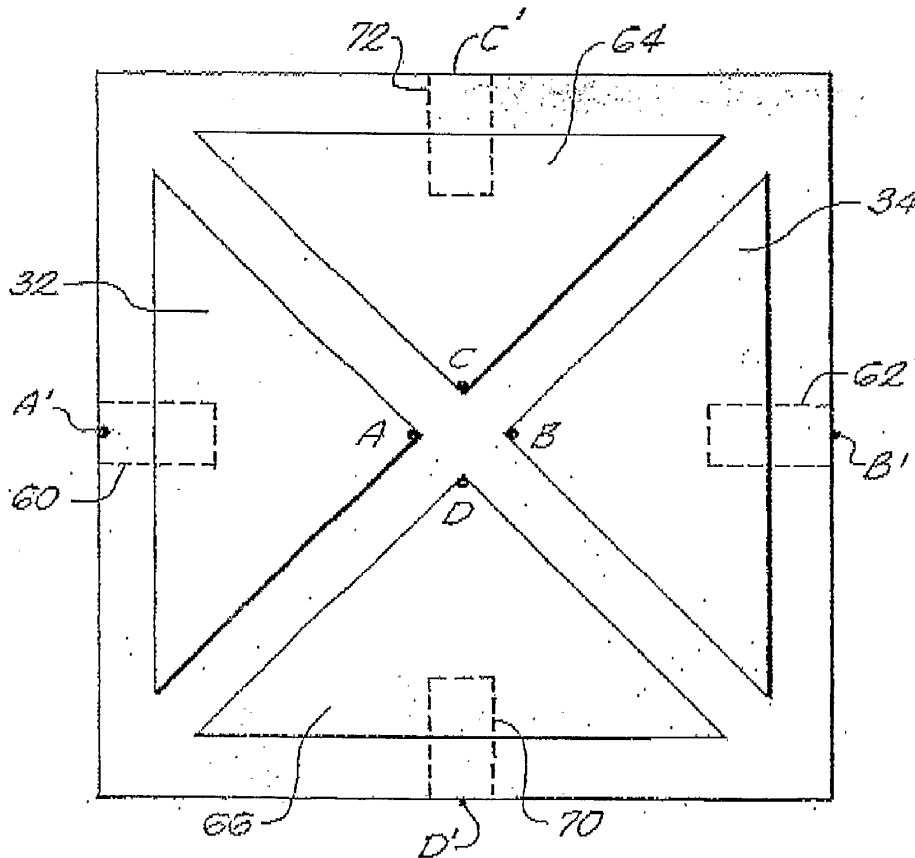
(76) **Inventor: John T. Apostolos, Merrimack, NH
(US)**

(57) **ABSTRACT**

Correspondence Address:
**BAE SYSTEMS INFORMATION AND
ELECTRONIC SYSTEMS INTEGRATION
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65 SPIT BROOK ROAD
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A wideband meander line loaded antenna is configured to be flush mounted to a conductive surface serving as a ground plane by embedding the meander line components within a conductive cavity surrounded at its top edge by the ground plane. The antenna thus looks out of a cavity recessed in the surface. By permitting flush mounting the meander line antenna, not only can the antenna dimensions be minimized due to the use of the meander line loaded antenna configuration, but in aircraft applications no part of the antenna exists above the skin of the aircraft, thereby to minimize turbulent flow. Also disclosed is a method and apparatus in which a lossy dielectric is placed across the feed points of a loop type meander line loaded antenna to markedly decrease the VSWR to below 3:1, thus to increase the bandwidth of a relatively wideband 3:1 meander line loaded antenna to 6:1.

(21) **Appl. No.: 10/584,842**
(22) **PCT Filed: Dec. 31, 2003**
(86) **PCT No.: PCT/US03/41777**
§ 371(c)(1),
(2), (4) **Date: Jun. 27, 2006**





US 20070115200A1

(19) **United States**

(12) **Patent Application Publication**
Ishimiya

(10) **Pub. No.: US 2007/0115200 A1**

(43) **Pub. Date: May 24, 2007**

(54) **FOLDED DIPOLE ANTENNA DEVICE AND MOBILE RADIO TERMINAL**

Publication Classification

(75) Inventor: **Katsunori Ishimiya**, Tokyo (JP)

(51) **Int. Cl.**

H01Q 9/26 (2006.01)

(52) **U.S. Cl.** **343/803; 343/804; 343/702**

Correspondence Address:

**RADER FISHMAN & GRAUER PLLC
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1233 20TH STREET N.W., SUITE 501
WASHINGTON, DC 20036 (US)**

(57) **ABSTRACT**

Disclosed is a folded dipole antenna device which is of an unbalanced feed type and includes an antenna element of approximately plate-like loop structure, connected to an antenna feed point and an antenna ground provided on a base plate. In the folded dipole antenna device, the antenna element of loop structure includes a pair of first element sections which extend approximately parallel to the base plate, a second element section formed by merging element sections that are folded back from both ends of the first element sections and extend approximately parallel to the first element sections, and a third element section which extends from a folded top part of the second element section toward the first element sections and an end part thereof is close to the first element sections.

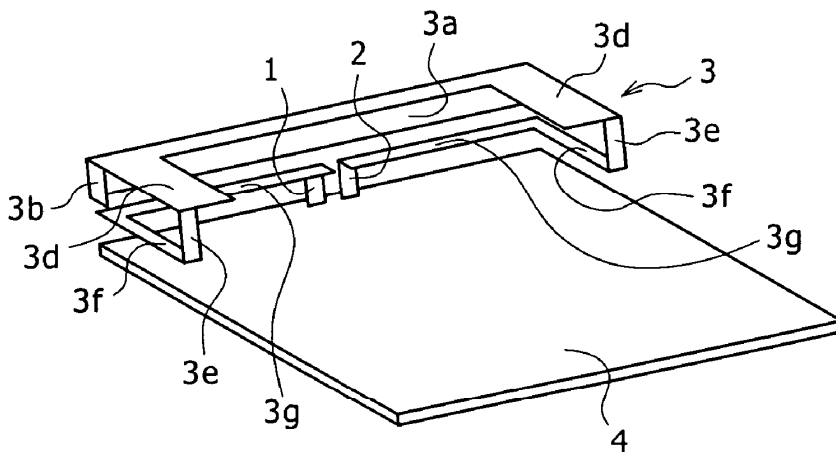
(73) Assignee: **Sony Ericsson Mobile Communications Japan, Inc.**, Tokyo (JP)

(21) Appl. No.: **11/588,289**

(22) Filed: **Oct. 27, 2006**

(30) **Foreign Application Priority Data**

Nov. 18, 2005 (JP) P2005-333783





US 20070117514A1

(19) **United States**
(12) **Patent Application Publication**
Gainey et al.

(10) **Pub. No.: US 2007/0117514 A1**
(43) **Pub. Date: May 24, 2007**

(54) **DIRECTIONAL ANTENNA CONFIGURATION FOR TDD REPEATER**

Publication Classification

(75) Inventors: **Kenneth M. Gainey**, Satellite Beach, FL (US); **James A. Proctor JR.**, Melbourne Beach, FL (US); **Christopher A. Snyder**, Melbourne, FL (US); **James C. Otto**, West Melbourne, FL (US)

(51) **Int. Cl.**
H04B 7/14 (2006.01)
H04B 1/00 (2006.01)
H04B 1/06 (2006.01)
(52) **U.S. Cl.** **455/63.4; 455/25; 455/269**

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(57) **ABSTRACT**

A wireless communication node, such as a repeater, including a frequency translating repeater, a physical layer (PHY) repeater, time divisional duplex repeater (TDD) and the like, is configured with a pair of directional patch antennae and an omni-directional antenna. The patch antennae can be selected depending on the orientation of the repeater package to communicate with a station such as an access point or a base station. The omni-directional antenna can be directed toward another station such as a client. The patch antennae and the omni-directional antenna can be orthogonally polarized to increase isolation and reduce electromagnetic coupling. Multiple antennae can be used in multiple-input-multiple-output (MIMO) configurations.

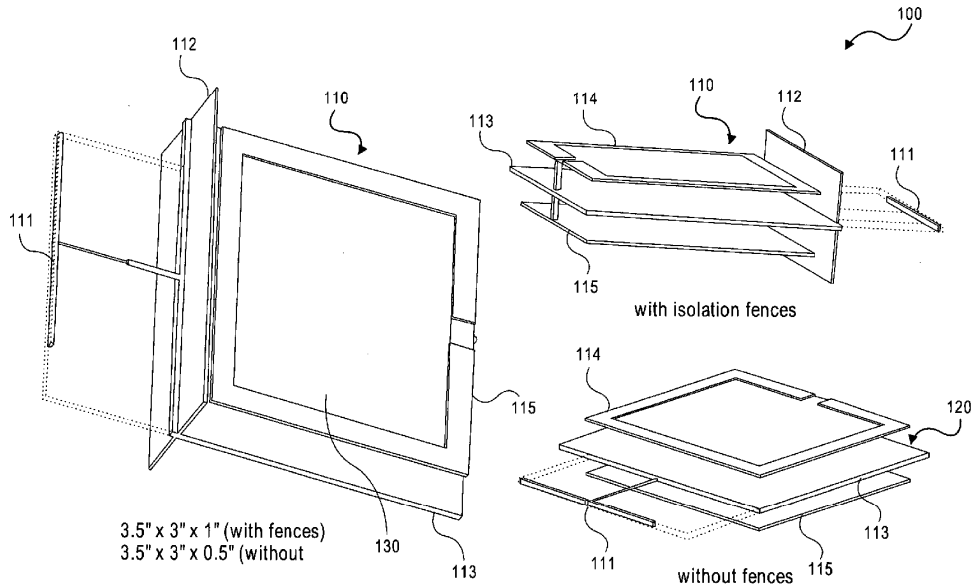
(73) Assignee: **WIDEFI, INC.**, Melbourne, FL (US)

(21) Appl. No.: **11/602,455**

(22) Filed: **Nov. 21, 2006**

Related U.S. Application Data

(60) Provisional application No. 60/738,579, filed on Nov. 22, 2005.





US 20070120740A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120740 A1**

(43) **Pub. Date: May 31, 2007**

(54) **ANTENNA FOR MOBILE TELEPHONE
HANDSETS, PDAS, AND THE LIKE**

Publication Classification

(76) Inventors: **Devis Iellici**, CAMBRIDGE (GB);
Simon Philip Kingsley, Cambridge
(GB); **James William Kingsley**,
Cambridge (GB); **Steven Gregory
O'keefe**, Queensland (AU)

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

Correspondence Address:
PEARL COHEN ZEDEK LATZER, LLP
1500 BROADWAY 12TH FLOOR
NEW YORK, NY 10036 (US)

(57) **ABSTRACT**

The present invention relates to an antenna structure comprising a dielectric pellet and a dielectric substrate with upper and lower surfaces and at least one groundplane, wherein the dielectric pellet is elevated above the upper surface of the dielectric substrate such that the dielectric pellet does not directly contact the dielectric substrate or the groundplane, and wherein the dielectric pellet is provided with a conductive direct feed structure. A radiating antenna component is additionally provided and arranged so as to be excited by the dielectric pellet. Elevating the dielectric antenna component so that it does not directly contact the groundplane or the dielectric substrate significantly improves bandwidth of the antenna as a whole.

(21) Appl. No.: **10/582,641**

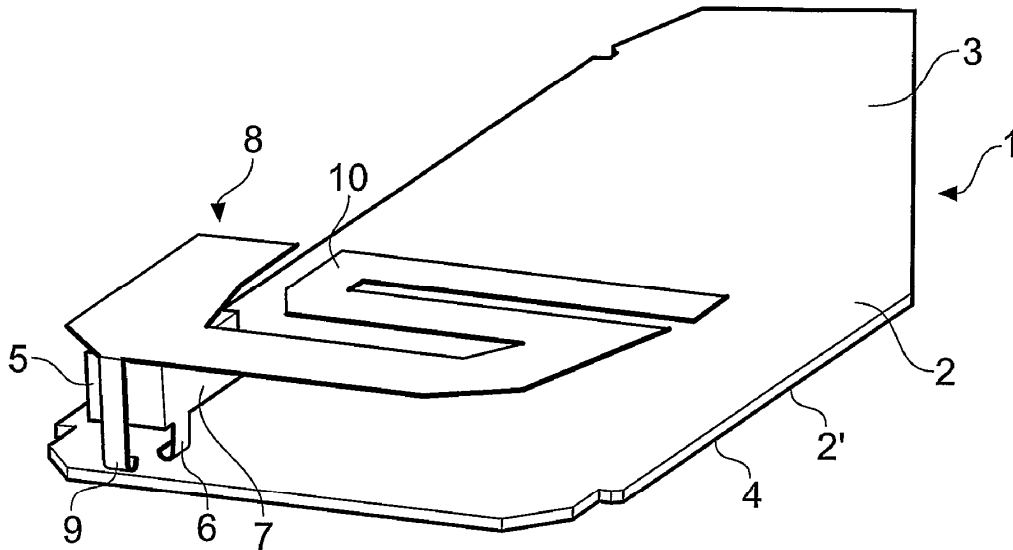
(22) PCT Filed: **Dec. 10, 2004**

(86) PCT No.: **PCT/GB04/05158**

§ 371(c)(1),
(2), (4) Date: **Jun. 12, 2006**

(30) **Foreign Application Priority Data**

Dec. 12, 2003 (GB) 0328811.5





US 20070120741A1

(19) **United States**

(12) **Patent Application Publication**
Tseng

(10) **Pub. No.: US 2007/0120741 A1**

(43) **Pub. Date: May 31, 2007**

(54) **ULTRA WIDE BANDWIDTH PLANAR ANTENNA**

Publication Classification

(75) Inventor: **Kuo-Hua Tseng, Mei-Nung Chen (TW)**

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

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

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BANNER & WITCOFF, LTD.
1100 13th STREET, N.W.
SUITE 1200
WASHINGTON, DC 20005-4051 (US)

(57) **ABSTRACT**

(73) Assignee: **UNIVERSAL SCIENTIFIC INDUSTRIAL CO., LTD., Tsao-Tun Chen (TW)**

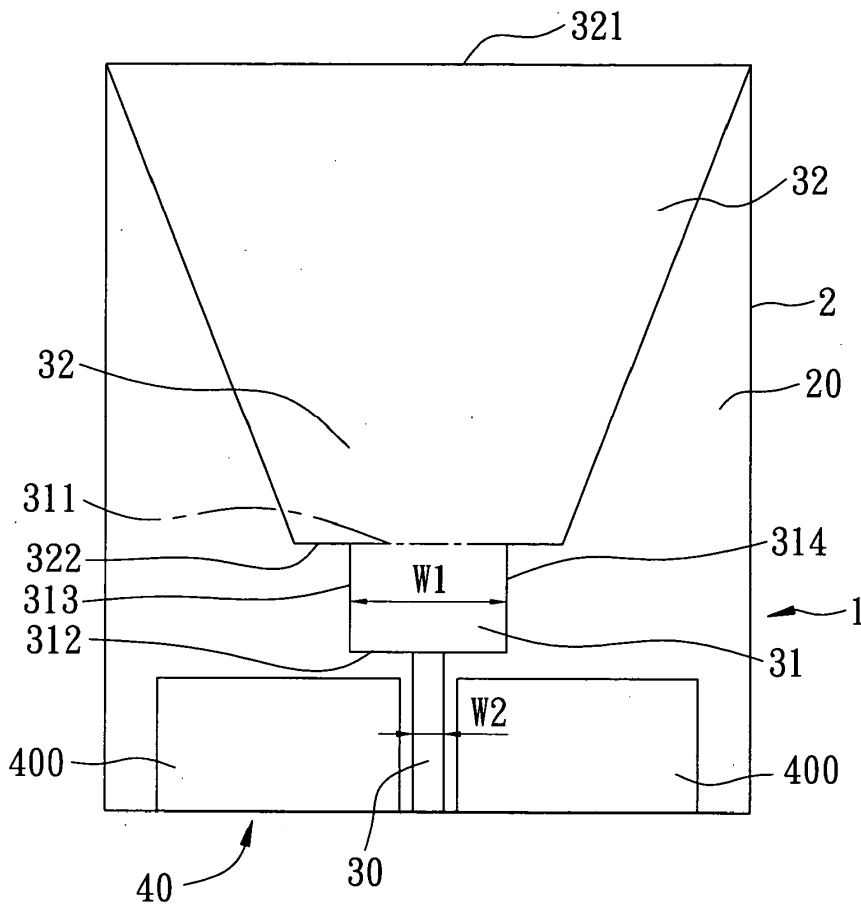
A planar antenna includes a dielectric substrate, first and second radiating elements, a feeding strip, and a grounding unit. The first radiating element is formed on the dielectric substrate. The second radiating element is formed on the dielectric substrate and is connected to the first radiating element. The feeding strip is formed on the dielectric substrate and extends from the second radiating element. The grounding unit is formed on the dielectric substrate, is physically disconnected from the first and second radiating elements and the feeding strip, and includes a pair of grounding elements that are physically disconnected from each other and that are disposed on opposite sides of the feeding strip.

(21) Appl. No.: **11/345,490**

(22) Filed: **Feb. 2, 2006**

(30) **Foreign Application Priority Data**

Nov. 28, 2005 (TW)..... 09141693





US 20070120743A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120743 A1**

(43) **Pub. Date: May 31, 2007**

(54) **MONOPOLE ANTENNA**

(30) **Foreign Application Priority Data**

(75) Inventors: **Yun-Long Ke**, Tu-Cheng (TW);
Lung-Sheng Tai, Tu-Cheng (TW);
Yao-Shien Huang, Tu-Cheng (TW)

Nov. 28, 2005 (TW)..... 94141660

Publication Classification

Correspondence Address:
WEI TE CHUNG
FOXCONN INTERNATIONAL, INC.
1650 MEMOREX DRIVE
SANTA CLARA, CA 95050 (US)

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

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

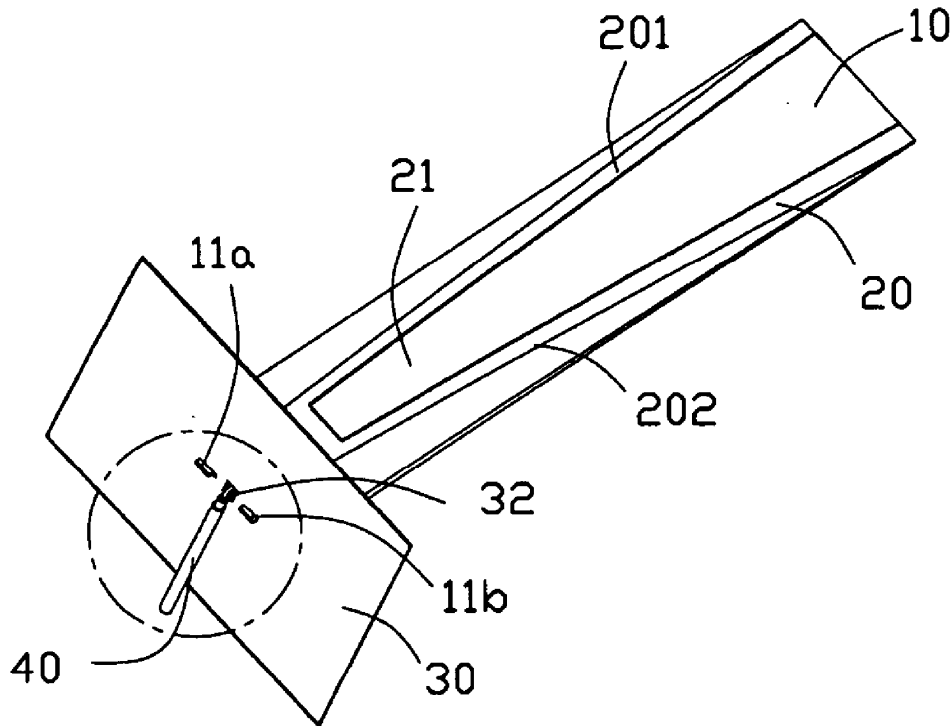
(57) **ABSTRACT**

(73) Assignee: **HON HAI PRECISION IND. CO., LTD.**

A monopole antenna comprises a planar substrate, a radiating element arranged on the planar substrate and of long-guide trapezium-shape and comprises a trapezium notch in the middle thereof, a grounding element assembled with said planar base with a predetermined angle.

(21) Appl. No.: **11/605,686**

(22) Filed: **Nov. 28, 2006**





US 20070120747A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120747 A1**

(43) **Pub. Date: May 31, 2007**

(54) **HIGH PERFORMANCE RETRACTABLE
HALF-WAVE ANTENNA**

Publication Classification

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

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

(75) Inventors: **Alejandro Candal**, Davie, FL (US);
Julio C. Castaneda, Coral Springs, FL
(US); **Jose M. Gonzalez**, Pembroke
Pines, FL (US); **Lorenzo A. Ponce De
Leon**, Lake Worth, FL (US); **Francis
M. Staszsky**, Fort Lauderdale, FL
(US)

(57) **ABSTRACT**

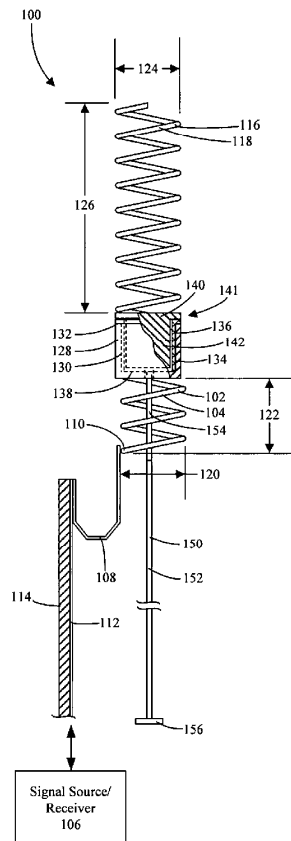
An antenna (100) that includes a first helical radiator (102) and a second helical radiator (116) positioned substantially co-linear with the first helical radiator. The first helical radiator can be communicatively linked to a signal source (106). The second helical radiator can be moveable between a first position wherein the second helical radiator is substantially adjacent to the first helical radiator and a second position wherein the second helical radiator is distal from the first helical radiator. The first helical radiator and the second helical radiator can cooperate to transmit and/or receive electromagnetic signals using an electrical connection and/or electromagnetic coupling. The electromagnetic coupling can primarily include capacitive coupling. The antenna also can include an impedance tuning member (538) which electromagnetically couples to the first helical radiator and/or the second helical radiator.

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12230 FOREST HILL BLVD.
SUITE 120
WELLINGTON, FL 33414 (US)

(73) Assignee: **Motorola, Inc.**

(21) Appl. No.: **11/290,195**

(22) Filed: **Nov. 30, 2005**





US 20070120749A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120749 A1**

(43) **Pub. Date: May 31, 2007**

(54) **PORTABLE ELECTRONIC DEVICE WITH A SLOT ANTENNA**

(30) **Foreign Application Priority Data**

Nov. 30, 2005 (TW)..... 094142082

(75) Inventors: **Tiao-Hsing Tsai**, Yungho City (TW);
Chao-Chiang Kuo, Chung Li City (TW);
Ying-Chih Wang, Kuei Shan Hsiang (TW)

Publication Classification

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

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

(57) **ABSTRACT**

A portable electronic device includes a metallic casing, a circuit board, a feeding line, and a grounding line. The metallic casing confines an accommodating space, and is formed with a slot that is in spatial communication with the accommodating space and that is defined by a slot-defining wall. The circuit board is disposed in the accommodating space, and is provided with feeding and grounding ports. The feeding line serves to couple electrically the feeding port to the slot-defining wall. The grounding line serves to couple electrically the grounding port to the slot-defining wall.

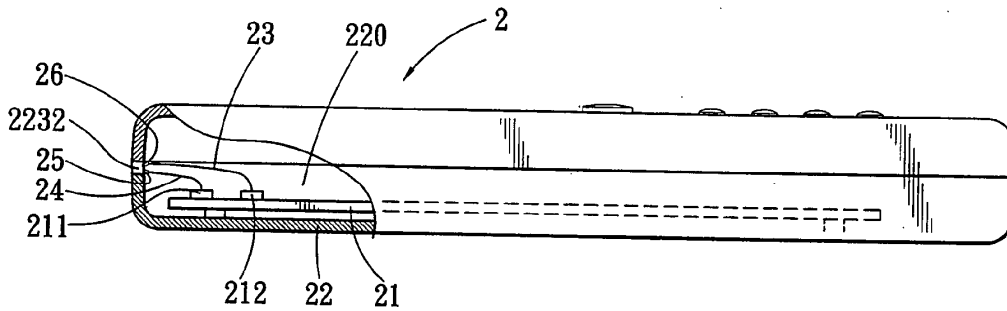
Correspondence Address:

LADAS & PARRY
Suite 2100
5670 Wilshire Boulevard
Los Angeles, CA 90036-5679 (US)

(73) Assignee: **QUANTA COMPUTER, INC.**

(21) Appl. No.: **11/386,013**

(22) Filed: **Mar. 20, 2006**





US 20070120750A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120750 A1**

(43) **Pub. Date: May 31, 2007**

(54) **ANTENNA FOR SLIDE-TYPE WIRELESS TERMINAL DEVICE**

(30) **Foreign Application Priority Data**

Nov. 30, 2005 (KR)..... 2005-0115343

(75) Inventors: **Yong-jin Kim**, Seoul (KR); **Do-hoon Kwon**, Seoul (KR); **Seong-soo Lee**, Suwon-si (KR); **Young-eil Kim**, Suwon-si (KR)

Publication Classification

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

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

(57) **ABSTRACT**

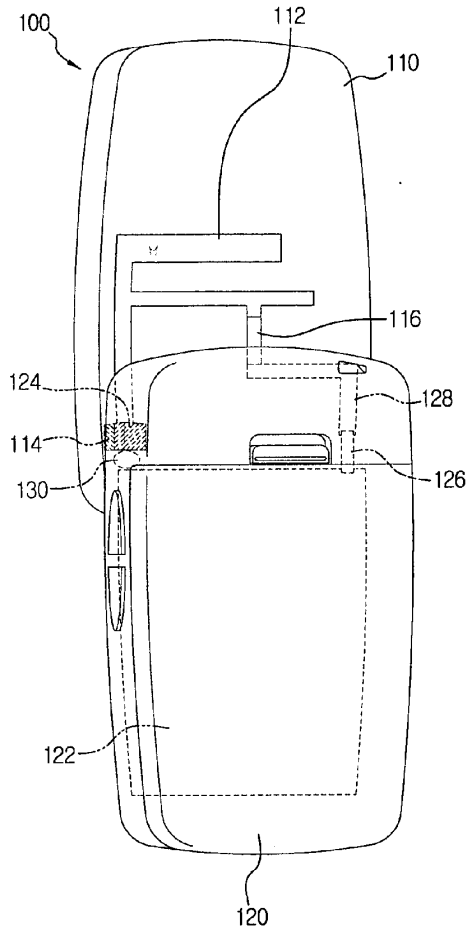
An antenna for a slide-type wireless terminal device includes a radiator formed in a first body, a ground surface formed on a second body, a power feeder connected to the ground surface in the second body, a first connection part connected to the radiator in the first body and operative to come in contact with the power feeder when the first body is slidably moved, and a short-circuit wire operative to come in contact with the radiator and the ground surface when the first body is slidably moved.

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

(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**

(21) Appl. No.: **11/442,529**

(22) Filed: **May 30, 2006**





US 20070120753A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120753 A1**

(43) **Pub. Date: May 31, 2007**

(54) **MULTI-BAND ANTENNA**

Publication Classification

(75) Inventors: **Chen-Ta Hung**, Tu-Cheng (TW);
Shu-Yean Wang, Tu-Cheng (TW);
Yun-Long Ke, Tu-Cheng (TW)

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

Correspondence Address:
WEI TE CHUNG
FOXCONN INTERNATIONAL, INC.
1650 MEMOREX DRIVE
SANTA CLARA, CA 95050 (US)

(57) **ABSTRACT**

A multi-band antenna adapted for used in a portable electronic device, includes: a first antenna including a first radiating element, a common grounding element, and a first connecting element connecting the first radiating element and the common grounding element; a second antenna, including a first radiating portion, the common grounding element, and a second connecting element connecting the radiating portion and the grounding element. Free end portions of the first radiating element and the first radiating portion do not align with each other in any direction.

(73) Assignee: **HON HAI PRECISION IND. CO., LTD.**

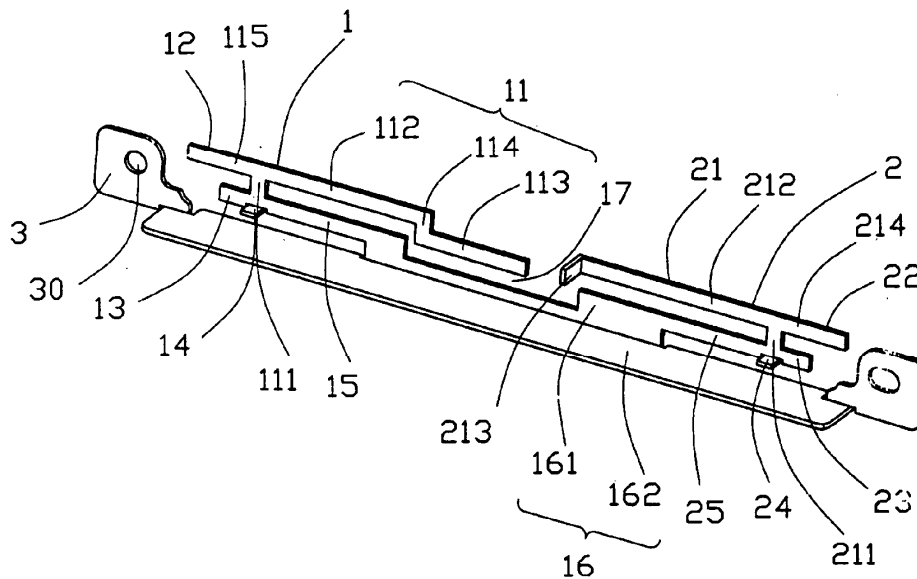
(21) Appl. No.: **11/605,517**

(22) Filed: **Nov. 28, 2006**

(30) **Foreign Application Priority Data**

Nov. 28, 2005 (TW)..... 94141658

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US 20070120754A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120754 A1**

(43) **Pub. Date: May 31, 2007**

(54) **SERIGRAPHED ANTENNA FOR THE REAR WINDOW OF A SALOON-TYPE CAR**

(30) **Foreign Application Priority Data**

Feb. 6, 2004 (FR)..... 0401140

(75) Inventors: **Alessandro Mondadori**, Poissy (FR);
Didier Viratelle, Voisins-le-Bretonneux (FR)

Publication Classification

(51) **Int. Cl.**
H01Q 1/32 (2006.01)

(52) **U.S. Cl.** **343/713; 343/704**

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(57) **ABSTRACT**

The aerial of antennas FM1 and FM2 comprises, in addition to the original defrosting network (2), two pairs of vertical lines (9,10) which are disposed symmetrically in relation to the median vertical longitudinal plane of the vehicle. The FM1 signal is collected at a point (12) of the aerial which makes it possible to obtain a directive signal in the direction of the length of the vehicle on a plane with zero height. The FM2 signal is collected at a point (13) which is different from the aerial, making it possible to obtain a directive signal in the direction of the width of the vehicle on a plane with zero height. The serigraphed antenna for the rear window of a saloon-type car provides excellent reception for FM, AM and servitude function modes.

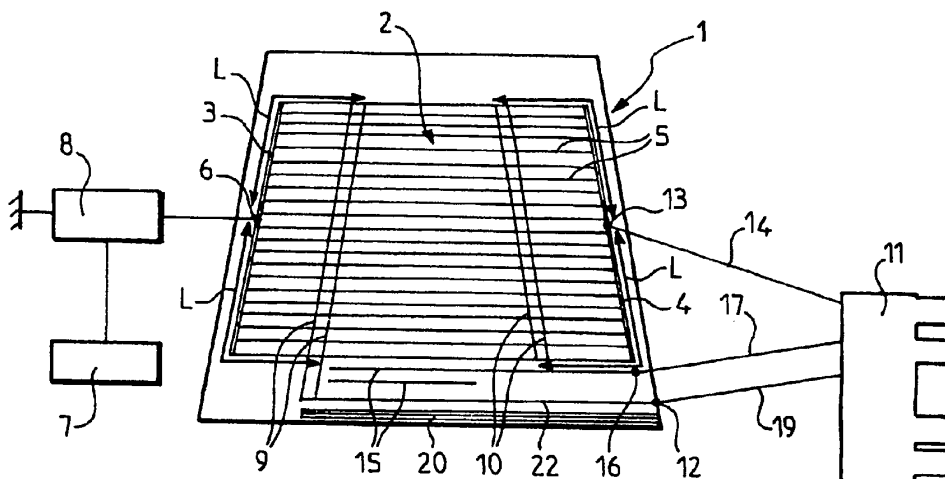
(73) Assignee: **SOCIETE DE COMPOSANTS ELECTRIQUES**, Evreux (FR)

(21) Appl. No.: **10/586,919**

(22) PCT Filed: **Feb. 7, 2005**

(86) PCT No.: **PCT/FR05/00268**

§ 371(c)(1),
(2), (4) Date: **Jul. 24, 2006**





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(19) **United States**

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

(10) **Pub. No.: US 2007/0120756 A1**

(43) **Pub. Date: May 31, 2007**

(54) **LOOP ANTENNA ATTACHED TO REAR WINDOW OF VEHICLE**

(52) **U.S. Cl.** 343/713; 343/704

(76) Inventors: **Kazushige Ogino**, Kobe-shi (JP);
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(57) **ABSTRACT**

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A loop antenna able to be mounted on the rear window of a vehicle provided with a defogger, that is, a loop antenna to be mounted on a rear window provided with a defogger having electrodes arranged in the vertical direction at the two ends and a plurality of electrical heating wires bridging the electrodes in the horizontal direction, wherein an antenna element forming a loop is made polygonal in shape, two power feed terminals of the loop antenna are provided at positions a predetermined distance away from the midpoint of the bottom of the antenna element, constituted by one side, in the vertical direction, a distance between the power feed terminals and bottom is formed smaller than the distance between adjoining electrical heating wires of the defogger, and the loop antenna is mounted on the rear window between the adjoining electrical heating wires. The polygonal shape may be a triangular shape.

(21) Appl. No.: **11/606,500**

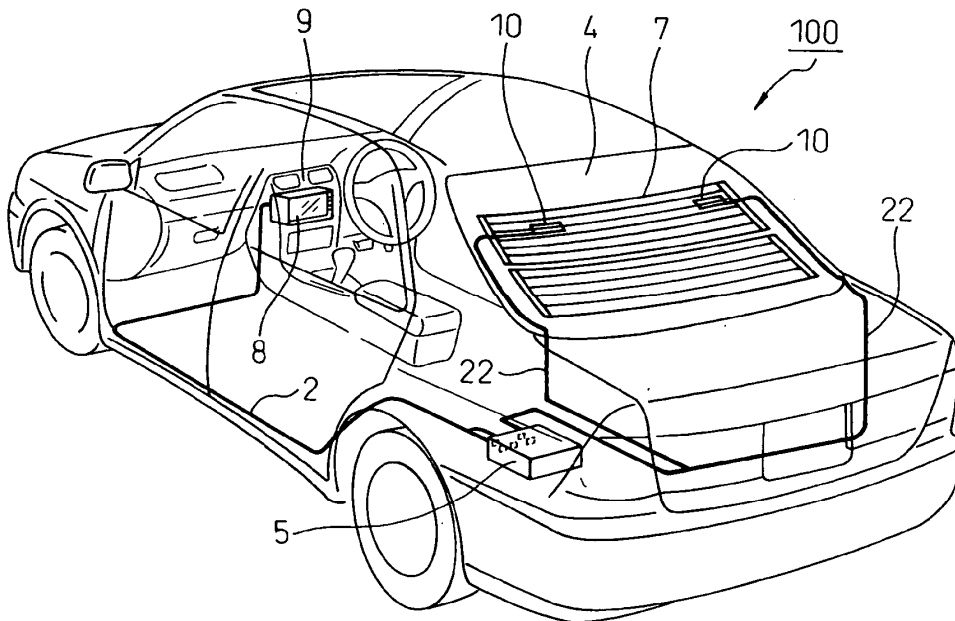
(22) Filed: **Nov. 28, 2006**

(30) **Foreign Application Priority Data**

Nov. 28, 2005 (JP) 2005-342891(PAT.)
Apr. 28, 2006 (JP) 2006-126652(PAT.)

Publication Classification

(51) **Int. Cl.**
H01Q 1/32 (2006.01)
H01Q 1/02 (2006.01)





US 20070120757A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120757 A1**

(43) **Pub. Date: May 31, 2007**

(54) **ROD ANTENNA MOUNTED AT REAR WINDOW OF VEHICLE**

Publication Classification

(51) **Int. Cl.**

H01Q 1/32 (2006.01)

H01Q 1/02 (2006.01)

(52) **U.S. Cl.** **343/713; 343/704**

(76) Inventors: **Kazushige Ogino**, Kobe-shi (JP);
Yoshio Umezawa, Kobe-shi (JP); **Koji Nagao**, Kobe-shi (JP); **Kazuo Takayama**, Kobe-shi (JP)

(57) **ABSTRACT**

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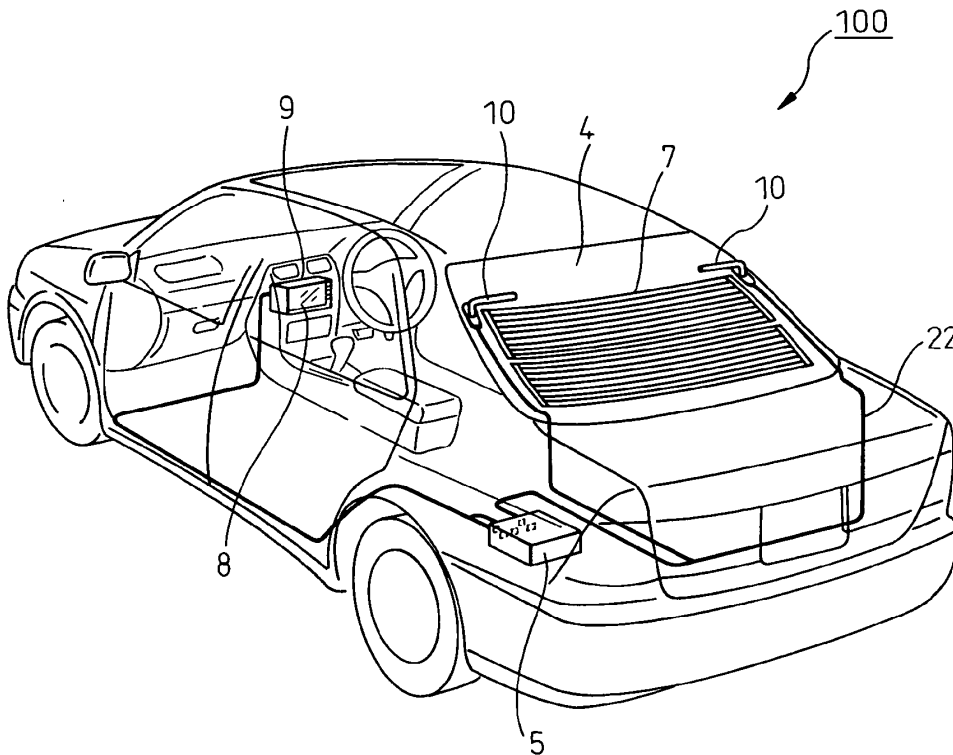
A rod antenna with a good reception sensitivity using a conductive body of a vehicle or a heater element of a defogger as a reflector, that is, a rod antenna to be mounted at a conductive outside surface of a vehicle or at an outside surface of a rear window of a vehicle where heater elements of a defogger are arranged in parallel, provided with a rod-shaped antenna element provided with a predetermined length and a holding member comprised of a base member for holding the antenna element and an antenna support member, the holding member holding the antenna element so that it is separated a predetermined distance from the outside surface so that the outside surface becomes a reflector for the antenna element.

(21) Appl. No.: **11/606,755**

(22) Filed: **Nov. 29, 2006**

(30) **Foreign Application Priority Data**

Nov. 30, 2005 (JP) 2005-346778





US 20070120760A1

(19) **United States**

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

(10) **Pub. No.: US 2007/0120760 A1**

(43) **Pub. Date: May 31, 2007**

(54) **COLUMN ANTENNA APPARATUS AND A MANUFACTURING METHOD THEREOF**

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

(76) Inventors: **Kang-Neng Hsu**, Hsinchu (TW);
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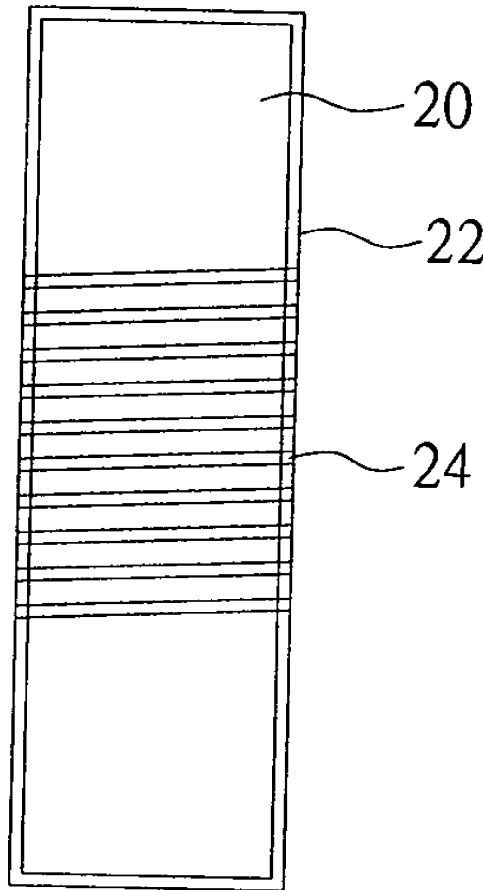
A column antenna apparatus and a manufacturing method thereof are disclosed. This invention forms a spiral metal layer on a column body. The column antenna apparatus can simplify the manufacturing process and enhance the yield rate. The column antenna apparatus includes a column body, a metal layer and a spiral structure. The metal layer is formed on the surface of the column body, and the spiral structure is formed on the metal layer. The spiral structure is implemented by removing part of the metal layer to form a pitch structure. The column body is exposed between the pitches. The column antenna apparatus can be applied to a single, dual, three or multi frequencies wireless communication device. Furthermore, the column antenna apparatus can be installed at outside of the wireless communication device to be an external antenna or at inside of the wireless communication device to be a built-in antenna.

(21) Appl. No.: 11/286,336

(22) Filed: Nov. 25, 2005

Publication Classification

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





US 20070120761A1

(19) **United States**

(12) **Patent Application Publication**
Candal

(10) **Pub. No.: US 2007/0120761 A1**

(43) **Pub. Date: May 31, 2007**

(54) **HIGH PERFORMANCE COMPACT HALF WAVE ANTENNA**

Publication Classification

(75) Inventor: **Alejandro Candal**, Davie, FL (US)

(51) **Int. Cl.**

H01Q 1/36 (2006.01)

H01Q 1/24 (2006.01)

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WELLINGTON, FL 33414 (US)

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

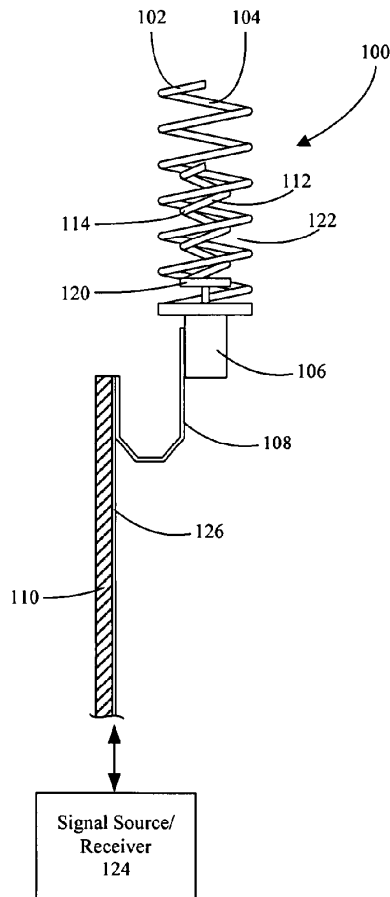
(57) **ABSTRACT**

An antenna (100) that includes an outer helical radiator (102) having a first diameter (118) and an inner helical radiator (112) having a second diameter (116) that is smaller than the first diameter. The inner helical radiator can be positioned at least in part interior to the outer helical radiator. Further, the outer helical radiator and the inner helical radiator can be substantially coaxially aligned. For example, the inner helical radiator can be attached to a dielectric member (120) such that the dielectric member maintains the position of the inner helical radiator.

(73) Assignee: **Motorola, Inc.**

(21) Appl. No.: **11/290,199**

(22) Filed: **Nov. 30, 2005**





US 20070123294A1

(19) **United States**

(12) **Patent Application Publication**
Lee

(10) **Pub. No.: US 2007/0123294 A1**

(43) **Pub. Date: May 31, 2007**

(54) **SPEAKER DEVICE FOR PORTABLE
TERMINAL USING ANTENNA MOUNTING
SPACE**

(30) **Foreign Application Priority Data**

Nov. 1, 2005 (KR)..... 10-2005-0103893

Publication Classification

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

(52) **U.S. Cl.** **455/550.1**

(57) **ABSTRACT**

Disclosed is a speaker device for a portable terminal using an antenna mounting space, which includes at least one speaker module so as to enable sound to resonate in the antenna mounting space. The speaker device includes at least one speaker module integrated with the embedded antenna module, in which sound can resonate in a mounting space for the embedded antenna when the speaker module generates the sound.

(75) Inventor: **Sin-Jae Lee**, Suwon-si (KR)

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

(21) Appl. No.: **11/503,254**

(22) Filed: **Aug. 11, 2006**

