



US 20080030405A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0030405 A1**

(43) **Pub. Date: Feb. 7, 2008**

(54) **ELECTRONIC DEVICE AND ANTENNA THEREOF**

(30) **Foreign Application Priority Data**

Jun. 12, 2006 (TW) TW95210218

(75) Inventors: **Feng-Chi Eddie Tsai**, Taipei (TW); **Kuan-Hsueh Tseng**, Taipei (TW); **Jiunn-Ming Huang**, Taipei (TW)

Publication Classification

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

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

(57) **ABSTRACT**

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2210 MAIN STREET, SUITE 200
SANTA MONICA, CA 90405

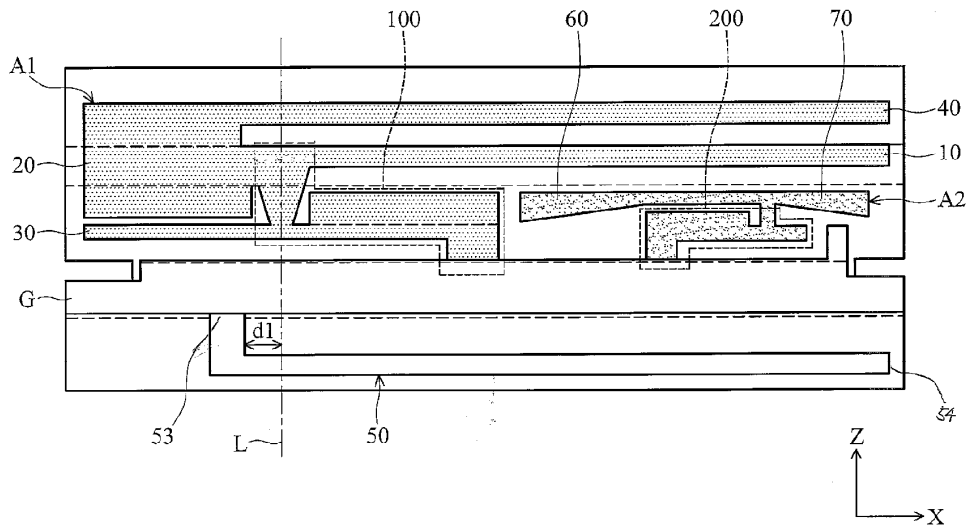
An antenna comprising a ground element, a first conductive element, a first transmission element, a second transmission element and a third transmission element. The first conductive element is connected to the ground element. The first transmission element is connected to the first conductive element extending in a first direction. The second transmission element is connected to the first conductive element. The third transmission element is connected to the first conductive element extending in a second direction opposite to the first direction, wherein the third transmission element nears the second transmission element, and maintains a distance from the second transmission element.

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

(21) Appl. No.: **11/752,884**

(22) Filed: **May 23, 2007**

A





US 20080030406A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0030406 A1**

(43) **Pub. Date: Feb. 7, 2008**

(54) **OMNI-DIRECTIONAL ANTENNA**

Publication Classification

(75) Inventors: **Frederick O. Fortson**, Whitmore Lake, MI (US); **Richard Hansen**, Ann Arbor, MI (US); **Greg Soosik**, Canton, MI (US)

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

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

(57) **ABSTRACT**

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An omni-directional antenna includes an electrically conductive ground plane, an electrically conductive parasitic disc spaced upwardly apart from the ground plane and parallel thereto, and an electrically conductive vertical antenna element extending up through the center of the ground plane and parasitic disc. The vertical element terminates in a tip defining a length above the parasitic disc that is matched to a frequency of interest. The parasitic disc and ground plane are preferably both circular. To prevent electrical connection, the vertical element preferably extends through separate insulators in the parasitic disc and ground plane. The length of the vertical element is matched to a microwave frequency; in particular, the length of the vertical element is proportioned to one-quarter wavelength of the frequency of interest. The invention is particularly suited to microwave frequencies.

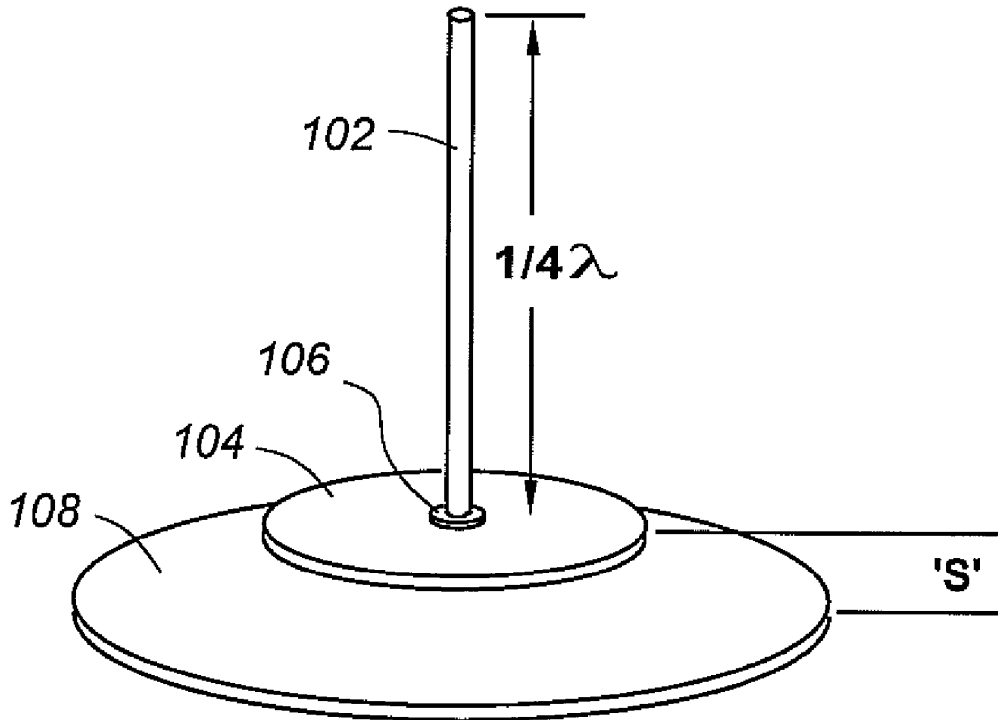
(73) Assignee: **Solidica, Inc.**

(21) Appl. No.: **11/755,265**

(22) Filed: **May 30, 2007**

Related U.S. Application Data

(60) Provisional application No. 60/809,257, filed on May 30, 2006.





US 20080030407A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2008/0030407 A1**

Hung et al. (43) **Pub. Date: Feb. 7, 2008**

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

(30) **Foreign Application Priority Data**

May 23, 2005 (TW)..... 94116677

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

Publication Classification

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

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

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(57) **ABSTRACT**

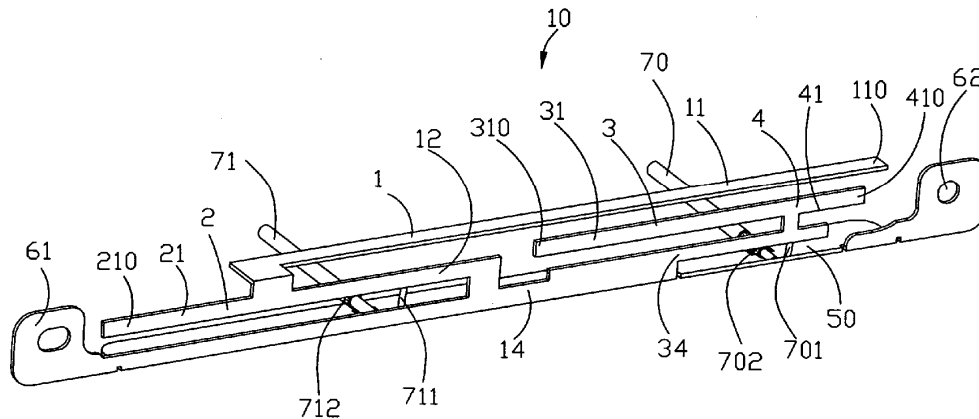
A multi-frequency antenna includes a first antenna (1) and a second antenna (2) both operating at wireless wide area network, a third antenna (3) and a fourth antenna (4) both operating at wireless local area network. The first antenna, the second antenna, the third antenna and the fourth antenna are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

(21) Appl. No.: **11/906,691**

(22) Filed: **Oct. 2, 2007**

Related U.S. Application Data

(63) Continuation of application No. 11/201,463, filed on Aug. 11, 2005, now Pat. No. 7,289,071.





US 20080030408A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0030408 A1**

(43) **Pub. Date: Feb. 7, 2008**

(54) **COMPACT SATCOM ANTENNA WITH INTEGRATED LNA**

(21) Appl. No.: **11/462,398**

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

Publication Classification

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

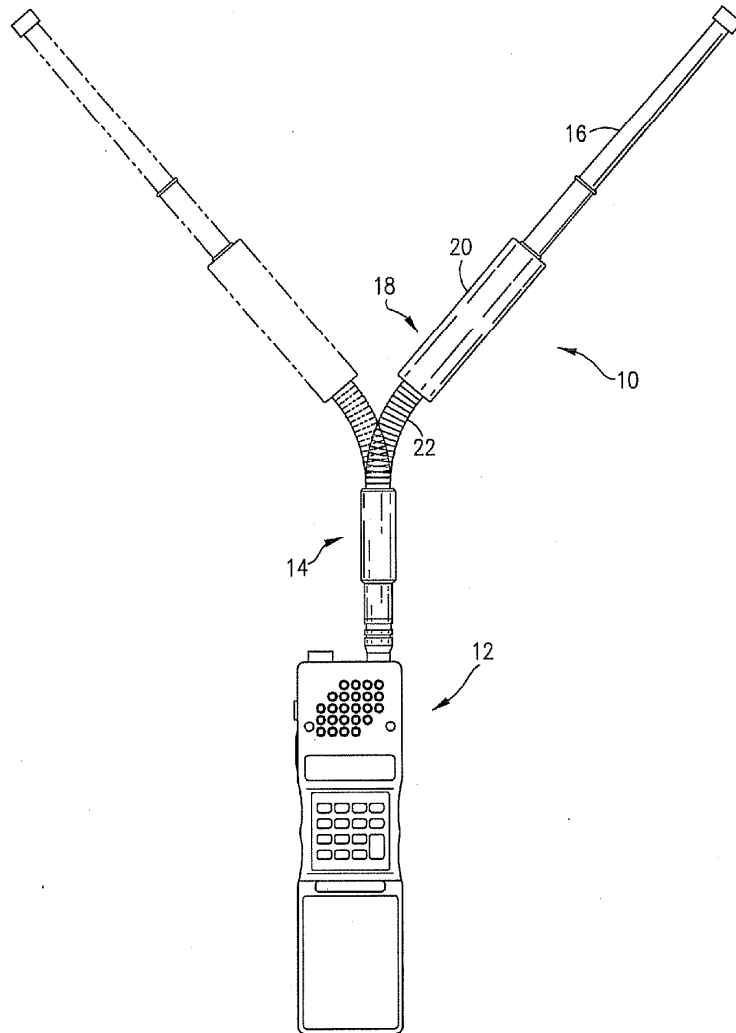
(52) **U.S. Cl.** **343/702; 343/792**

(76) Inventors: **Chad Coates**, Satellite Beach, FL (US); **David L. Dunathan**, Palm Bay, FL (US); **Stephen Darnell Hughey**, Melbourne, FL (US); **Malcolm Packer**, Fairport, NY (US); **Kurt Alan Zimmerman**, Indialantic, FL (US); **Brent Eric Raiber**, Springville, NY (US)

(57) **ABSTRACT**

A compact SATCOM antenna is provided having an LNA integrated into the radiator body which may be mounted to a handheld satellite radio and articulated with respect to the radio to assume a wide variety of positions for communication with a geosynchronous satellite.

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US 20080030409A1

(19) **United States**

(12) **Patent Application Publication**
Shih

(10) **Pub. No.: US 2008/0030409 A1**

(43) **Pub. Date: Feb. 7, 2008**

(54) **ROTATIONAL ANTENNA APPARATUS FOR GPS DEVICE**

(57) **ABSTRACT**

(76) Inventor: **Yih Lieh Shih**, Taipei (TW)

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

(21) Appl. No.: **11/498,239**

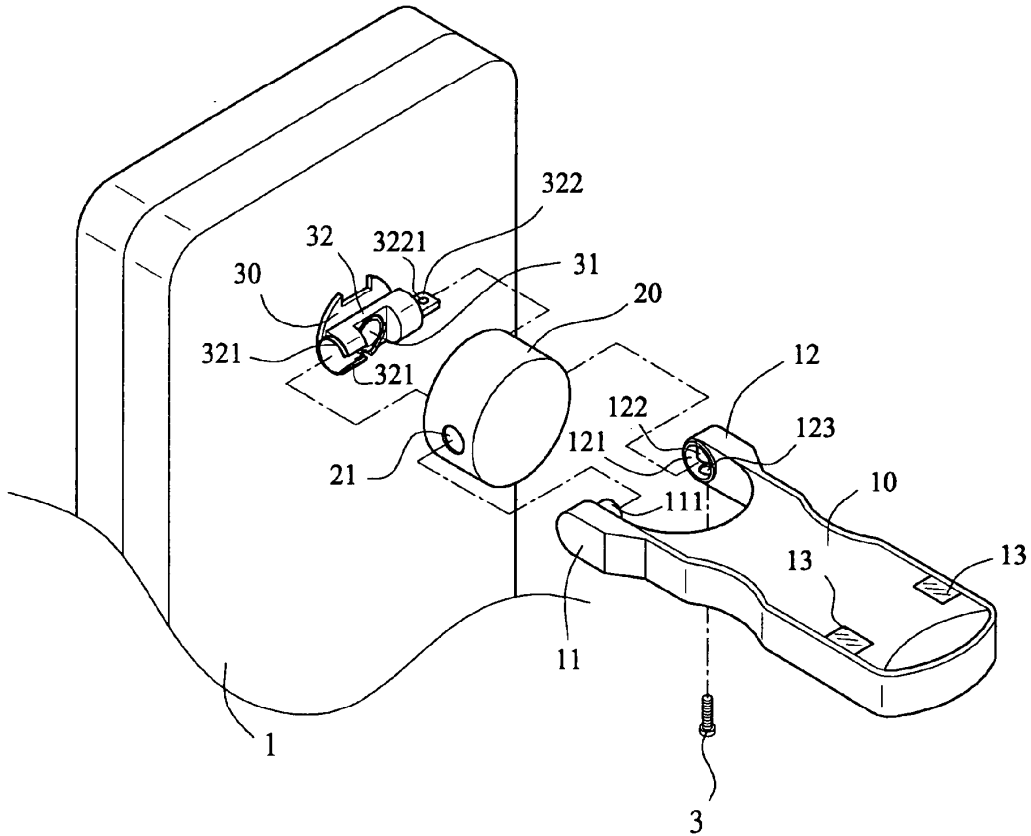
(22) Filed: **Aug. 3, 2006**

Publication Classification

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

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

A rotational antenna apparatus for GPS device includes a receiving antenna, a coupling shaft and a rotational stage. The receiving antenna includes a satellite receiving module and a pair of coupling legs on one end thereof. The coupling shaft is of circular cap shape and includes a pair of coupling holes on circumference thereof and corresponding to the coupling legs such that the receiving antenna can be pivotally connected to the coupling shaft and the receiving antenna has 180 degree rotation with the coupling hole as a pivot. The rotational stage is fixed to a casing of the GPS device and includes a pivotal hole through the casing, a tenon pivotally connected to the pivotal hole, wherein the coupling hole is pivotally connected to the coupling leg of the receiving antenna and the receiving antenna has 360 degree rotation with the pivotal hole as a pivot.





US 20080030410A1

(19) **United States**

(12) **Patent Application Publication**
Ying

(10) **Pub. No.: US 2008/0030410 A1**

(43) **Pub. Date: Feb. 7, 2008**

(54) **PORTABLE COMMUNICATION DEVICE WITH ULTRA WIDEBAND ANTENNA**

(30) **Foreign Application Priority Data**

Nov. 29, 2004 (EP) 04028215.4

(76) Inventor: **Zhinong Ying**, Lund (SE)

Publication Classification

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11350 RANDOM HILLS ROAD
SUITE 600
FAIRFAX, VA 22030 (US)

(51) **Int. Cl.**
H01Q 1/22 (2006.01)

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

(57) **ABSTRACT**

The present invention relates to a portable communication device and an antenna arrangement. The device comprises a circuit board (16) having two sides (26, 28) that are straight, at least in an area where they meet at an angle below one hundred and eighty degrees for forming a corner (30), a ground plane (18) extending between said two sides except for a free area at the corner of the circuit board, and a radiating antenna element (22) provided in the free area at the corner. The antenna arrangement, which comprises the ground plane and the radiating antenna element, is suitable for use in the Ultra Wide Band frequency range while at the same time occupying little space in the portable communication device.

(21) Appl. No.: **11/720,292**

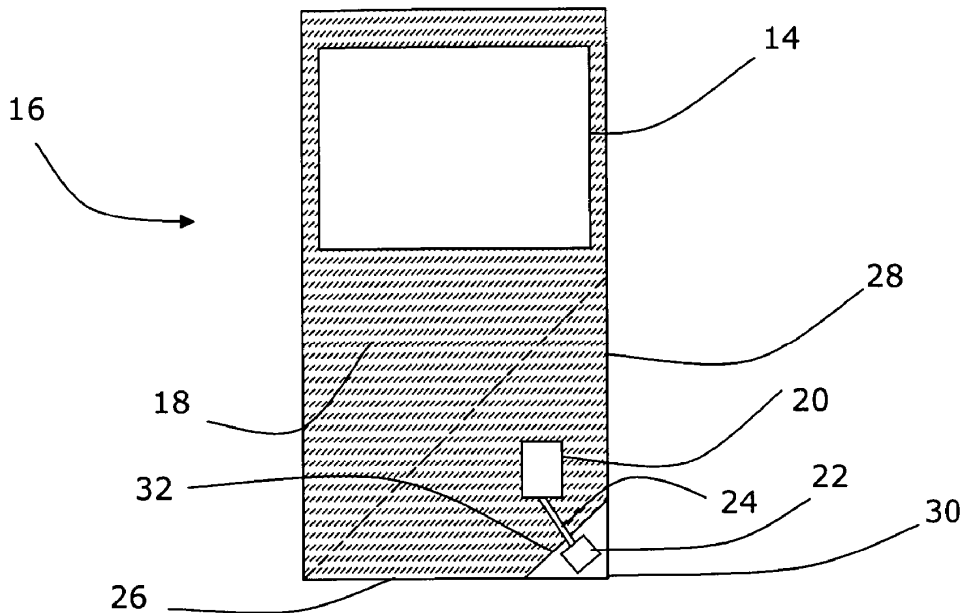
(22) PCT Filed: **Oct. 27, 2005**

(86) PCT No.: **PCT/EP05/11512**

§ 371(c)(1),
(2), (4) Date: **May 25, 2007**

Related U.S. Application Data

(60) Provisional application No. 60/633,823, filed on Dec. 7, 2004.





US 20080030411A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0030411 A1**

(43) **Pub. Date: Feb. 7, 2008**

(54) **MULTIPLE-BAND ANTENNA WITH PATCH AND SLOT STRUCTURES**

Publication Classification

(75) Inventors: **Geyi Wen**, Waterloo (CA); **Perry Jarmuszewski**, Waterloo (CA); **Adam D. Stevenson**, Waterloo (CA)

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 1/00 (2006.01)
H01Q 9/04 (2006.01)
H01Q 1/22 (2006.01)
(52) **U.S. Cl.** **343/702**; 29/600; 343/700 MS; 343/745

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(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 the 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 primarily with the second operating frequency band. A mounting structure for the multiple-band antenna is also provided. The mounting structure 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 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.: **11/838,751**

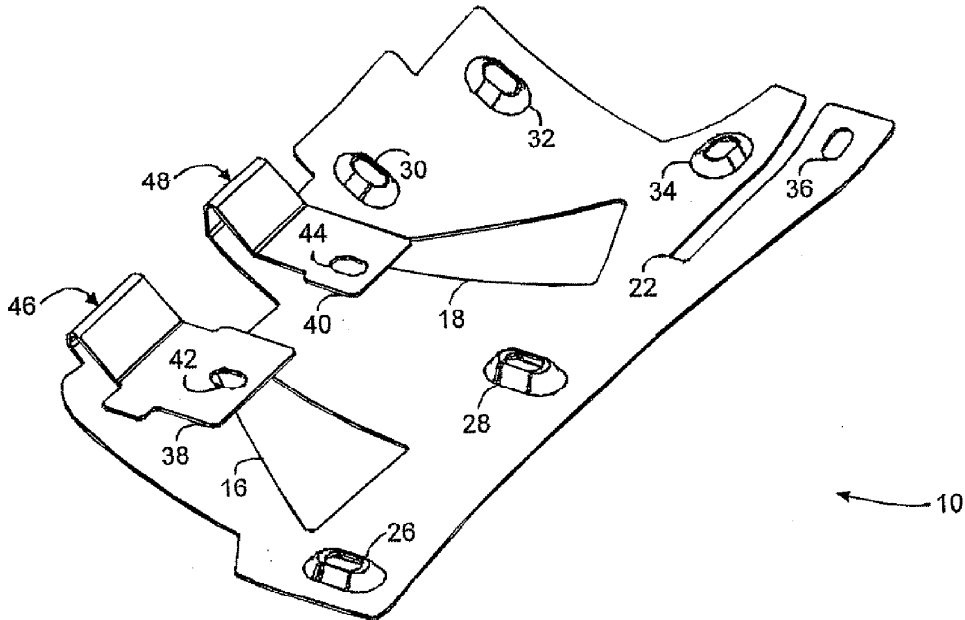
(22) Filed: **Aug. 14, 2007**

Related U.S. Application Data

(63) Continuation of application No. 10/781,195, filed on Feb. 18, 2004, now Pat. No. 7,280,537, which is a continuation of application No. 10/723,840, filed on Nov. 26, 2003, now Pat. No. 7,224,312.

(30) **Foreign Application Priority Data**

Nov. 28, 2002 (CA) PCT/CA02/01842





US 20080030418A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0030418 A1**

(43) **Pub. Date: Feb. 7, 2008**

(54) **MULTI-BAND PRINTED DIPOLE ANTENNA**

Publication Classification

(76) Inventors: **Patrice Brachat**, Nice (FR); **Philippe Ratajczak**, Nice (FR); **Frederic Devillers**, Nice (FR)

(51) **Int. Cl.**
H01Q 9/16 (2006.01)
H01Q 1/38 (2006.01)
H01Q 21/00 (2006.01)

(52) **U.S. Cl.** **343/810**

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ANNAPOLIS, MD 21403 (US)

(57) **ABSTRACT**

The invention relates to a printed antenna comprising a dielectric substrate (CS1, CS2) supporting feeder lines (LA1, LA2) and first and second T-shaped dipoles (D1, D2) of different sizes for dual-band operation. Each dipole includes a stem (J1, J2) and two radiating arms (B1, B2) separated by a coupling slot (FC1, FC2) made in the stem. For compactness of the antenna, the stems are partly superimposed, the coupling slots are aligned and a decoupling cut-out (ED) is made in the second dipole so as to uncover the coupling slot of the first dipole, by virtue of their superposition. The substrate can comprise one, two or three layers. Plural antennas can constitute an antenna network used as a base element in one-dimensional or two-dimensional network.

(21) Appl. No.: **11/888,756**

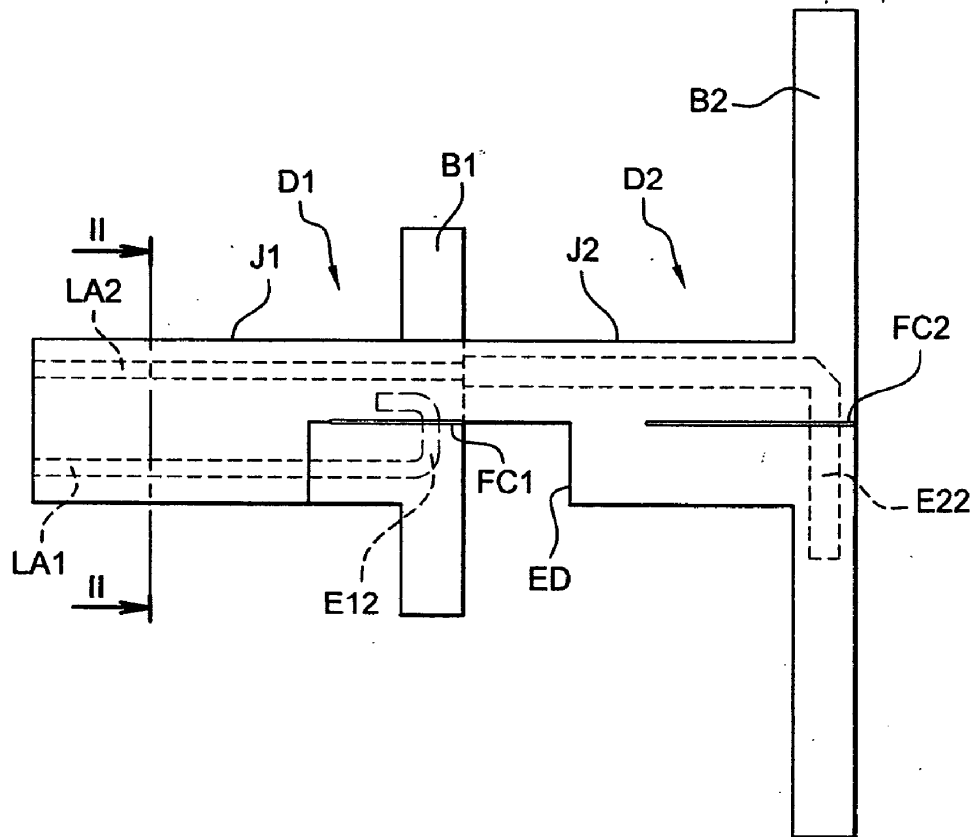
(22) Filed: **Aug. 2, 2007**

Related U.S. Application Data

(63) Continuation of application No. PCT/FR06/50099, filed on Feb. 3, 2006.

(30) **Foreign Application Priority Data**

Aug. 2, 2005 (FR)..... 0501814





US 20080036663A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0036663 A1**

(43) **Pub. Date: Feb. 14, 2008**

(54) **ANTENNA DEVICE**

Publication Classification

(76) Inventors: **Yukio Sakai**, Hyogo (JP); **Jyouji Fujiwara**, Osaka (JP)

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

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

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(57) **ABSTRACT**

Antenna device (1) includes substrate (2) having first surface (21), antenna element (3), circuit element (4) and first pattern (6) formed of metal, antenna element (3) is arranged on first surface (21), circuit element (4) is soldered to first surface (21) and electrically connected to antenna element (3), first pattern (6) is arranged between antenna element (3) and circuit element (4) on first surface (21), a distance between antenna element (3) and first pattern (6) is a length equal to or larger than a width of antenna element. In this arrangement, antenna device (1) in which substrate (2) between antenna element (3) and circuit element (4) is reinforced by first pattern (6), and warping of substrate (2) when being taken out from a reflow oven is restrained is provided.

(21) Appl. No.: **11/630,113**

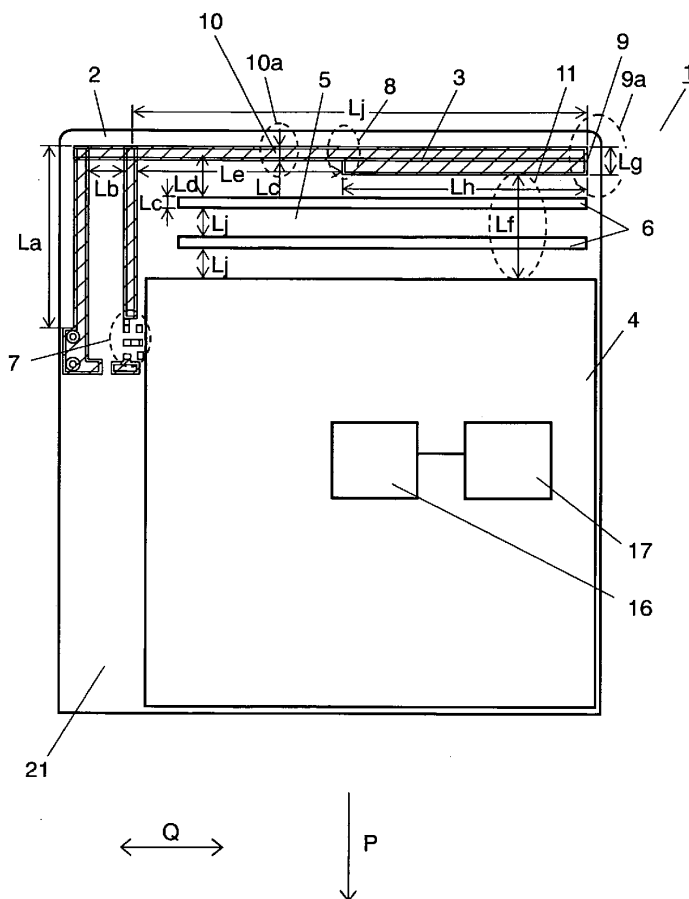
(22) PCT Filed: **Jun. 15, 2006**

(86) PCT No.: **PCT/JP06/11990**

§ 371(c)(1),
(2), (4) Date: **Dec. 20, 2006**

(30) **Foreign Application Priority Data**

Jun. 27, 2005 (JP) 2005-185852





US 20080036665A1

(19) **United States**

(12) **Patent Application Publication**
Schadler

(10) **Pub. No.: US 2008/0036665 A1**

(43) **Pub. Date: Feb. 14, 2008**

(54) **HIGH-POWER-CAPABLE CIRCULARLY POLARIZED PATCH ANTENNA APPARATUS AND METHOD**

(75) Inventor: **John L. Schadler**, Raymond, ME (US)

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CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

(73) Assignee: **SPX Corporation**

(21) Appl. No.: **11/882,383**

(22) Filed: **Aug. 1, 2007**

Related U.S. Application Data

(60) Provisional application No. 60/836,398, filed on Aug. 9, 2006.

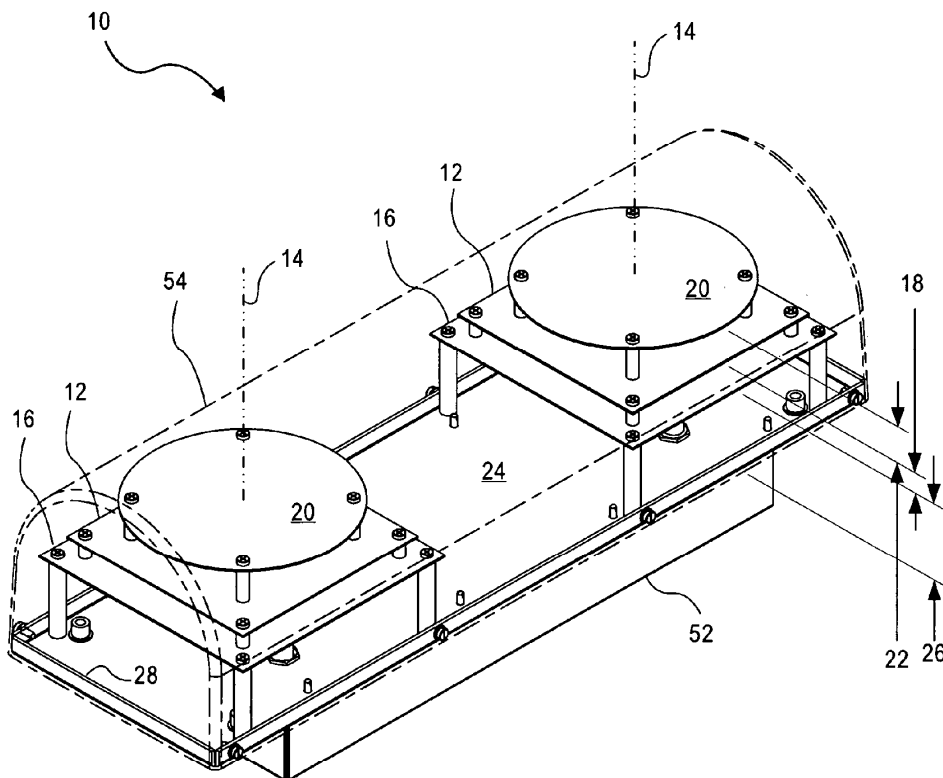
Publication Classification

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

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

(57) **ABSTRACT**

A circularly polarized patch antenna uses a square quarter-wavelength conductive plate, spaced away from a slightly larger backing conductor. Excitation uses a coaxial feed stem pair, whereof respective inner conductors join the patch at orthogonal locations on a reference circle, and outer conductors intrude past points of joining to the backing conductor to establish gaps that interact with patch and backing conductor size and spacing to jointly establish terminal impedance. A parasitic element in the propagation path broadens bandwidth, while a frame behind serves to define a cavity reflector. A power divider behind the frame converts a single applied broadcast signal into two equal signals with orthogonal phase, which signals are delivered to the feed stems with equal-length coaxial lines.





US 2008003666A1

(19) **United States**

(12) **Patent Application Publication**
SHIH

(10) **Pub. No.: US 2008/0036666 A1**

(43) **Pub. Date: Feb. 14, 2008**

(54) **ANTENNA DEVICE**

Publication Classification

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

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

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FULLERTON, CA 92835

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

(57) **ABSTRACT**

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

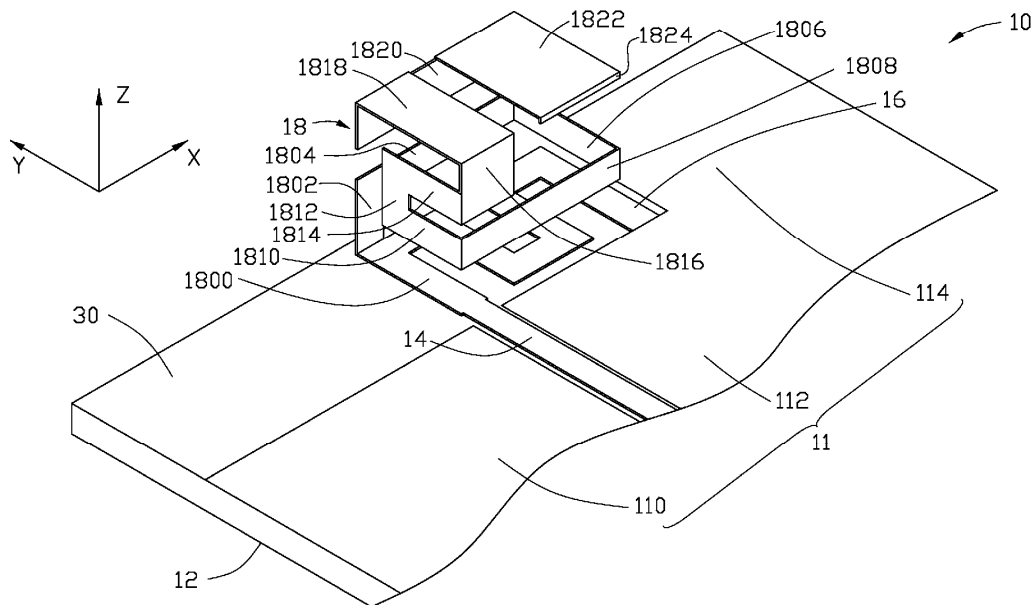
An antenna device (10) is disposed on a substrate (30), and includes a feed part (14), a holder (20), a body part (18), at least one ground plane (11), and a matching part (16). The feed part is for feeding electromagnetic signals. The body part is for radiating and receiving the electromagnetic signals is electronically connected to the feed part. The body part includes at least two radiation parts electronically connected in sequence and disposed on at least two adjacent surfaces of the holder. The at least one ground plane for grounding is disposed on one side of the substrate. The matching part for impedance matching includes one end electronically connected to the body part and another end electronically connected to the ground plane. The ground plane surrounds two adjacent sides of the matching part.

(21) Appl. No.: **11/615,949**

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

(30) **Foreign Application Priority Data**

Aug. 11, 2006 (TW) 95129620





US 20080036667A1

(19) **United States**

(12) **Patent Application Publication**
Fedan

(10) **Pub. No.: US 2008/0036667 A1**
(43) **Pub. Date: Feb. 14, 2008**

(54) **TRANSMISSION LINE RESONATOR LOOP ANTENNA**

Publication Classification

(76) Inventor: **Orest Fedan, Belmont, MA (US)**

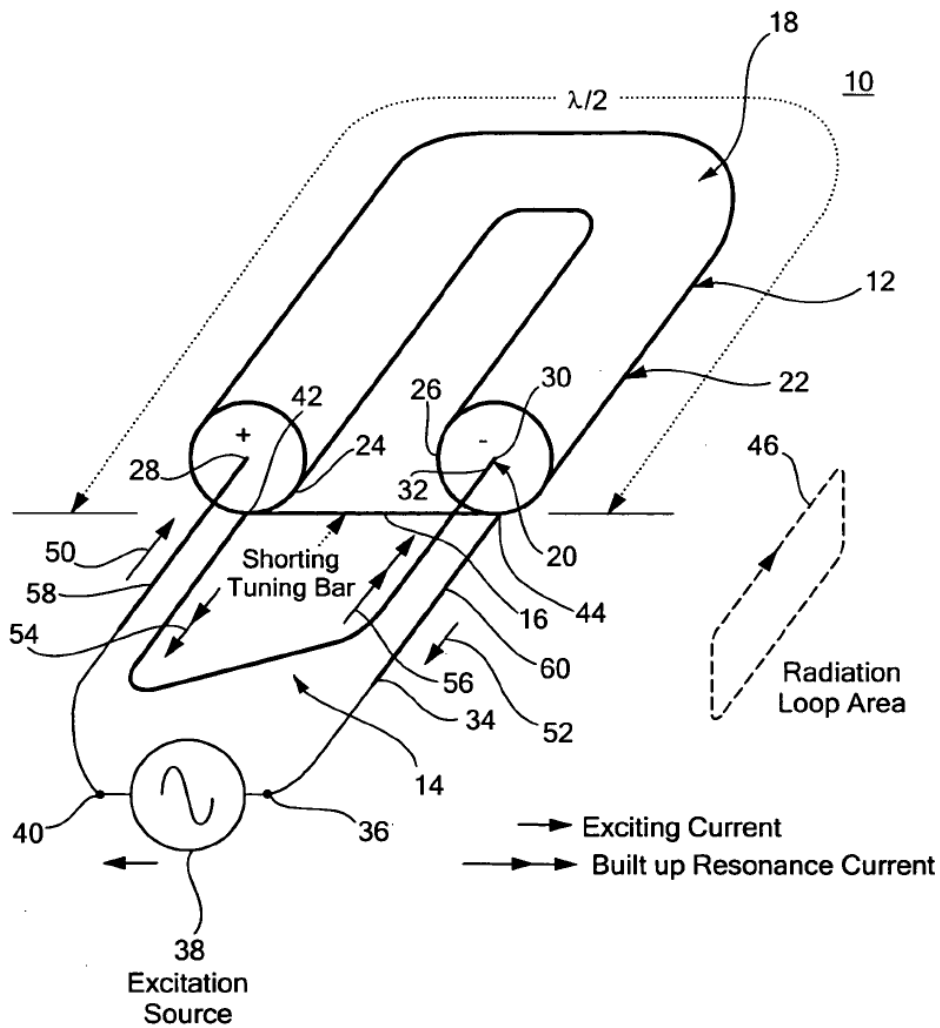
(51) **Int. Cl.**
H01Q 11/12 (2006.01)
(52) **U.S. Cl.** **343/741; 343/713; 343/866**
(57) **ABSTRACT**

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A transmission line resonator loop antenna includes a transmission line resonator for receiving an input excitation signal and producing a predetermined resonant output signal which is substantially phase reversed relative to the input excitation signal; and a loop antenna having one end responsive to the phase reversed output signal and the other end responsive to a reference excitation signal for maintaining the predetermined resonance.

(21) Appl. No.: **11/502,191**

(22) Filed: **Aug. 10, 2006**





US 20080036678A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0036678 A1**

(43) **Pub. Date: Feb. 14, 2008**

(54) **LOOP ANTENNA HAVING MATCHING
CIRCUIT INTEGRALLY FORMED**

(30) **Foreign Application Priority Data**

Aug. 8, 2006 (KR) 10-2006-0074501

(75) Inventors: **Wee-sang Park**, Yongin-si (KR);
Yoon-taek Lim, Yongin-si (KR);
Young-eil Kim, Yongsin-si (KR);
Yong-jin Kim, Yongin-si (KR)

Publication Classification

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

(52) **U.S. Cl.** **343/866; 343/741**

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WASHINGTON, DC 20037

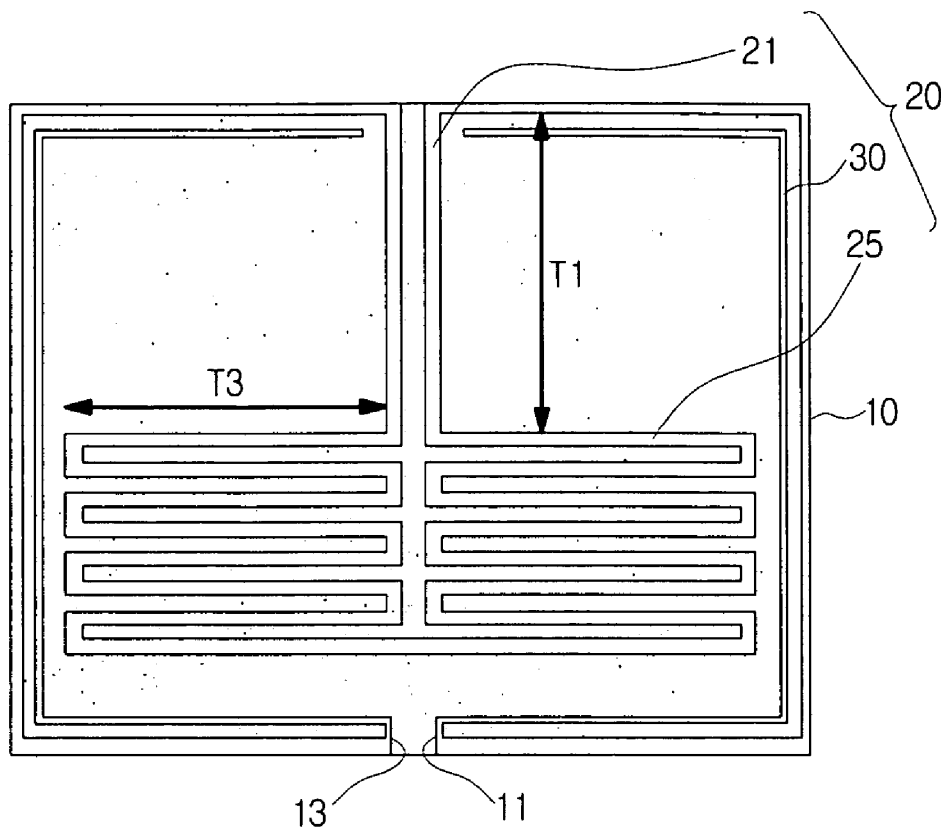
(57) **ABSTRACT**

A loop antenna is provided having a matching circuit integrally formed includes a radiator which is formed in a loop shape; and a matching circuit including an extension part extended from one side of the radiator to an inner side of the loop and a bend part bent from an end of the extension part several times. Accordingly, the space for the installation of the loop antenna can be reduced and the design modification of the matching circuit can be facilitated.

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

(21) Appl. No.: **11/645,774**

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





US 20080036682A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0036682 A1**

(43) **Pub. Date: Feb. 14, 2008**

(54) **ANTENNA DEVICE TO BE LOADED INTO AN INFORMATION PROCESSING APPARATUS**

Publication Classification

(51) **Int. Cl.**
H01Q 1/22 (2006.01)

(75) **Inventors:** Masao Teshima, Kunitachi-shi (JP); Hiroshi Shimasaki, Hamura-shi (JP)

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

Correspondence Address:
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SUNNYVALE, CA 94085-4040

(57) **ABSTRACT**

An antenna device to be loaded into an information apparatus has an antenna unit composed of antenna members which have a plurality of radio communication frequency bands, and which are divided into two of an element part having a flexural portion and a GND part, and a holding member composed of a member having non-conductivity, such as a resin member, to hold the respective antenna members so as to leave a constant gap *g* from the antenna members within a window area, the holding member being mounted so as to hang on an edge at the outside of a frame body of a liquid crystal display panel in an LCD housing of a PC.

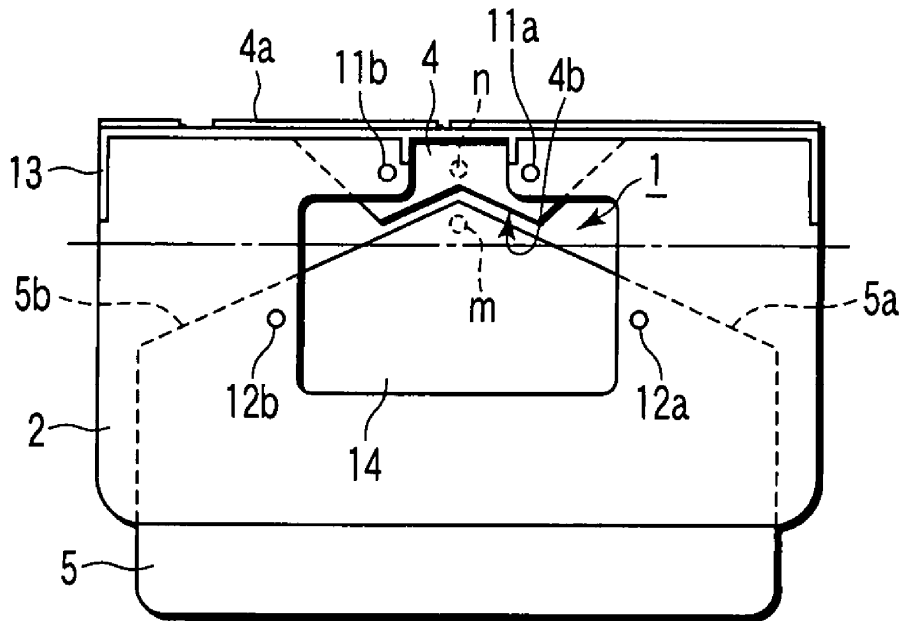
(73) **Assignee:** Kabushiki Kaisha Toshiba

(21) **Appl. No.:** 11/786,580

(22) **Filed:** Apr. 12, 2007

(30) **Foreign Application Priority Data**

May 26, 2006 (JP) 2006-146623





US 20080036684A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0036684 A1**

(43) **Pub. Date: Feb. 14, 2008**

(54) **ANTENNA ASSEMBLY WITH A MOVEABLE ANTENNA**

(30) **Foreign Application Priority Data**

Aug. 8, 2006 (TW) 95128971

(75) Inventors: **Wen-Fong Su**, Tu-Cheng (TW);
Lung-Sheng Tai, Tu-Cheng (TW);
Yao-Shien Huang, Tu-Cheng (TW);
Yu-Lung Shih, Tu-Cheng (TW);
Li-Heng Cheng, Tu-Cheng (TW)

Publication Classification

(51) **Int. Cl.**
H01Q 1/08 (2006.01)

(52) **U.S. Cl.** **343/880**

(57) **ABSTRACT**

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SANTA CLARA, CA 95050

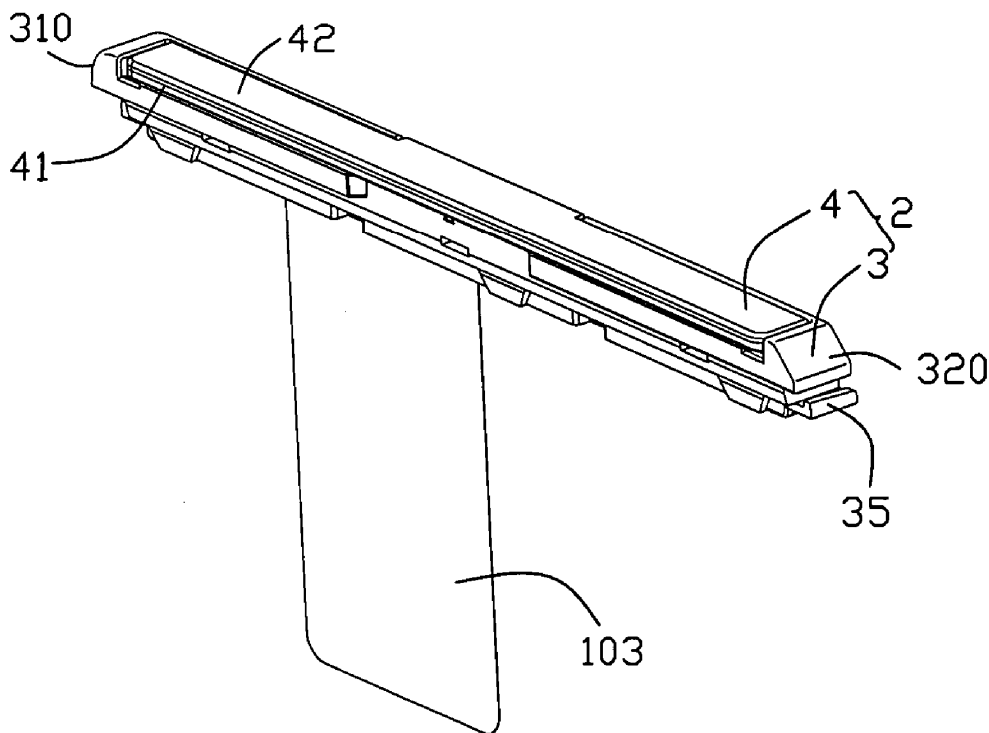
An antenna assembly with a movable antenna, assembled on an electronic device, includes a fixed portion adapted for assembling to said electronic device, an active portion movably assembled to the fixed portion and receiving the antenna therein, a first guiding means is served by some guiding slots formed on one of the fixed portion and the active portion and some guiding tabs corresponding to the guiding slots and formed on one of the active portion and the fixed portion; wherein the movable antenna capable of moving between a close position and an open position, and said guiding tabs are capable of sliding along the guiding slots and being stopped by the guiding slots to achieve the open position and close position of the antenna.

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

(21) Appl. No.: **11/890,954**

(22) Filed: **Aug. 8, 2007**

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US 20080036687A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0036687 A1**

(43) **Pub. Date: Feb. 14, 2008**

(54) **THIN-FILM EAS AND RFID ANTENNAS**

Publication Classification

(75) Inventors: **Adam S. Bergman**, Boca Raton, FL (US); **Stewart E. Hall**, Wellington, FL (US); **Manuel A. Soto**, Lake Worth, FL (US)

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
(52) **U.S. Cl.** **343/895**

(57) **ABSTRACT**

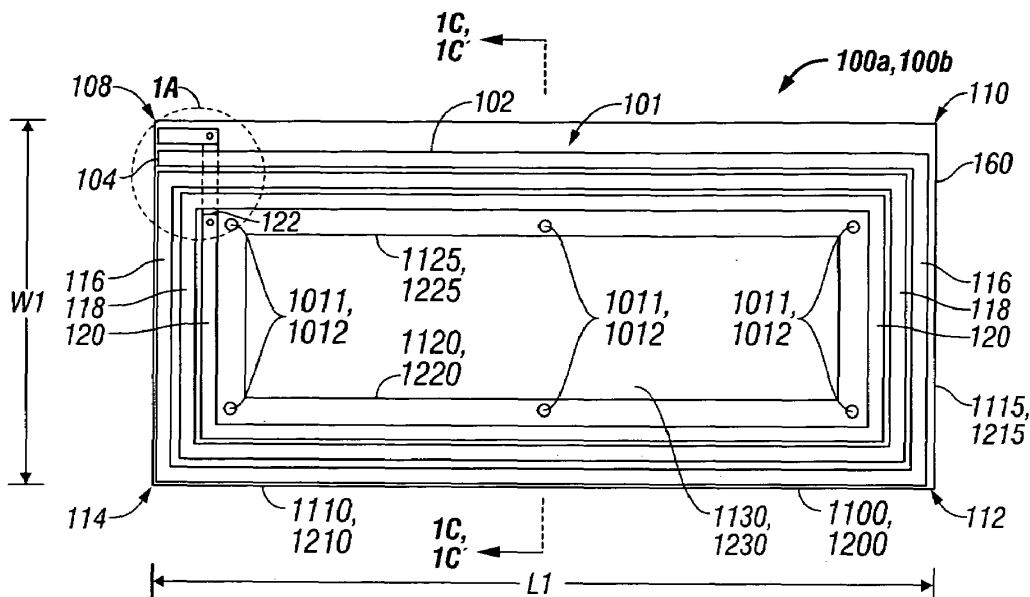
Correspondence Address:
IP LEGAL DEPARTMENT
TYCO FIRE & SECURITY SERVICES
ONE TOWN CENTER ROAD
BOCA RATON, FL 33486

An antenna assembly is capable of being installed in a structure wherein the structure includes a covering and a substructure and the antenna assembly is configured with thin film materials to have a total thickness such that the antenna assembly can be disposed between the substructure and the covering. The antenna assembly may have a total thickness not greater than about 15 millimeters (mm), and may include at least one of a transmitter antenna, a transceiver antenna, and a receiver antenna. The receiver antenna may be configured as an air core antenna or a non-air core antenna. The receiver antenna may be configured as a non-air core receiver antenna in an internal compartment over or within a base insulating layer. The antenna assembly may be at least partially housed within a housing assembly of thin film materials so that both can be disposed between the substructure and the covering.

(73) Assignee: **Sensormatic Electronics Corporation**, Boca Raton, FL (US)

(21) Appl. No.: **11/501,499**

(22) Filed: **Aug. 8, 2006**





US 20080042903A1

(19) **United States**

(12) **Patent Application Publication**
CHENG

(10) **Pub. No.: US 2008/0042903 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **MULTI-BAND DIELECTRIC RESONATOR ANTENNA**

Publication Classification

(76) Inventor: **Dajun CHENG**, Acton, MA (US)

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

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

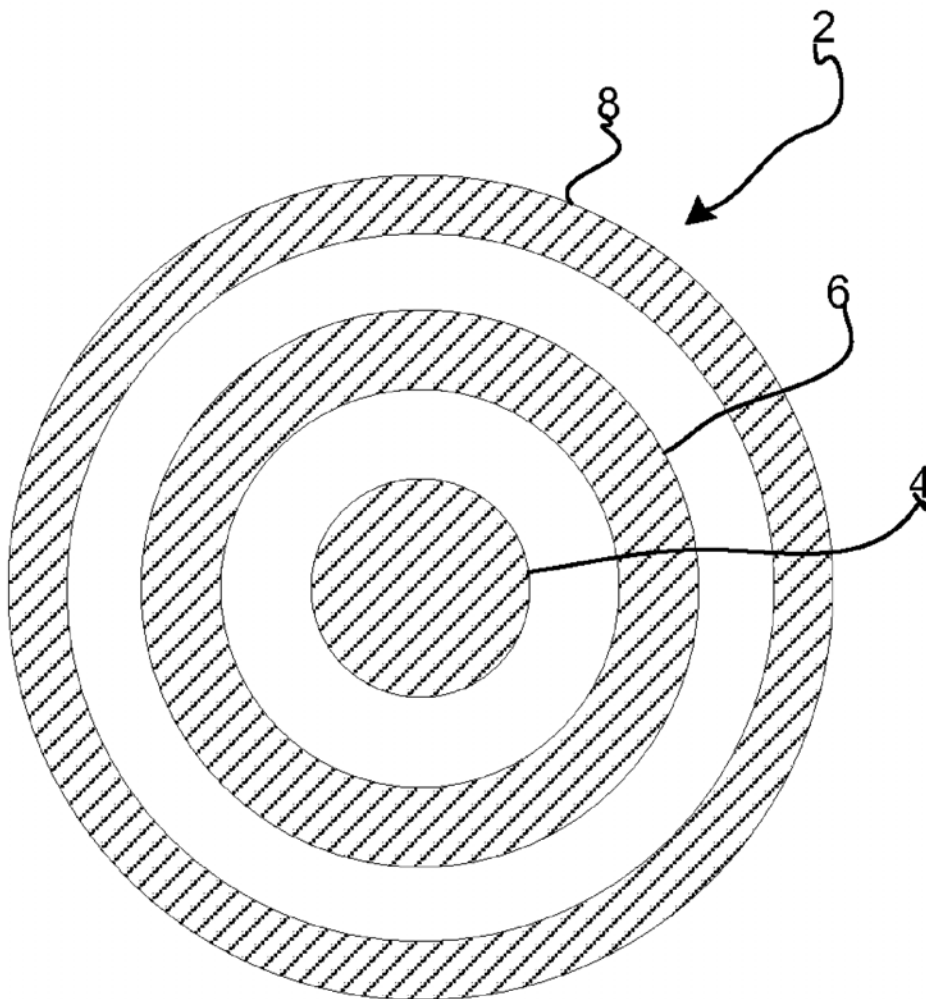
Correspondence Address:
KONRAD RAYNES & VICTOR, LLP.
ATTN: INT77
315 SOUTH BEVERLY DRIVE, SUITE 210
BEVERLY HILLS, CA 90212

(57) **ABSTRACT**

Provided is an antenna comprising a first dielectric resonator antenna operative within a first frequency band, a second dielectric resonator antenna operative within a second frequency band, and a feeding structure electrically coupled to the first and second dielectric resonator antennas to receive and transmit signals at the first and second frequency bands through the first and second dielectric resonator antennas.

(21) Appl. No.: **11/464,774**

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



Multi-Band Dielectric Antenna



US 20080042904A1

(19) **United States**

(12) **Patent Application Publication**
SHIH

(10) **Pub. No.: US 2008/0042904 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **PLANAR ANTENNA**

(30) **Foreign Application Priority Data**

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

Aug. 18, 2006 (TW) 95130446

Publication Classification

Correspondence Address:
PCE INDUSTRY, INC.
ATT. CHENG-JU CHIANG JEFFREY T. KNAPP
458 E. LAMBERT ROAD
FULLERTON, CA 92835

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

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

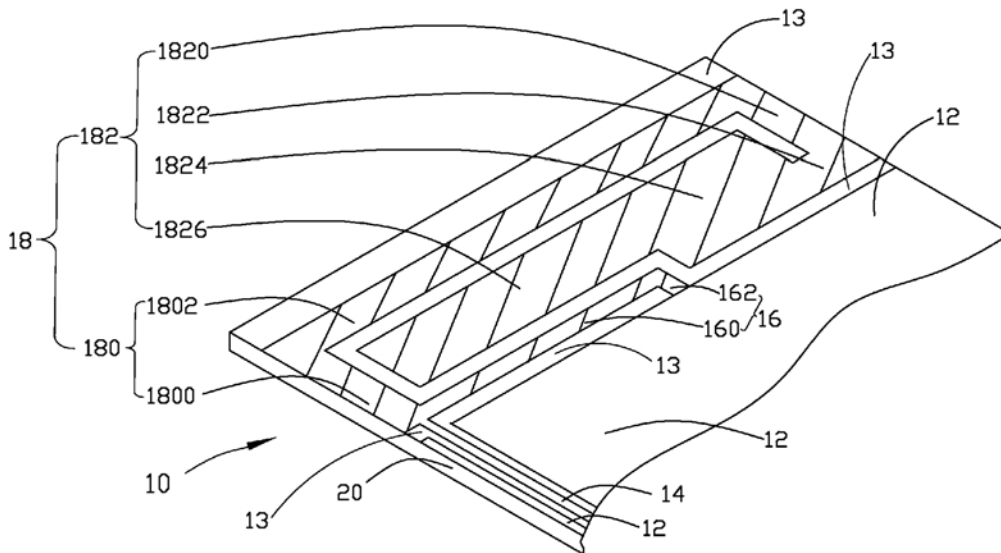
(57) **ABSTRACT**

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

A planar antenna (10) includes a feed wire (14), a radiation part (18), a matching part (16), and a ground portion (12). The feed wire is used for feeding electromagnetic signals. The radiation part is connected to the feed wire for radiating electromagnetic signals, and the radiation part includes a first radiation part (180) and a second radiation part (182) connected to the first radiation part. The matching part is connected to the radiation part, and is used for impedance matching. The ground portion surrounds the feed wire, and is electronically connected to the matching part.

(21) Appl. No.: **11/611,151**

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





US 20080042905A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0042905 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **MONOPOLE ANTENNA HAVING MATCHING FUNCTION**

(30) **Foreign Application Priority Data**

Aug. 18, 2006 (KR) 10-2006-0078323

(75) Inventors: **Young-min Moon, Yongin-si (KR);
Se-hyun Park, Yongin-si (KR);
Young-eil Kim, Yongin-si (KR);
Kyeong-sik Min, Yongin-si (KR)**

Publication Classification

(51) **Int. Cl.**
H01Q 1/44 (2006.01)

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

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

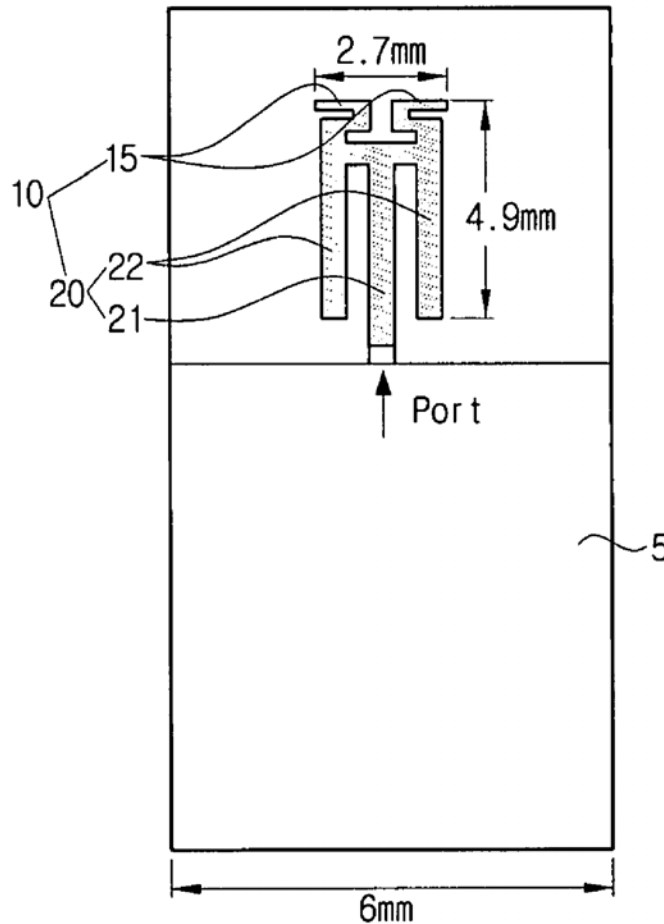
(57) **ABSTRACT**

A monopole antenna having a matching function includes a ground; and a radiator having a first radiation part which is connected to a first side of the ground in a strip shape perpendicularly to the ground, and at least one second radiation part which is bent from a first end of the first radiation part at least once.

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

(21) Appl. No.: **11/708,632**

(22) Filed: **Feb. 21, 2007**





US 20080042906A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0042906 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **ANTENNA APPARATUS AND ELECTRONIC APPARATUS**

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

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

(30) **Foreign Application Priority Data**

Aug. 18, 2006 (JP) 2006-222849

Publication Classification

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

(52) **U.S. Cl.** **343/700 MS; 343/872**

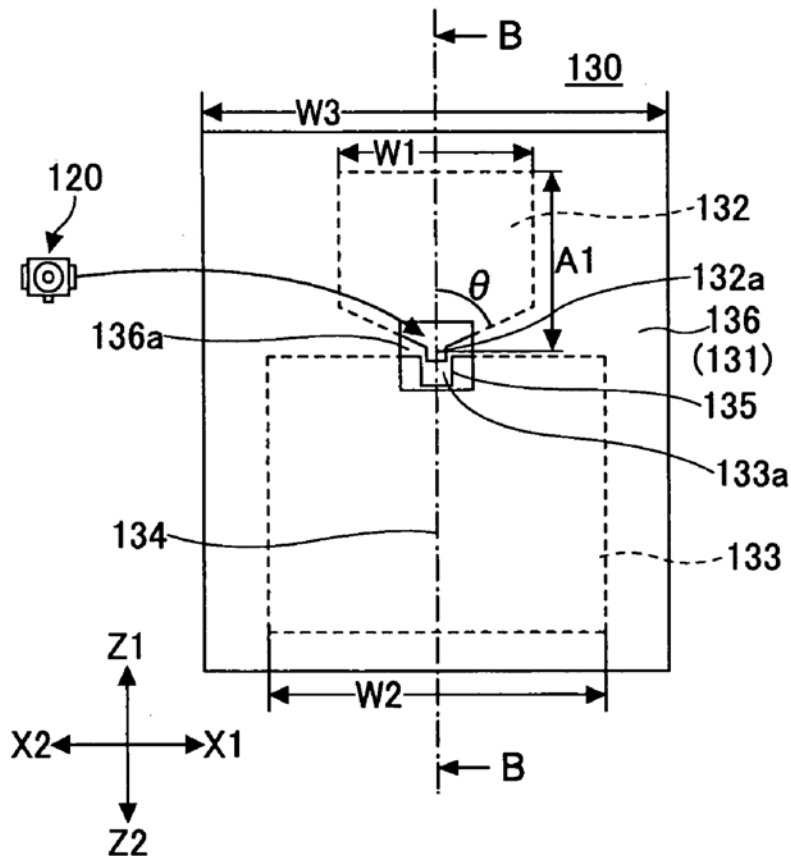
(57) **ABSTRACT**

A disclosed antenna apparatus includes a dielectric flexible base having an element pattern and a ground pattern formed thereon. The dielectric flexible base has a cylindrical shape encompassing an antenna axis. The element pattern and the ground pattern formed on the dielectric flexible base are symmetrically formed with respect to the antenna axis.

Correspondence Address:
STAAS & HALSEY LLP
SUITE 700, 1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

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

(21) Appl. No.: **11/717,187**



W1 : 16mm
A1 : 15mm



US 20080042907A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0042907 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **COMPACT RADIO FREQUENCY
TRANSMITTING AND RECEIVING
ANTENNA AND CONTROL DEVICE
EMPLOYING SAME**

Publication Classification

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/700 MS**

(75) **Inventors:** **Spencer L. Webb**, Pelham, NH (US);
Stephen S. Thompson, London (GB);
Gregory S. Altonen, Easton, PA (US);
Stuart DeJonge, Riegelsville, PA (US);
Edward M. Felegy Jr., Macungie, PA
(US); **Siddharth P. Sinha**, London
(GB)

(57) **ABSTRACT**

An antenna operable to transmit or receive radio frequency signals at a specified frequency, the antenna comprising a first printed circuit board comprising a first loop of conductive material having a capacitance and an inductance, the capacitance and the inductance forming a circuit being resonant at the specified frequency; and a second printed circuit board comprising a second loop of conductive material having two ends adapted to be electrically coupled to an electronic circuit, the second loop being substantially only magnetically coupled to the first loop and electrically insulated from the first loop; the antenna for use with a device for controlling the power delivered to an electrical load, further wherein the first loop of the conductive material comprises a break and the capacitance includes a capacitor bridging the break; wherein the first printed circuit board is disposed in a first plane, and the first loop is disposed in the plane perpendicular to the first plane whereby electrical current flows in the first loop in a plane perpendicular to the first plane.

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

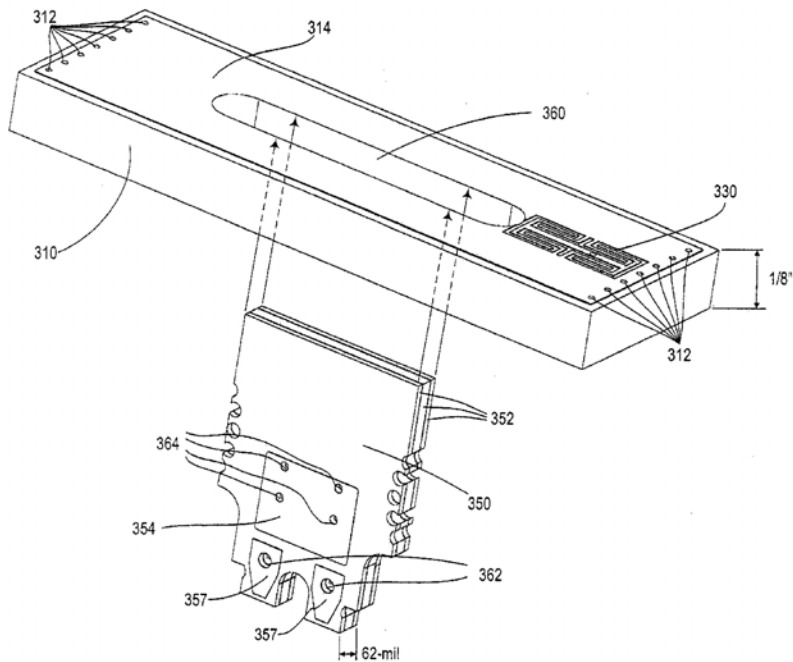
(73) **Assignee:** **LUTRON ELECTRONICS CO., INC.**,
Coopersburg, PA (US)

(21) **Appl. No.:** **11/874,563**

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

Related U.S. Application Data

(62) Division of application No. 10/873,033, filed on Jun. 21, 2004.





US 20080042908A1

(19) **United States**

(12) **Patent Application Publication**
Rausch

(10) **Pub. No.: US 2008/0042908 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **WIRELESS COMMUNICATION DEVICE
WITH A PATCH ANTENNA SUPPORTING
CROSS-POLARIZED ACTIVE ELEMENTS**

Related U.S. Application Data

(63) Continuation of application No. 11/464,901, filed on Aug. 16, 2006, now Pat. No. 7,301,503.

(75) Inventor: **Walter F. Rausch**, Shawnee, KS (US)

Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 9/04 (2006.01)
(52) **U.S. Cl.** **343/700 MS**

Correspondence Address:
SPRINT
6391 SPRINT PARKWAY
KSOPHT0101-Z2100
OVERLAND PARK, KS 66251-2100 (US)

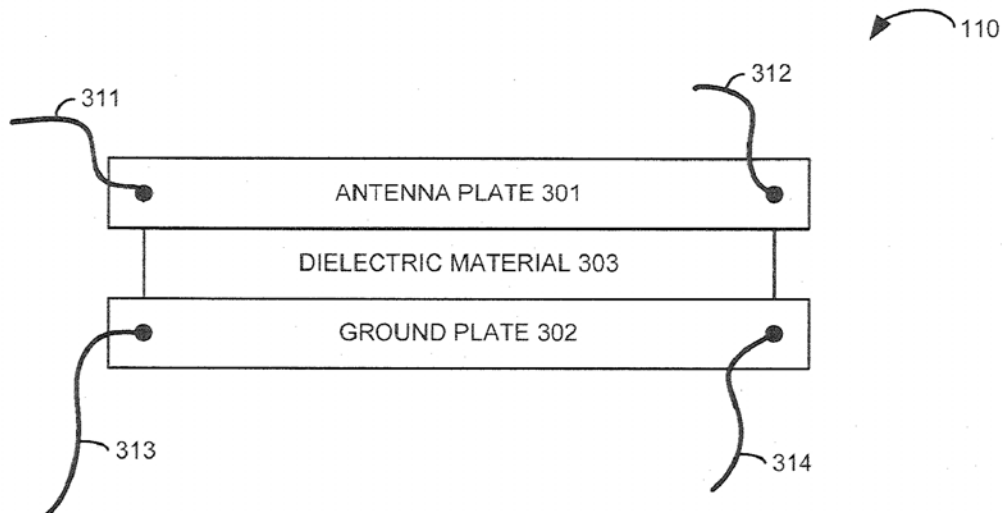
(57) **ABSTRACT**

A wireless communication device comprises a first portion and a second portion. The first portion comprises a patch antenna that includes an antenna plate and a ground plate that are separated by a dielectric. The antenna plate has orthogonal antenna elements that are configured to transmit and receive cross-polarized wireless signals. The second portion is configured to be handheld by a user.

(73) Assignee: **Sprint Communications Company L.P.**, Overland Park, KS

(21) Appl. No.: **11/875,553**

(22) Filed: **Oct. 19, 2007**





US 20080042910A1

(19) **United States**

(12) **Patent Application Publication**

Lee et al.

(10) **Pub. No.: US 2008/0042910 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **ANTENNA UNIT AND ELECTRICAL CONNECTION DEVICE THEREOF AND PORTABLE DEVICE HAVING THE SAME**

(30) **Foreign Application Priority Data**

Jul. 2, 2004 (KR)..... 2004-51713
Nov. 12, 2004 (KR)..... 2004-92413

(76) Inventors: **Jae-Ho Lee**, Gumi-si (KR); **Do-Hwan Choi**, Daegu (KR); **Yeong-Moo Ryu**, Gumi-si (KR); **Hark-Sang Kim**, Daegu (KR)

Publication Classification

Correspondence Address:
ROYLANCE, ABRAMS, BERDO & GOODMAN, L.L.P.
1300 19TH STREET, N.W.
SUITE 600
WASHINGTON,, DC 20036 (US)

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
(52) **U.S. Cl.** 343/702

(57) **ABSTRACT**

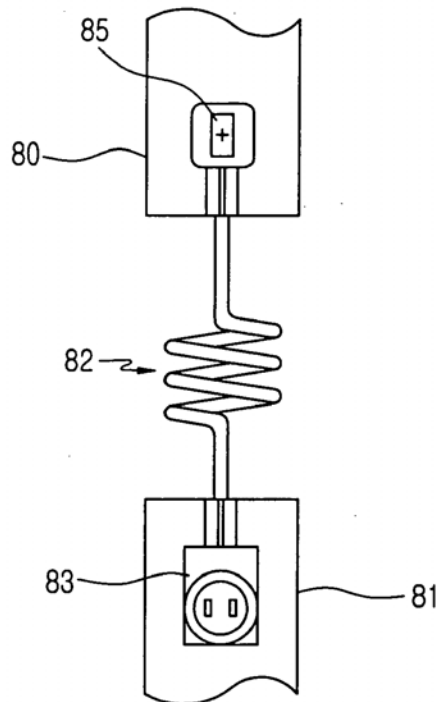
(21) Appl. No.: **11/896,406**

(22) Filed: **Aug. 31, 2007**

Related U.S. Application Data

(62) Division of application No. 11/172,870, filed on Jul. 5, 2005, now Pat. No. 7,286,089.

A portable device with a sliding variable built-in antenna is provided including a main body, a variable built-in antenna which is assembled at a predetermined location of the main body and configured to slide up/down with respect to the main body according to an antenna reception sensitivity, and an electrical connection device for signal transmission between the main body and the variable built-in antenna.





US 20080042914A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0042914 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **COMPACT RADIO FREQUENCY
TRANSMITTING AND RECEIVING
ANTENNA AND CONTROL DEVICE
EMPLOYING SAME**

Publication Classification

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/38 (2006.01)
H01Q 9/00 (2006.01)
(52) **U.S. Cl.** **343/745; 343/700 MS**

(75) **Inventors:** **Spencer L. Webb**, Pelham, NH (US);
Stephen S. Thompson, London (GB);
Gregory S. Altonen, Easton, PA (US);
Stuart DeJonge, Riegelsville, PA (US);
Edward M. Felegy JR., Macungie, PA
(US); **Siddharth P. Sinha**, London
(GB)

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

(73) **Assignee:** **LUTRON ELECTRONICS CO., INC.**,
Coopersburg, PA (US)

(21) **Appl. No.:** **11/874,500**

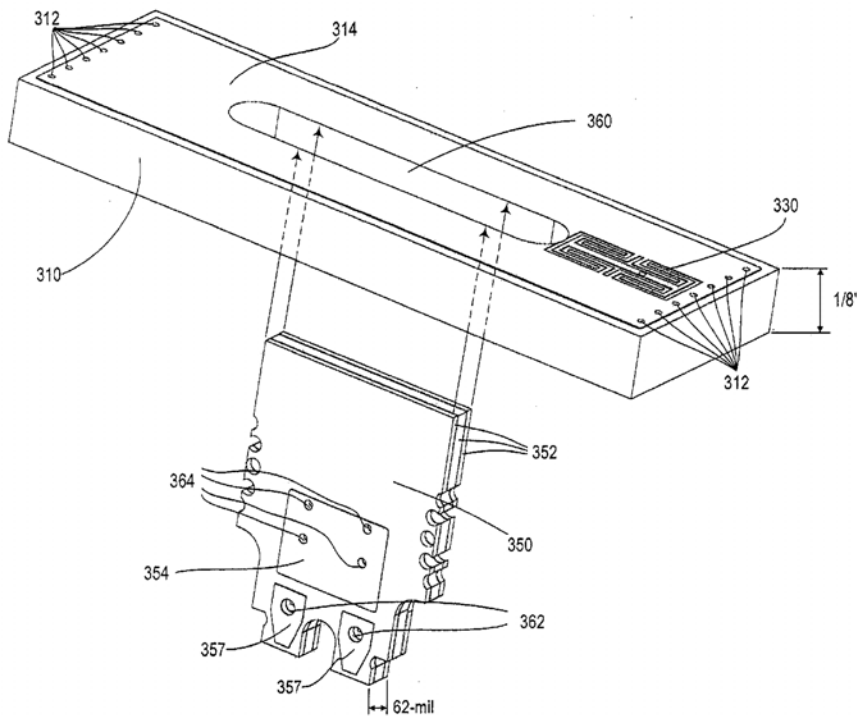
(22) **Filed:** **Oct. 18, 2007**

Related U.S. Application Data

(62) **Division of application No. 10/873,033, filed on Jun. 21, 2004.**

(57) **ABSTRACT**

An antenna operable to transmit or receive radio frequency signals at a specified frequency, the antenna comprising a first printed circuit board comprising a first loop of conductive material having a capacitance and an inductance, the capacitance and the inductance forming a circuit being resonant at the specified frequency; and a second printed circuit board comprising a second loop of conductive material having two ends adapted to be electrically coupled to an electronic circuit, the second loop being substantially only magnetically coupled to the first loop and electrically insulated from the first loop; the antenna for use with a device for controlling the power delivered to an electrical load, further wherein the first loop of the conductive material comprises a break and the capacitance includes a capacitor bridging the break; wherein the first loop comprises a first metal layer on a first side of the first printed circuit board and a second metal layer on a second, opposite side of the first printed circuit board, the first and second layers being electrically connected to each other and wherein the break is provided in one of layers.





US 20080042915A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0042915 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **TUNABLE ANTENNA OF PLANAR CONSTRUCTION**

Publication Classification

(76) Inventors: **Gerald Schillmeier**, Munchen (DE); **Frank Mierke**, Munchen (DE)

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 9/00 (2006.01)
(52) **U.S. Cl.** **343/745; 343/700 MS**

Correspondence Address:
NIXON & VANDERHYE, PC
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

(57) **ABSTRACT**

An improved tunable antenna of planar construction is distinguished by the following features:

(21) Appl. No.: **11/889,842**

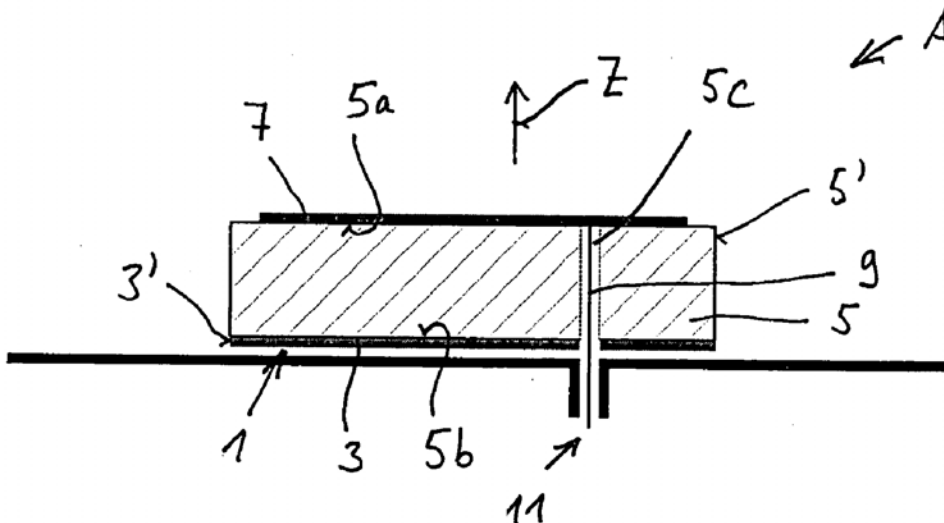
in plan view perpendicular to the effective surface (7), the electrically conductive structure (13, 113) completely or partially covers the effective surface (7),

(22) Filed: **Aug. 16, 2007**

the electrically conductive structure (13, 113) is coupled and/or connected galvanically or capacitively or serially and/or with interposition with at least one electrical component (125) with the ground surface (3) and/or a chassis (B) located on a potential or ground.

(30) **Foreign Application Priority Data**

Aug. 17, 2006 (DE) 102006038528.4-55





US 20080042916A1

(19) **United States**

(12) **Patent Application Publication**
Ma

(10) **Pub. No.: US 2008/0042916 A1**

(43) **Pub. Date: Feb. 21, 2008**

(54) **ANTENNA**

Publication Classification

(76) Inventor: **Guozhong Ma**, Farnborough (GB)

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

Correspondence Address:
HARRINGTON & SMITH, PC
4 RESEARCH DRIVE
SHELTON, CT 06484-6212 (US)

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

(57) **ABSTRACT**

An antenna having a plurality of resonant frequencies and including a feed point; a ground point; and an antenna track extending between the feed point and the ground point and including, in series, a first small loop, a large loop and a second small loop. In one embodiment, the extension of the antenna track through the first U-shaped small loop displaces the antenna track in a first direction, then the extension of the antenna track through the large U-shaped loop displaces the antenna track in a second direction opposite to the first direction and the extension of the antenna track through the second U-shaped small loop displaces the antenna track in the first direction. A bridge element may be used.

(21) Appl. No.: **11/628,914**

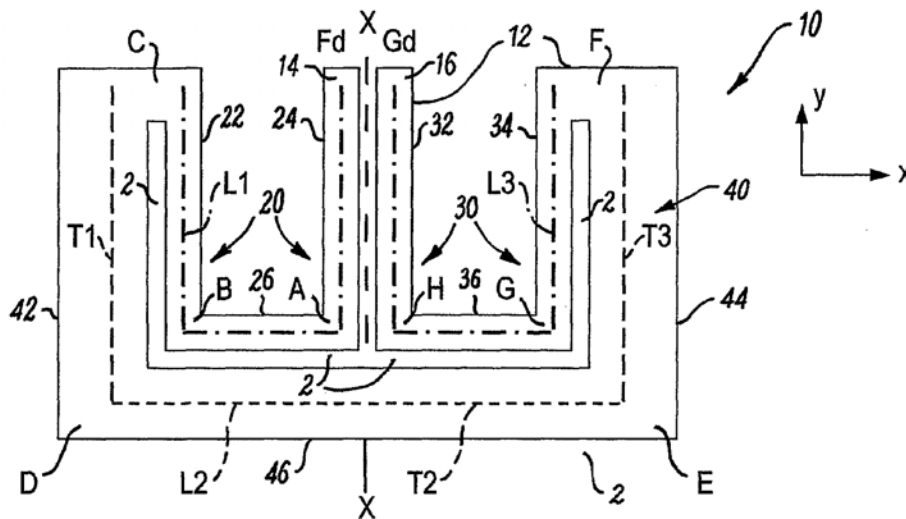
(22) PCT Filed: **Jun. 27, 2005**

(86) PCT No.: **PCT/IB05/01961**

§ 371(c)(1),
(2), (4) Date: **Jul. 23, 2007**

(30) **Foreign Application Priority Data**

Jun. 30, 2004 (GB) 0414575.1





US 20080042918A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2008/0042918 A1**

Lee (43) **Pub. Date: Feb. 21, 2008**

(54) **MOBILE TERMINAL EQUIPMENT AND ANTENNA THEREOF**

(30) **Foreign Application Priority Data**

Feb. 20, 2004 (KR) 10-2004-00011584

(75) Inventor: **Hyo Jin Lee, Seoul (KR)**

Publication Classification

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

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

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

(73) Assignee: **LG TELECOM, LTD., Seoul (KR)**

(57) **ABSTRACT**

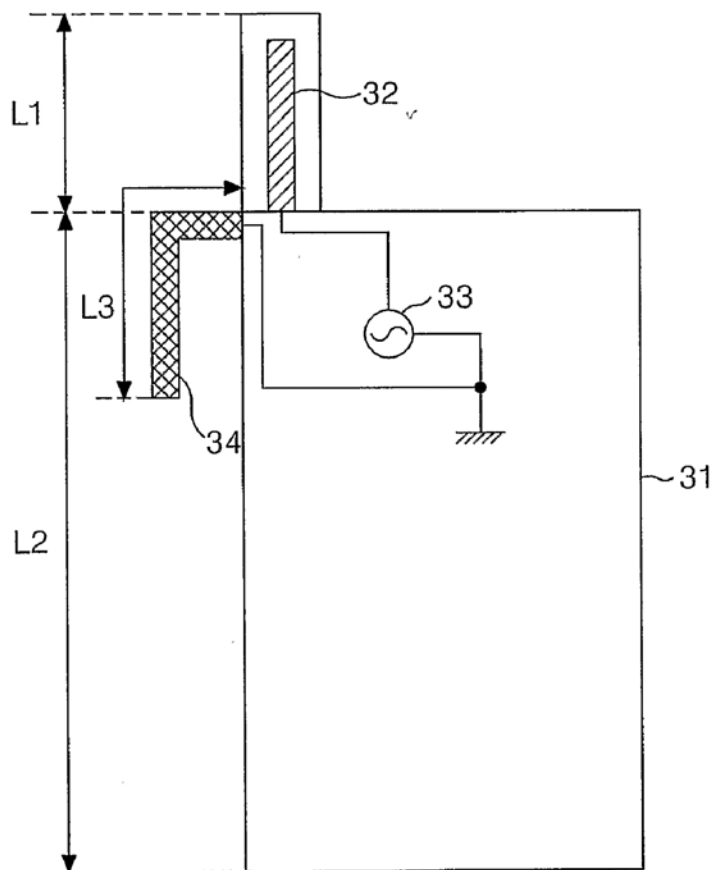
(21) Appl. No.: **10/589,824**

The present invention relates to a mobile terminal and an antenna thereof of which the radiation pattern is not distorted regardless of the length of the mobile terminal. The mobile terminal includes a terminal body; an antenna connected to a high frequency signal source within the terminal body; and a grounding means connected to a ground voltage source within the terminal body.

(22) PCT Filed: **Feb. 21, 2005**

(86) PCT No.: **PCT/KR05/00470**

§ 371 (c)(1),
(2), (4) Date: **Apr. 24, 2007**





US 20080048915A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0048915 A1**

(43) **Pub. Date: Feb. 28, 2008**

(54) **WIDEBAND DIELECTRIC RESONATOR
MONOPOLE ANTENNA**

Publication Classification

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

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

(57) **ABSTRACT**

(76) Inventors: **Tze-Hsuan Chang**, Taipei City
(TW); **Jean-Fu Kiang**, Taipei City
(TW)

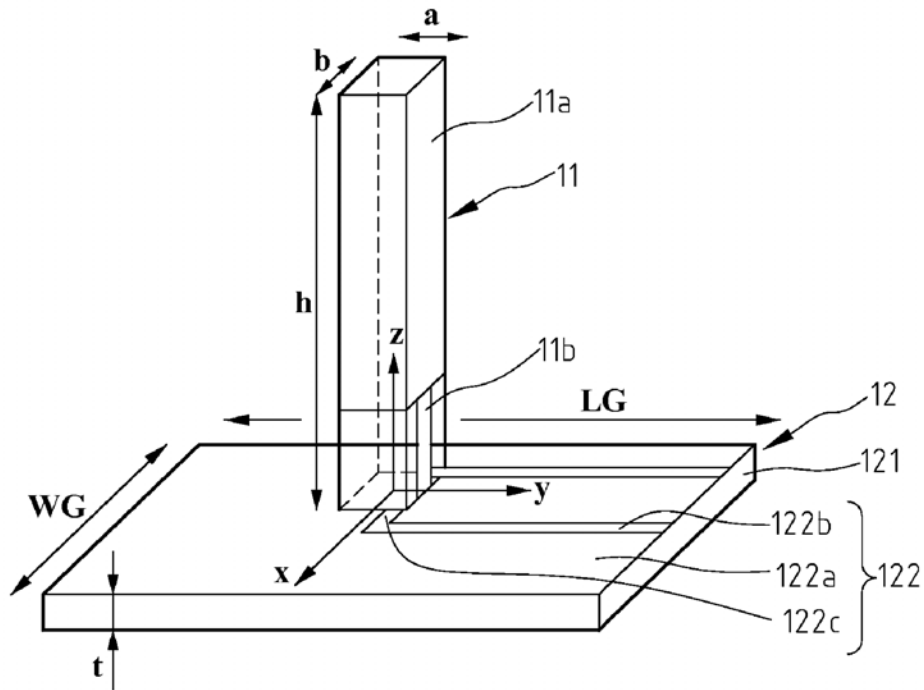
Correspondence Address:
**LIN & ASSOCIATES INTELLECTUAL PROP-
ERTY, INC.**
P.O. BOX 2339
SARATOGA, CA 95070-0339

A wideband dielectric resonator monopole antenna, which includes a dielectric resonator and a monopole antenna, combines two frequency bands having close resonant frequencies to achieve 49% of bandwidth and omnidirectional radiation patterns within the frequency band. It includes a column structure and a substrate, wherein the surface of the column structure is coated with a conductive layer, the column structure is kept upright to the substrate, and the substrate is coated or printed with two slot lines extended inward from an edge of the substrate.

(21) Appl. No.: **11/466,454**

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

1





US 20080048918A1

(19) **United States**

(12) **Patent Application Publication**

Hsu et al.

(10) **Pub. No.: US 2008/0048918 A1**

(43) **Pub. Date: Feb. 28, 2008**

(54) **COLUMN ANTENNA APPARATUS AND METHOD FOR MANUFACTURING THE SAME**

Publication Classification

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

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

(76) **Inventors:** Kang-Neng Hsu, Hsinchu (TW);
Chih-Ming Chen, Hsinchu (TW);
Liang-Neng Lee, Hsinchu (TW);
Kuo-Wei Wu, Hsinchu (TW)

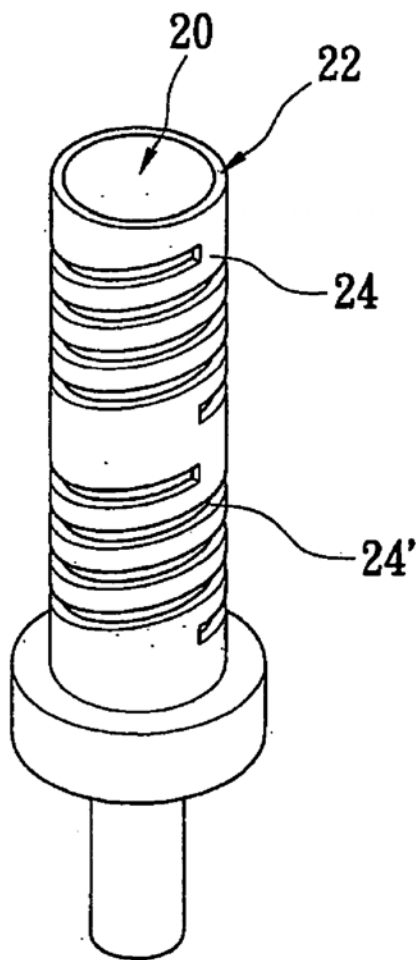
(57) **ABSTRACT**

A column antenna apparatus and a manufacturing method thereof are disclosed. This invention forms a metal layer with at least two spiral structures 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 at least two spiral structures. The metal layer is formed on the surface of the column body, and the at least two spiral structures are formed on the metal layer for increasing bandwidth of low frequency. Each spiral structure is formed by removing a part of the metal layer, and the column body is exposed via the at least two spiral structures.

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

(21) **Appl. No.:** 11/509,655

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





US 20080048919A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0048919 A1**

(43) **Pub. Date: Feb. 28, 2008**

(54) **WIRELESS ANTENNA MODULE, AND
DISPLAY DEVICE AND DISPLAY SYSTEM
HAVING THE SAME**

(30) **Foreign Application Priority Data**

Aug. 23, 2006 (KR) 10-2006-80146

(75) Inventors: **Yong Sub Jung**, Suwon-si (KR);
Chang Won Ryu, Ansan-si (KR);
Woo Suk Lee, Suwon-si (KR)

Publication Classification

(51) **Int. Cl.**
H01Q 21/24 (2006.01)
H01Q 1/22 (2006.01)
H04N 5/66 (2006.01)

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

(52) **U.S. Cl.** **343/702; 343/893; 348/739**

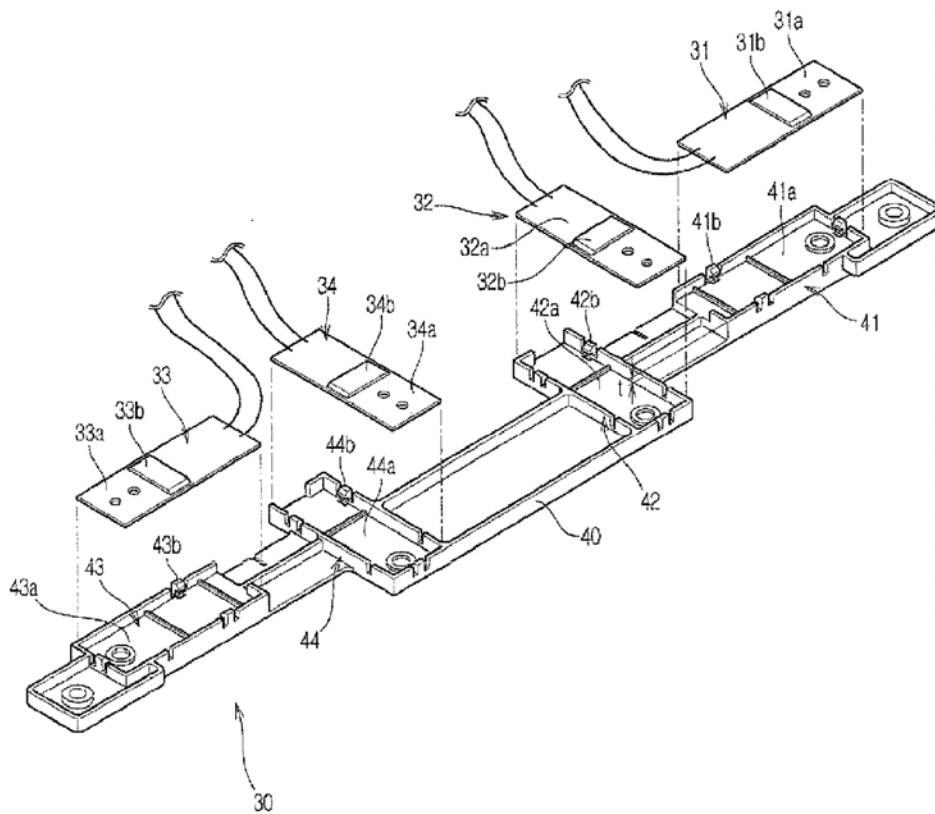
(73) Assignee: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR)

(57) **ABSTRACT**

(21) Appl. No.: **11/774,158**

A wireless antenna module including a plurality of antennas that can be easily installed in an appliance, and a display device and a display system having the same. The wireless antenna module includes a plurality of antennas that transmit and/or receive radio frequency (RF) signals, and an antenna holder for fixing the antennas to an appliance. The antenna holder includes a plurality of antenna couplers, each antenna coupler coupled with a respective antenna.

(22) Filed: **Jul. 6, 2007**





US 20080048926A1

(19) **United States**

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

(10) **Pub. No.: US 2008/0048926 A1**

(43) **Pub. Date: Feb. 28, 2008**

(54) **ELECTRONIC DEVICE WITH AN INTERNAL ANTENNA**

(30) **Foreign Application Priority Data**

Aug. 23, 2006 (TW) 095214934

(75) Inventors: **Chien-Yi Wu**, Tao Yuan Shien (TW); **Cheng-Hsiung Wu**, Tao Yuan Shien (TW); **Chi-Yin Fang**, Tao Yuan Shien (TW)

Publication Classification

(51) **Int. Cl.**
H01Q 1/52 (2006.01)

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

(57) **ABSTRACT**

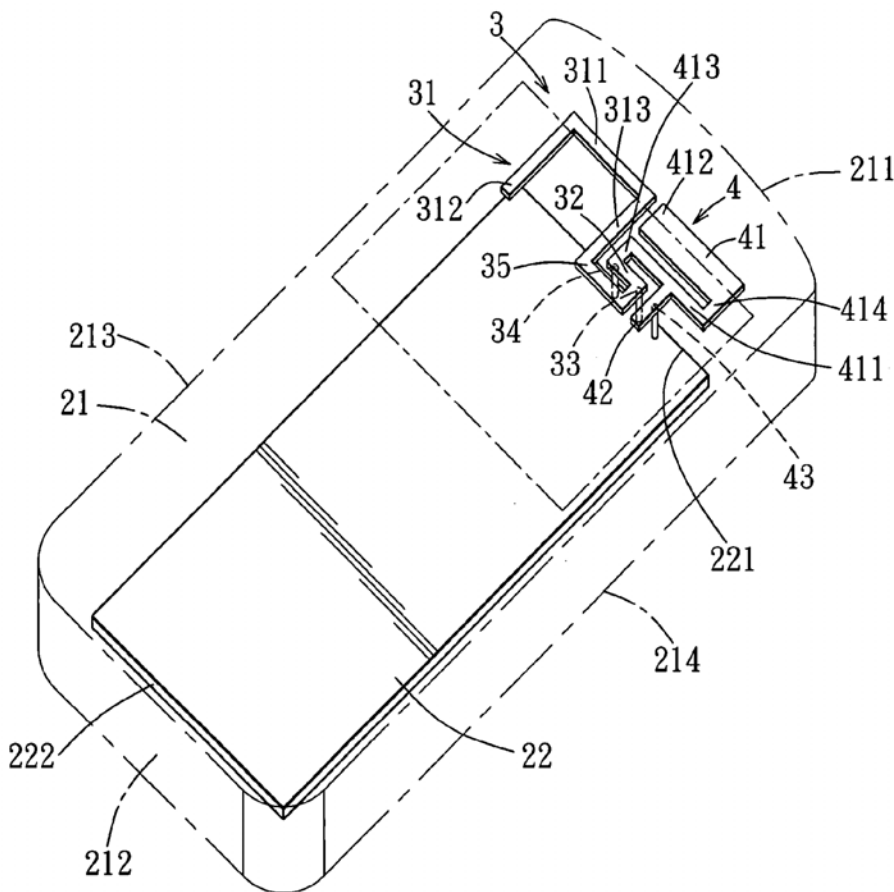
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An electronic device includes a casing, a circuit board, and an internal antenna unit. The circuit board is disposed in the casing. The internal antenna unit is disposed in the casing, and includes a feeding element that overlaps with the circuit board, and first and second radiating elements, each of which extends from the feeding element toward a wall of the casing beyond an edge of the circuit board. A feeding point is provided on the feeding element, and is coupled to the edge of the circuit board. A grounding point is provided on the feeding element, and is coupled to the edge of the circuit board.

(73) Assignee: **QUANTA COMPUTER INC.**,
Tao Yuan Shien (TW)

(21) Appl. No.: **11/725,356**

(22) Filed: **Mar. 19, 2007**





US 20080048927A1

(19) **United States**

(12) **Patent Application Publication**
Hoshi

(10) **Pub. No.: US 2008/0048927 A1**

(43) **Pub. Date: Feb. 28, 2008**

(54) **VARIABLE DIRECTIVITY ANTENNA AND INFORMATION PROCESSING DEVICE**

Publication Classification

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

(52) **U.S. Cl.** **343/850**

(76) **Inventor: Fumikazu Hoshi, Kanagawa (JP)**

(57) **ABSTRACT**

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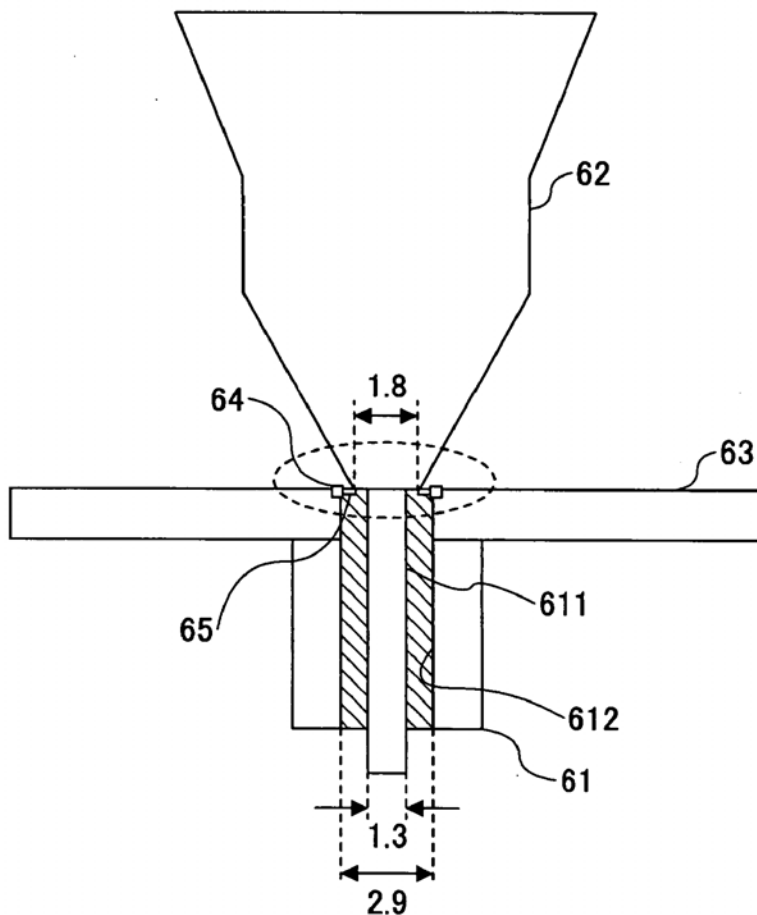
In a variable directivity antenna, an antenna element includes a pole-like or rotator-like radiator. A coaxial line supplies power to the antenna element. A directivity switching unit is provided in a junction between the antenna element and the coaxial line to change a directivity of the variable directivity antenna. At least one of an inside diameter of an outer conductor of the coaxial line in contact with the junction and a diameter of an inner conductor of the coaxial line in contact with the junction is provided to change a gain of the variable directivity antenna.

(21) **Appl. No.: 11/895,328**

(22) **Filed: Aug. 23, 2007**

(30) **Foreign Application Priority Data**

Aug. 25, 2006 (JP) 2006-229636





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(19) **United States**

(12) **Patent Application Publication**
Channabasappa

(10) **Pub. No.: US 2008/0048929 A1**

(43) **Pub. Date: Feb. 28, 2008**

(54) **MULTI SECTION MEANDER ANTENNA**

Publication Classification

(75) Inventor: **Eswarappa Channabasappa**,
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(51) **Int. Cl.**
H01Q 1/36 (2006.01)

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

(73) Assignee: **M/A-Com, Inc.**, Lowell, MA (US)

(57) **ABSTRACT**

(21) Appl. No.: **11/466,997**

An antenna formed on a dielectric substrate having first and second opposing surfaces, a first meander antenna element disposed on the first surface of the substrate and a second meander antenna element disposed on the second surface of the substrate.

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

