



US007352326B2

(12) **United States Patent**
Korva et al.

(10) **Patent No.:** **US 7,352,326 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **MULTIBAND PLANAR ANTENNA**

FOREIGN PATENT DOCUMENTS

(75) Inventors: **Heikki Korva**, Tupos (FI); **Petra Ollitervo**, London (GB)

EP	1 162 688 A1	12/2001
FI	110395 B	9/1998
WO	WO-00/36700 A1	6/2000
WO	WO-03/094290 A1	11/2003

(73) Assignee: **LK Products Oy**, Kempele (FI)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 175 days.

OTHER PUBLICATIONS

(21) Appl. No.: **10/595,607**

International Preliminary Report on Patentability for International Application No. PCT/FI2004/000554, date of issuance of report May 1, 2006.

(22) PCT Filed: **Sep. 21, 2004**

* cited by examiner

(86) PCT No.: **PCT/FI2004/000554**

§ 371 (c)(1),
(2), (4) Date: **Apr. 28, 2006**

Primary Examiner—Shih-Chao Chen

(74) Attorney, Agent, or Firm—Darby & Darby P.C.

(87) PCT Pub. No.: **WO2005/043674**

(57) **ABSTRACT**

PCT Pub. Date: **May 12, 2005**

(65) **Prior Publication Data**

US 2007/0132641 A1 Jun. 14, 2007

(30) **Foreign Application Priority Data**

Oct. 31, 2003 (FI) 20031584

(51) **Int. Cl.**

H01Q 1/38 (2006.01)

H01Q 1/24 (2006.01)

H01Q 21/00 (2006.01)

(52) **U.S. Cl.** **343/700 MS; 343/702; 343/728**

(58) **Field of Classification Search** **343/700 MS; 343/702, 728, 846, 873**

See application file for complete search history.

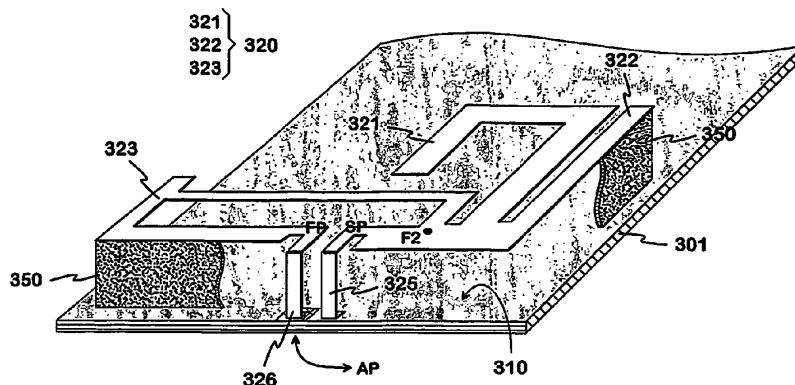
(56) **References Cited**

U.S. PATENT DOCUMENTS

5,363,114 A	11/1994	Shoemaker
5,541,617 A	7/1996	Connolly et al.
6,734,826 B1 *	5/2004	Dai et al. 343/700 MS
6,897,810 B2 *	5/2005	Dai et al. 343/700 MS
2004/0085244 A1	5/2004	Kadambi et al.

A multiband planar antenna intended for small-sized radio devices and a radio device. The basic structure of the antenna is a two-resonance PIFA, the radiating plane (320) of which has a structural part (321) corresponding to the lowest operating band and a structural part (322) corresponding to the upper operating band. In addition, a loop resonator (323) operating as a radiator is formed in the radiating plane. The ground conductor (325) of the feed line of the loop is at the same time the short-circuit conductor of the PIFA. The second conductor (326) of the feed line is connected to the opposite end of the loop, and it operates as the feed conductor of the PIFA. At the same time the structural part (321) of the radiating plane that corresponds to the lowest operating band is located between the loop and the structural part of the PIFA that corresponds to the upper operating band, in order to reduce interference between them. The resonance frequency of the loop radiator is arranged on the upper operating band of the antenna, for example. Thus the loop improves the matching of the antenna on the upper operating band and the matching and efficiency on the lowest operating band as well. This is based on additional inductance caused by the loop conductor (323) that functions as a part of the feed conductor of the PIFA.

9 Claims, 4 Drawing Sheets



Acrobat 文件



US007352327B2

(12) **United States Patent**
Yeh et al.

(10) **Patent No.:** **US 7,352,327 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **WIRELESS APPARATUS CAPABLE OF CONTROLLING RADIATION PATTERNS OF ANTENNA**

(75) Inventors: **Shih-Huang Yeh**, Tou-Liu (TW);
Zih-Hao Lu, Taichung Hsien (TW);
Chia-Lun Tang, Miao-Li Hsien (TW)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/221,148**

(22) Filed: **Sep. 7, 2005**

(65) **Prior Publication Data**

US 2006/0250310 A1 Nov. 9, 2006

(30) **Foreign Application Priority Data**

May 5, 2005 (TW) 94114506 A

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

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

(58) **Field of Classification Search** **343/700 MS, 343/702, 829, 846, 767**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,466,176 B1 * 10/2002 Maoz et al. 343/767

6,563,468 B2 * 5/2003 Hill et al. 343/741
6,879,296 B2 * 4/2005 Jiang et al. 343/767
6,985,108 B2 * 1/2006 Mikkola et al. 343/700 MS
7,050,003 B2 * 5/2006 Sievenpiper 343/700 MS
2004/0252056 A1 12/2004 Chen et al. 343/700

OTHER PUBLICATIONS

A Novel CPW-FED Ultra-Wideband Antenna Design Seong H. Lee, Jong K. Park, and Jung N. Lee Microwave and Optical Technology Letters/vol. 44, No. 5, Mar. 5, 2005.

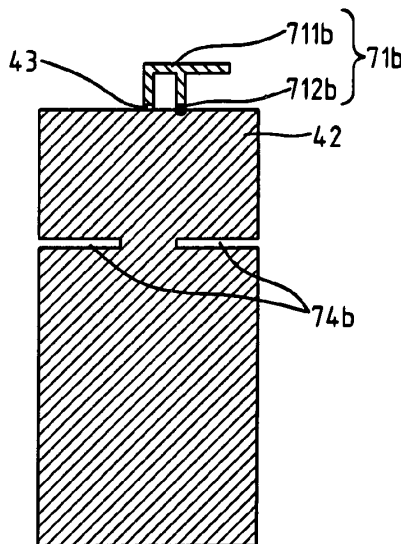
* cited by examiner

Primary Examiner—Tho Phan

(57) **ABSTRACT**

A wireless apparatus capable of controlling radiation patterns and directions of antenna is provided. It comprises an antenna element, a ground plane, an antenna feed-point, and at least one slot or slit formed on the ground plane. The inclusion of such slots or slits in the wireless apparatus improves the radiation directivity of antenna, and greatly enhances the antenna gain on the horizontal plane. It also resolves the problems caused by shift of radiation patterns of antenna and the poor antenna gains for a conventional antenna apparatus. The wireless apparatus of the present invention has the advantages of simple structure and easy fabrication. The invention can be applied to various kinds of antennas, such as monopole antenna, shorted-monopole antenna, dipole antenna, loop antenna, and planar inverted-F antenna, etc.

11 Claims, 9 Drawing Sheets



Acrobat 文件



US007352328B2

(12) **United States Patent**
Moon et al.

(10) **Patent No.:** **US 7,352,328 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **FLAT-PLATE MIMO ARRAY ANTENNA
WITH ISOLATION ELEMENT**

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

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

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/441,206**

(22) Filed: **May 26, 2006**

(65) **Prior Publication Data**

US 2007/0069960 A1 Mar. 29, 2007

(30) **Foreign Application Priority Data**

Sep. 27, 2005 (KR) 10-2005-0089925

(51) **Int. Cl.**

H01Q 1/38 (2006.01)

H01Q 21/00 (2006.01)

H01Q 1/52 (2006.01)

(52) **U.S. Cl.** **343/700 MS; 343/817;**
343/841

(58) **Field of Classification Search** **343/700 MS;**
343/841, 844, 853, 817, 818
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,069,586 A *	5/2000	Karlsson et al.	343/700 MS
6,069,588 A	5/2000	Karlsson et al.	
6,218,989 B1 *	4/2001	Schneider et al. ...	343/700 MS
6,473,040 B1	10/2002	Nakamura	
6,515,634 B2 *	2/2003	Desclos et al.	343/818

FOREIGN PATENT DOCUMENTS

EP	0720252 B1	7/1996
EP	0847101 A2	6/1998
FR	2616015 A1	12/1988
GB	2390225 A	12/2003
JP	2005-124056 A	5/2005
WO	2004/017462 A1	2/2004

* cited by examiner

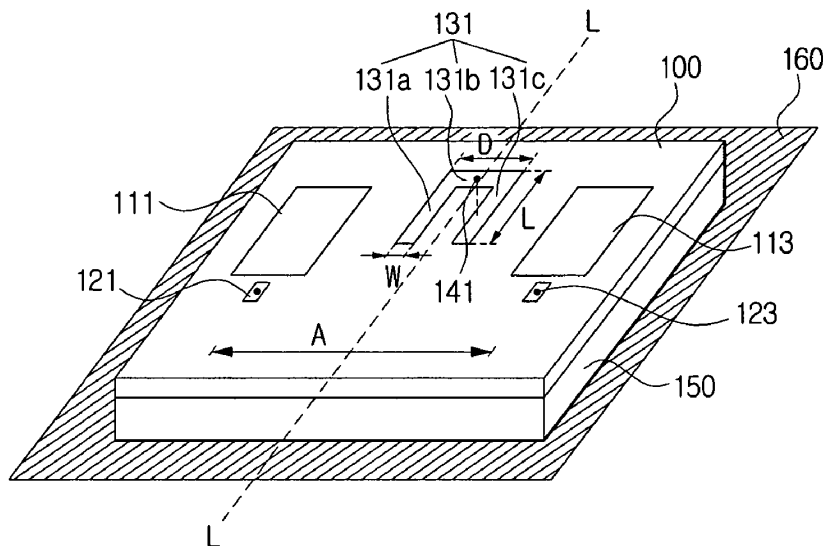
Primary Examiner—Shih-Chao Chen

(74) *Attorney, Agent, or Firm*—Sughrue Mion, PLLC

(57) **ABSTRACT**

A flat-plate MIMO array antenna includes a substrate, a plurality of antenna elements disposed on the substrate, and at least one isolation element interposed between a plurality of antenna elements on the substrate and connected to a ground. Mutual interference between the antenna elements is prevented by the isolation element formed between the antenna elements, thereby preventing the distortion of the radiation pattern. Also, since the isolation element is grounded to the ground surface, the isolation element operates as a parasitic antenna, thereby increasing the output gain.

20 Claims, 8 Drawing Sheets



Acrobat 文件



US007352329B2

(12) **United States Patent**
Chung et al.

(10) **Patent No.:** **US 7,352,329 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **MULTI-BAND ANTENNA WITH
BROADBAND FUNCTION**

(56) **References Cited**

U.S. PATENT DOCUMENTS

- (75) Inventors: **Ming-Hsun Chung**, Hsin-Tien (TW);
Tsung-Wen Chiu, Hsin-Tien (TW);
Ching-Feng Tseng, Hsin-Tien (TW);
Yun-Fan Bai, Hsin-Tien (TW);
An-Chia Chen, Hsin-Tien (TW);
Fu-Ren Hsiao, Hsin-Tien (TW)
- (73) Assignee: **Advance Connectek, Inc.**, Hsin-Tien,
Taipei Hsien (TW)
- (*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

6,774,850	B2 *	8/2004	Chen	343/700 MS
6,836,252	B2 *	12/2004	Tai et al.	343/702
7,026,999	B2 *	4/2006	Umehara et al.	343/702
7,034,754	B2 *	4/2006	Hung et al.	343/700 MS
7,061,437	B2 *	6/2006	Lin et al.	343/702
7,161,543	B2 *	1/2007	Cheng et al.	343/702
7,170,450	B2 *	1/2007	Chang et al.	343/700 MS
2005/0128151	A1 *	6/2005	Kwak et al.	343/702
2006/0197705	A1 *	9/2006	Chen et al.	343/700 MS
2007/0040750	A1 *	2/2007	Tai et al.	343/700 MS
2007/0040754	A1 *	2/2007	Liu et al.	343/702
2007/0120753	A1 *	5/2007	Hung et al.	343/702
2007/0132646	A1 *	6/2007	Hung et al.	343/700 MS
2007/0146216	A1 *	6/2007	Wang et al.	343/702
2007/0247372	A1 *	10/2007	Huang	343/700 MS
2007/0257847	A1 *	11/2007	Su et al.	343/700 MS

* cited by examiner

(21) Appl. No.: **11/604,617**

Primary Examiner—Tan Ho

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

(74) *Attorney, Agent, or Firm*—Jackson Walker, LLP

(65) **Prior Publication Data**

US 2007/0171130 A1 Jul. 26, 2007

(57) **ABSTRACT**

(30) **Foreign Application Priority Data**

Jan. 20, 2006 (TW) 95102140 A

A multi-band antenna with the broadband function is based upon a planar inverted-F antenna with two conductive arms and a ground. The two conductive arms extend from the ground near the two opposite ends of the ground. Two radiation plates of the two conductive arms extend toward each other. The multi-band antenna has a sufficient large band at high frequencies. Since the conductive arms are disposed close to the two ends of the ground, operations of bending the two conductive arms or soldering a feed wires are simpler and have a higher yield.

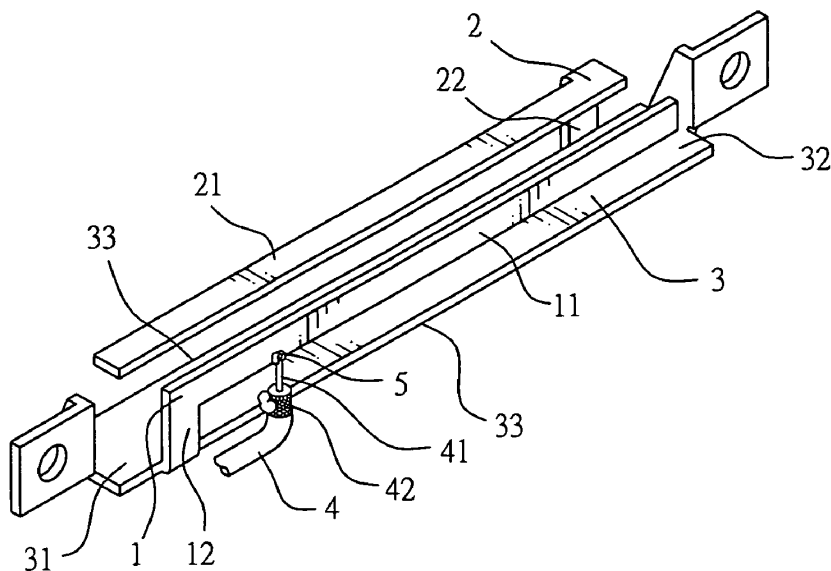
(51) **Int. Cl.**
H01Q 1/38 (2006.01)

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

(58) **Field of Classification Search** **343/700 MS,**
343/702, 846, 848

See application file for complete search history.

8 Claims, 3 Drawing Sheets



Acrobat 文件



US007352330B2

(12) **United States Patent**
Komine

(10) **Patent No.:** **US 7,352,330 B2**

(45) **Date of Patent:** **Apr. 1, 2008**

(54) **PORTABLE TERMINAL INCLUDING ANTENNA**

(75) Inventor: **Yasushi Komine**, Tokyo (JP)

(73) Assignee: **Kabushiki Kaisha Toshiba**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/094,246**

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

(65) **Prior Publication Data**

US 2006/0092082 A1 May 4, 2006

(30) **Foreign Application Priority Data**

Oct. 28, 2004 (JP) 2004-314175

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

(52) **U.S. Cl.** **343/702**; 343/700 MS;
455/575.3; 455/575.7

(58) **Field of Classification Search** 343/702,
343/720, 866, 700 MS; 455/575.5, 575.7
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,266,020 B1 * 7/2001 Chang 343/702
6,577,280 B2 * 6/2003 Kim 343/702
6,670,926 B2 * 12/2003 Miyasaka 343/702
6,822,611 B1 * 11/2004 Kontogeorgakis et al. .. 343/702

7,003,318 B2 * 2/2006 Kota et al. 455/575.3
2003/0137468 A1 * 7/2003 Kim 343/702
2003/0234743 A1 * 12/2003 Ponce De Leon et al. .. 343/702
2005/0001773 A1 * 1/2005 Morningstar et al. 343/702
2005/0001775 A1 * 1/2005 Liang et al. 343/702
2005/0024274 A1 * 2/2005 Byun et al. 343/702
2005/0225487 A1 * 10/2005 Fujii et al. 343/702

FOREIGN PATENT DOCUMENTS

JP 2001-284934 10/2001
JP 2003-078333 3/2003
JP 2003-234668 8/2003

OTHER PUBLICATIONS

"What is Insert Molding?", *Microplastics Inc.*, pp. 1-2. Printed off the Internet at http://www.microplasticsinc.com/what_is_insert_molding.htm, Sep. 26, 2007.

* cited by examiner

Primary Examiner—Douglas W. Owens

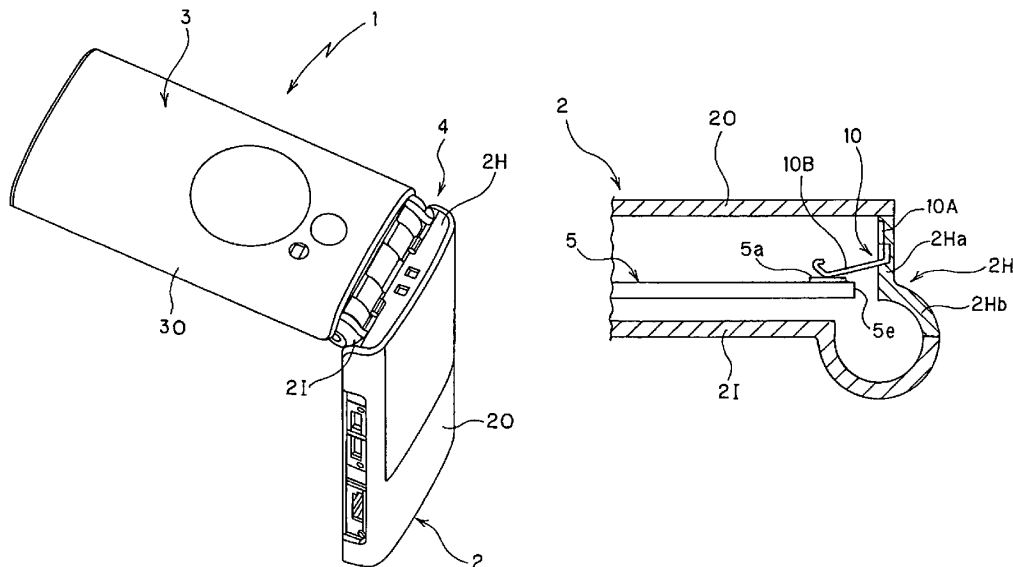
Assistant Examiner—Ephrem Alemu

(74) *Attorney, Agent, or Firm*—Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.

(57) **ABSTRACT**

A portable terminal, which has an antenna disposed within a housing accommodating a circuit board, capable of securing a clearance between the antenna and parts of the circuit board, etc. within the housing without increasing the size of the housing, whereby the antenna performance can be prevented from degrading when transmitting or receiving, in which the antenna is insert-molded integrally with the housing accommodating the circuit board within it.

10 Claims, 8 Drawing Sheets



Acrobat 文件



US007352331B2

(12) **United States Patent**
Quagliaro

(10) **Patent No.:** **US 7,352,331 B2**

(45) **Date of Patent:** **Apr. 1, 2008**

(54) **SPACE TELECOMMUNICATIONS
INTEGRATED ANTENNA SYSTEM FOR
MOBILE TERRESTRIAL STATIONS
(SATCOMS)**

(75) Inventor: **Gilles Quagliaro**, Corneilles en Parisis
(FR)

(73) Assignee: **Thales** (FR)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 206 days.

(21) Appl. No.: **11/235,530**

(22) Filed: **Sep. 27, 2005**

(65) **Prior Publication Data**

US 2006/0071867 A1 Apr. 6, 2006

(30) **Foreign Application Priority Data**

Sep. 28, 2004 (FR) 04 10268

(51) **Int. Cl.**
H01Q 1/28 (2006.01)

(52) **U.S. Cl.** **343/705; 343/700 MS**

(58) **Field of Classification Search** **343/700 MS,**
343/713, 705, 708

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,914,448 A *	4/1990	Otsuka et al.	343/872
4,990,926 A *	2/1991	Otsuka et al.	343/700 MS
2004/0017316 A1 *	1/2004	Tanaka et al.	343/700 MS
2007/0013593 A1 *	1/2007	Zafar et al.	343/713

FOREIGN PATENT DOCUMENTS

EP	0 867 969	9/1998
JP	08162883 A	10/1996

* cited by examiner

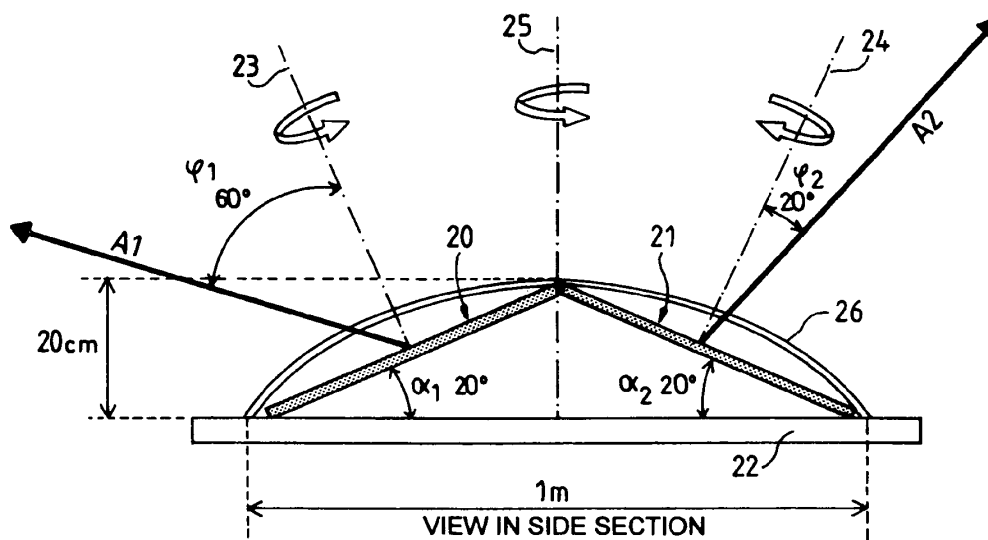
Primary Examiner—Hoanganh Le

(74) *Attorney, Agent, or Firm*—Lowe Hauptman Ham &
Berner, LLP

(57) **ABSTRACT**

An integrated antenna system for telecommunications comprises at least one substantially flat and circular antenna provided with a rotation axis coinciding with its axis, the antenna being fixedly joined to a support itself comprising a rotation axis. The rotation axis of the antenna is inclined by an angle θ relative to the rotation axis of the antenna support and the antenna beam forms an angle ϕ relative to the rotation axis of the antenna.

8 Claims, 2 Drawing Sheets



Acrobat 文件



US007352333B2

(12) **United States Patent**
McCorkle

(10) **Patent No.:** **US 7,352,333 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **FREQUENCY-NOTCHING ANTENNA**

(75) Inventor: **John W. McCorkle**, Vienna, VA (US)

(73) Assignee: **Freescall Semiconductor, Inc.**, Austin, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 170 days.

(21) Appl. No.: **11/237,751**

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

(65) **Prior Publication Data**

US 2007/0069955 A1 Mar. 29, 2007

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

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

(58) **Field of Classification Search** **343/767, 343/700 MS, 769, 829, 830, 846, 848**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,748,153 A * 5/1998 McKinzie et al. 343/767

5,828,340 A * 10/1998 Johnson 343/700 MS
6,590,545 B2 * 7/2003 McCorkle 343/830
6,914,573 B1 * 7/2005 McCorkle 343/767
6,980,171 B2 * 12/2005 Maruyama et al. 343/788

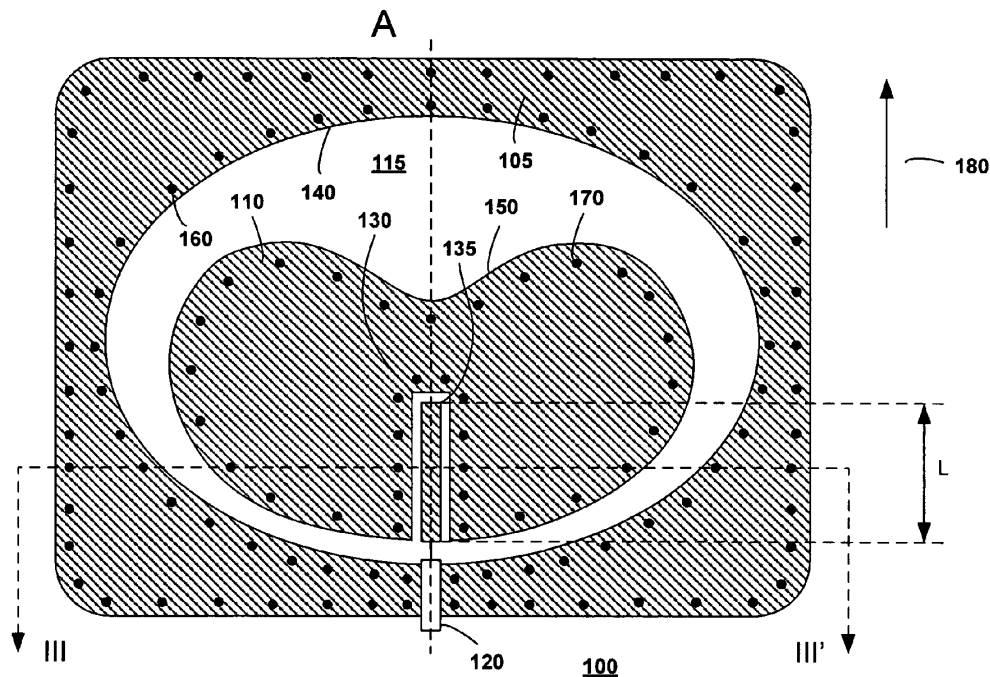
* cited by examiner

Primary Examiner—Huedung Mancuso

(57) **ABSTRACT**

An antenna (100) is provided. The antenna includes: a first ground element (105); a first driven element (110) formed from a planar piece of conductive material, the first driven element being configured to transmit and receive wireless signals, the first driven element including a physical slot (130); a conductive line (135) formed in the physical slot such that the conductive line is separated from the first driven element by a gap (G) filled with non-conductive material, the conductive line having a line impedance that is a function of an effective line width of the conductive line, and an effective gap width of a gap between the conductive line and the first driven element; and a signal line (120) configured to send and receive signals to and from the conductive line.

30 Claims, 9 Drawing Sheets



Acrobat 文件



US007352334B2

(12) **United States Patent**
Kuroda et al.

(10) **Patent No.:** **US 7,352,334 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **WIDEBAND ANTENNA**

(75) Inventors: **Shinichi Kuroda**, Tokyo (JP); **Hisato Asai**, Tokyo (JP); **Tomoya Yamaura**, Tokyo (JP)

(73) Assignee: **Sony Corporation**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/488,678**

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

(65) **Prior Publication Data**

US 2006/0262019 A1 Nov. 23, 2006

Related U.S. Application Data

(62) Division of application No. 10/498,813, filed as application No. PCT/JP03/13487 on Oct. 22, 2003, now Pat. No. 7,132,993.

(30) **Foreign Application Priority Data**

Oct. 23, 2002	(JP)	2002-307908
Oct. 23, 2002	(JP)	2002-307909
Oct. 30, 2002	(JP)	2002-315381
Feb. 26, 2003	(JP)	2003-49895
Feb. 26, 2003	(JP)	2003-49896
Mar. 31, 2003	(JP)	2003-96903

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

(52) **U.S. Cl.** **343/772; 343/786**

(58) **Field of Classification Search** **343/772, 343/773, 786**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,401,387 A 9/1968 Milligan et al.

4,143,377 A	3/1979	Salvat et al.
4,851,859 A *	7/1989	Rappaport 343/790
4,907,010 A	3/1990	Wright

(Continued)

FOREIGN PATENT DOCUMENTS

JP	64-5203	1/1989
JP	1-32681	7/1989
JP	02246502	10/1990
JP	2-270405	11/1990
JP	8-138515	5/1996
JP	8-139515	5/1996
JP	2002-298105	10/2002

OTHER PUBLICATIONS

U.S. Appl. No. 11/488,753, filed Jul. 19, 2006, Kuroda, et al.

(Continued)

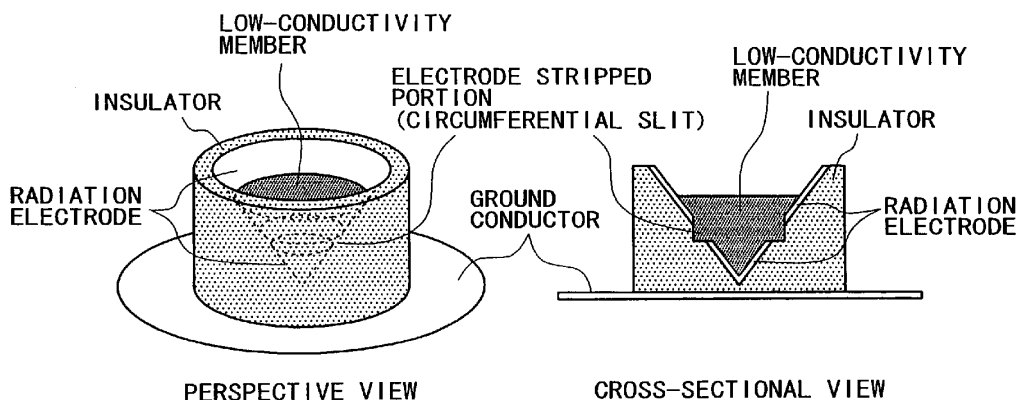
Primary Examiner—Trinh Vo Dinh

(74) *Attorney, Agent, or Firm*—Oblon, Spivak, McClelland, Maier & Neustadt, P.C.

(57) **ABSTRACT**

A monoconical antenna comprises: a substantially conical concavity formed in one end face of a dielectric; a radiation electrode provided on the surface of the concavity; and a ground conductor provided in proximity to and substantially in parallel with the other end face opposite the one end face of the dielectric. The monoconical antenna is so constituted that electrical signals are fed to between the near vertex region of the radiation electrode and the region of the ground conductor. The half-cone angle α of the substantially conical concavity formed in the one end face of the dielectric is determined by a predetermined rule corresponding to relative dielectric constant ϵ_r . Thus, the quality of wideband characteristics inherent in the monoconical antenna can be sufficiently maintained, and further size reduction can be accomplished by dielectric loading.

10 Claims, 26 Drawing Sheets



Acrobat 文件



US007352335B2

(12) **United States Patent**
Inomata et al.

(10) **Patent No.:** **US 7,352,335 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **RADAR APPARATUS HAVING ARRAYED
HORN ANTENNA PARTS COMMUNICATED
WITH WAVEGUIDE**

5,426,442 A * 6/1995 Haas 343/778
6,211,837 B1 * 4/2001 Crouch et al. 343/786
6,211,838 B1 * 4/2001 Cherrette et al. 343/786
6,841,768 B2 * 1/2005 Moon et al. 250/208.1
6,950,073 B2 * 9/2005 Clymer et al. 343/713

(75) Inventors: **Naofumi Inomata**, Kawasaki (JP);
Takahisa Ishida, Utsunomiya (JP);
Masahito Shingyoji, Sakado (JP);
Hiroyuki Ando, Kawagoe (JP)

FOREIGN PATENT DOCUMENTS

(73) Assignees: **Honda Elesys Co., Ltd.**, Yokohama
(JP); **Honda Motor Co., Ltd.**, Tokyo
(JP)

JP 2005-020525 A 1/2005

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

* cited by examiner

Primary Examiner—Tan Ho

(74) *Attorney, Agent, or Firm*—Arent Fox LLP.

(21) Appl. No.: **11/605,255**

(57) **ABSTRACT**

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

(65) **Prior Publication Data**

US 2007/0139287 A1 Jun. 21, 2007

(30) **Foreign Application Priority Data**

Dec. 20, 2005 (JP) 2005-366547

(51) **Int. Cl.**
H01Q 13/00 (2006.01)

(52) **U.S. Cl.** 343/786; 343/713

(58) **Field of Classification Search** 343/713,
343/771, 786

See application file for complete search history.

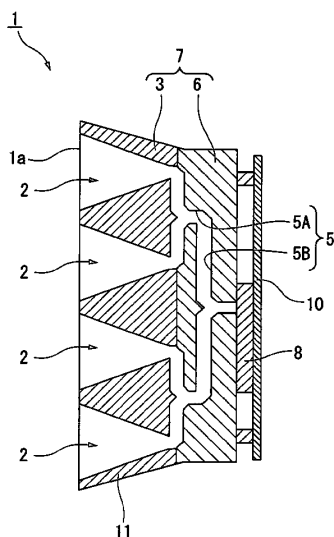
(56) **References Cited**

U.S. PATENT DOCUMENTS

5,323,169 A * 6/1994 Koslover 343/786

A horn antenna part of a radar apparatus is made of a heat emitting material and includes: an antenna body part having a plurality of horn parts arranged in an array form, wherein each horn part is open toward a front surface of the apparatus, and has a diameter which gradually increases toward the front surface; and a feeder part including a waveguide which communicates with the horn parts, wherein the feeder part is connected to the antenna body part. The radar apparatus also includes: a wireless part for generating a high-frequency signal supplied to the feeder part, and converting a reflected high-frequency signal to a medium-frequency signal; and a circuit part for controlling the high-frequency signal and processing the medium-frequency signal. At least one of the wireless part and the circuit part is arranged in a manner such that it contacts the feeder part.

8 Claims, 3 Drawing Sheets



Acrobat 文件



US007352336B1

(12) **United States Patent**
Lier et al.

(10) **Patent No.:** **US 7,352,336 B1**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **DIRECTIVE LINEARLY POLARIZED
MONOPOLE ANTENNA**

6,326,922 B1 * 12/2001 Hegendoerfer 343/700 MS
2007/0001924 A1 * 1/2007 Hirabayashi 343/893

(75) Inventors: **Erik Lier**, Newtown, PA (US);
Bernard F Lindinger, Elkins Park, PA
(US)

* cited by examiner

Primary Examiner—Shih-Chao Chen

(73) Assignee: **Lockheed Martin Corporation**,
Bethesda, MD (US)

(74) *Attorney, Agent, or Firm*—McDermott Will & Emery
LLP

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(57) **ABSTRACT**

A directive monopole antenna element with good RF performance (e.g., directivity and cross-polarization) and a low assembly cost is provided. The directive monopole antenna includes a dielectric support structure and one or more conductive directors coupled to the support structure. Each of the conductive directors is disposed parallel to every other conductive director and in a first plane of the support structure. The directive monopole antenna further includes a conductor coupled to an end of the support structure. The conductor has a feed probe section disposed in the first plane perpendicular to the one or more conductive directors and extending beyond the end of the support structure. The conductor further has a bent section disposed in the first plane parallel to the one or more conductive directors. The feed probe section and the bent section are electrically coupled. The directive monopole antenna element may be fed by a waveguide or a coaxial feed line.

(21) Appl. No.: **11/652,608**

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

(51) **Int. Cl.**
H01Q 9/28 (2006.01)
H01Q 19/30 (2006.01)
H01Q 9/38 (2006.01)

(52) **U.S. Cl.** **343/795**; 343/819; 343/830

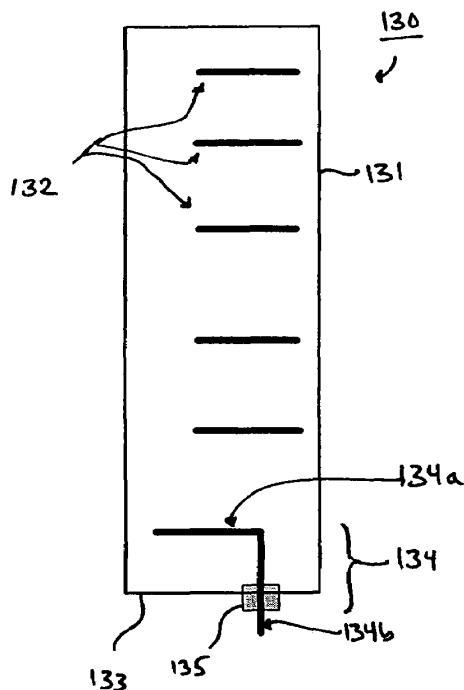
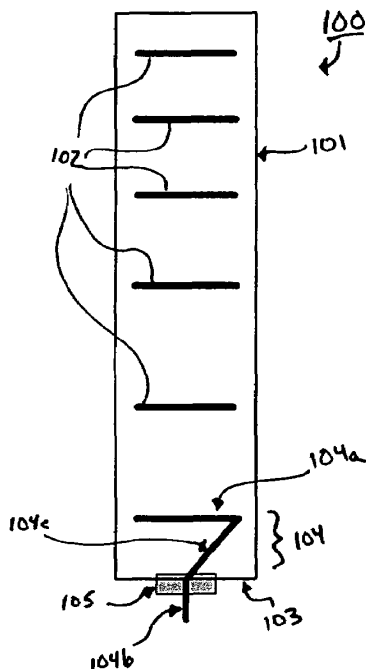
(58) **Field of Classification Search** 343/795,
343/819, 818, 829, 830
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,307,524 B1 * 10/2001 Britain 343/795

22 Claims, 9 Drawing Sheets



Acrobat 文件



US007352337B2

(12) **United States Patent**
Yegin et al.

(10) **Patent No.:** **US 7,352,337 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **PORTABLE SDARS-RECEIVING DEVICE
WITH INTEGRATED AUDIO WIRE AND
ANTENNA**

(75) Inventors: **Korkut Yegin**, Grand Blanc, MI (US);
Daniel G. Morris, Ovid, MI (US);
William R. Livengood, Grand Blanc,
MI (US)

(73) Assignee: **Delphi Technologies, Inc.**, Troy, MI
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 117 days.

3,827,053 A	7/1974	Willie et al.	343/701
5,828,348 A	10/1998	Tassoudji et al.	343/895
5,990,847 A	11/1999	Filipovic et al.	343/895
6,356,773 B1 *	3/2002	Rinot	455/575.1
6,421,028 B1	7/2002	Ohgren et al.	343/895
6,421,029 B1 *	7/2002	Tanabe	343/895
6,538,611 B2	3/2003	Noro	343/725
6,587,081 B2 *	7/2003	Noro et al.	343/895
6,653,987 B1 *	11/2003	Lamensdorf et al.	343/895
6,791,509 B2	9/2004	Noro	343/895
7,257,422 B2 *	8/2007	Loprete	455/550.1
2002/0149539 A1	10/2002	Noro et al.	343/895
2004/0108967 A1	6/2004	Fujimura et al.	343/895

(21) Appl. No.: **11/437,160**

FOREIGN PATENT DOCUMENTS

(22) Filed: **May 19, 2006**

GB 962100 6/1964

(65) **Prior Publication Data**

US 2006/0238435 A1 Oct. 26, 2006

Related U.S. Application Data

(62) Division of application No. 10/999,385, filed on Nov.
30, 2004, now Pat. No. 7,180,472.

(60) Provisional application No. 60/574,520, filed on May
26, 2004.

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

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

(58) **Field of Classification Search** 343/702,
343/895

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,899,549 A 8/1959 Potter 455/269

EP 05076197—European Search Reports dated Aug. 11, 2005 &
Oct. 21, 2005.

Petros, A, et al: "folded quadrifilar helix antenna"; IEEE Antennas
and Propagation Society International Symposium. 2001 Digest.
APS. Boston, MA, Jul. 8-13, 2001 New York, NY, IEEE, US, vol.
1 or 4, pp. 569-572, XPO10564703.

* cited by examiner

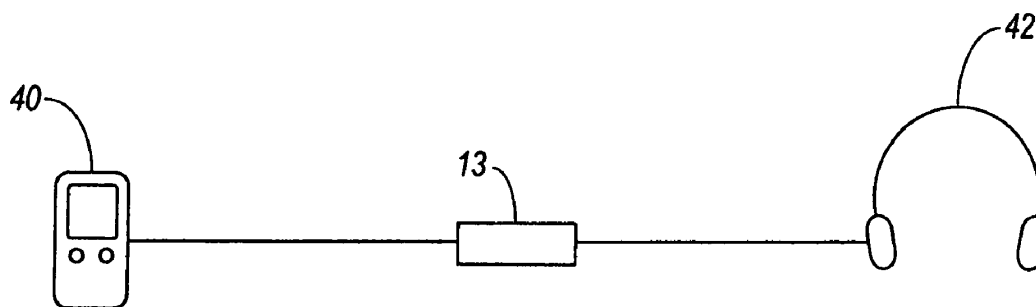
Primary Examiner—Hoang V. Nguyen

(74) *Attorney, Agent, or Firm*—Jimmy L. Funke

(57) **ABSTRACT**

An antenna having a plurality of elongated conductors is
disclosed. The elongated conductors have a substantially
straight portion and a substantially helical portion.

19 Claims, 3 Drawing Sheets



Acrobat 文件



US007352338B2

(12) **United States Patent**
Chenoweth

(10) **Patent No.:** **US 7,352,338 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **WIDEBAND ANTENNA WITH REDUCED DIELECTRIC LOSS**

(75) Inventor: **John P. Chenoweth**, Coral Springs, FL (US)

(73) Assignee: **Motorola, Inc.**, Schaumburg, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 574 days.

(21) Appl. No.: **10/896,274**

(22) Filed: **Jul. 21, 2004**

(65) **Prior Publication Data**

US 2006/0030363 A1 Feb. 9, 2006

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

(52) **U.S. Cl.** **343/897; 343/895**

(58) **Field of Classification Search** **343/897, 343/895**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,771,027 A	6/1998	Marks et al.	
6,043,792 A *	3/2000	Finlayson	343/867
6,741,221 B2	5/2004	Aisenbrey	
6,774,849 B2 *	8/2004	Umehara et al.	343/700 MS
2004/0174318 A1 *	9/2004	Aisenbrey	343/897

* cited by examiner

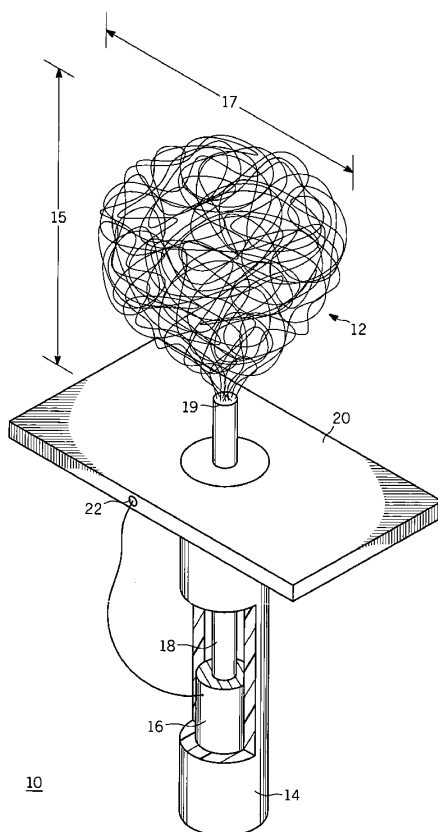
Primary Examiner—Hoang Nguyen

Assistant Examiner—Robert Karacsony

(57) **ABSTRACT**

A wideband antenna (10) includes a plurality of conductive strands (12) randomly interconnected and further coupled to a feedpoint (19) and a sheath (52) structurally retaining the plurality of conductive strands. The sheath can be a thin dielectric coating and the plurality of conductive strands can each be taller than one-quarter wavelength. The wideband antenna can have low dielectric losses while maintaining a multi-octave bandwidth. Air can be used as a dielectric between the plurality of conductive strands.

18 Claims, 2 Drawing Sheets



Acrobat 文件



US007353013B2

(12) **United States Patent**
Qi et al.

(10) **Patent No.:** **US 7,353,013 B2**
(45) **Date of Patent:** **Apr. 1, 2008**

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE WITH POLARIZATION DIVERSITY
WIRELESS LOCAL AREA NETWORK (LAN)
ANTENNA AND RELATED METHODS**

(75) Inventors: **Yihong Qi**, Waterloo (CA); **Ying Tong Man**, Kitchener (CA); **Perry Jarmuszewski**, Waterloo (CA); **Adrian Cooke**, Kitchener (CA)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 262 days.

(21) Appl. No.: **10/924,276**

(22) Filed: **Aug. 23, 2004**

(65) **Prior Publication Data**

US 2006/0040622 A1 Feb. 23, 2006

(51) **Int. Cl.**
H04B 7/04 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** **455/278.1**; 455/272; 455/101;
343/702; 343/700 MS

(58) **Field of Classification Search** 455/552.1,
455/101, 272, 278.1, 269; 343/700 MS,
343/702, 725, 893

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,532,708 A 7/1996 Krenz et al. 343/795
6,031,503 A 2/2000 Preiss, II et al. 343/770

6,404,394 B1 6/2002 Hill 343/702
6,549,170 B1 * 4/2003 Kuo et al. 343/702
6,624,790 B1 9/2003 Wong et al. 343/702
7,253,779 B2 * 8/2007 Greer et al. 343/744
2002/0101377 A1 * 8/2002 Crawford 343/702
2004/0017320 A1 * 1/2004 Yuanzhu 343/727
2004/0051669 A1 * 3/2004 Rutfors et al. 343/702
2004/0085245 A1 * 5/2004 Miyata et al. 343/700 MS
2005/0070326 A1 * 3/2005 Morton 455/552.1
2005/0212708 A1 * 9/2005 Fifield 343/702
2006/0116127 A1 * 6/2006 Wilhoite et al. 455/442

FOREIGN PATENT DOCUMENTS

EP 1189304 * 3/2002
FR EP0689301 12/1995
JP 11274827 10/1999
JP 2001352214 12/2001
WO WO03063290 7/2003

* cited by examiner

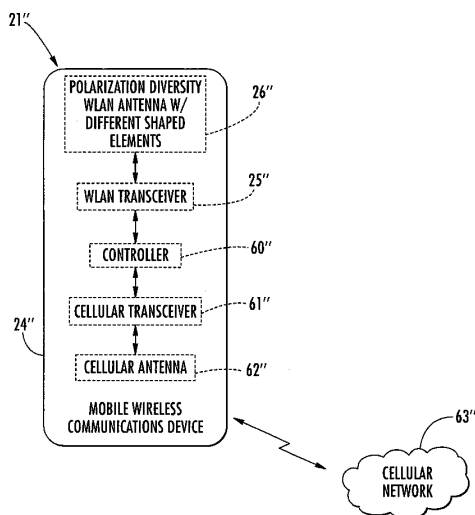
Primary Examiner—Blane J. Jackson

(74) *Attorney, Agent, or Firm*—Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.

(57) **ABSTRACT**

A mobile wireless LAN communications device may include a portable, handheld housing, and a wireless LAN transceiver carried by the housing. A polarization diversity wireless LAN antenna may be included for cooperating with the wireless LAN transceiver to communicate over a wireless LAN. The polarization diversity wireless LAN antenna may include a first antenna element coupled to the wireless LAN transceiver having a first shape and a first polarization, and a second antenna element coupled to the wireless LAN transceiver having a second shape different from the first shape. The second antenna element may also have a second polarization different from the first polarization.

26 Claims, 5 Drawing Sheets



Acrobat 文件



US007355270B2

(12) **United States Patent**
Hasebe et al.

(10) **Patent No.:** **US 7,355,270 B2**
(45) **Date of Patent:** **Apr. 8, 2008**

(54) **SEMICONDUCTOR CHIP WITH COIL
ANTENNA AND COMMUNICATION SYSTEM**

(75) Inventors: **Takehiko Hasebe**, Yokohama (JP);
Yasushi Goto, Tokyo (JP); **Kouichi
Uesaka**, Yokohama (JP); **Yoshiaki
Yazawa**, Tokyo (JP); **Makoto Torigoe**,
Yokohama (JP)

JP	04-363006	12/1992
JP	2001-147231	5/2001
JP	2002-014072	1/2002
JP	2002-092566	3/2002
JP	2002-093916	3/2002
JP	2002092566	3/2002
JP	2004-213196	7/2004
WO	WO 01/80173 A1	10/2001

(73) Assignee: **Hitachi, Ltd.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 281 days.

(21) Appl. No.: **11/030,058**

(22) Filed: **Jan. 7, 2005**

(65) **Prior Publication Data**
US 2005/0173532 A1 Aug. 11, 2005

(30) **Foreign Application Priority Data**
Feb. 10, 2004 (JP) 2004-033293

(51) **Int. Cl.**
H01L 23/02 (2006.01)

(52) **U.S. Cl.** **257/679**; 257/684; 257/728

(58) **Field of Classification Search** 257/679,
257/684, 728
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,268,796 B1	7/2001	Gnadinger et al.	
6,538,569 B1	3/2003	Dunn	
7,119,693 B1 *	10/2006	Devilbiss	340/572.5
2003/0102872 A1	6/2003	Honda	

FOREIGN PATENT DOCUMENTS

EP 1168442 A2 1/2002

OTHER PUBLICATIONS

Hassan M. Elkamchouchi et al, Helical Antennas with Nonuniform
Helix Diameter, Eighteenth National Radio Science Conference, pp.
143-152.*

IBM Technical Disclosure Bulletin, "Radiofrequency Tag With
Biological Sensor," M. J. Brady et al, vol. 40, No. 02, Feb. 1997
[XP000692192], p. 115 (one page).

European Search Report for EP 05000752, dated Nov. 8, 2007.

* cited by examiner

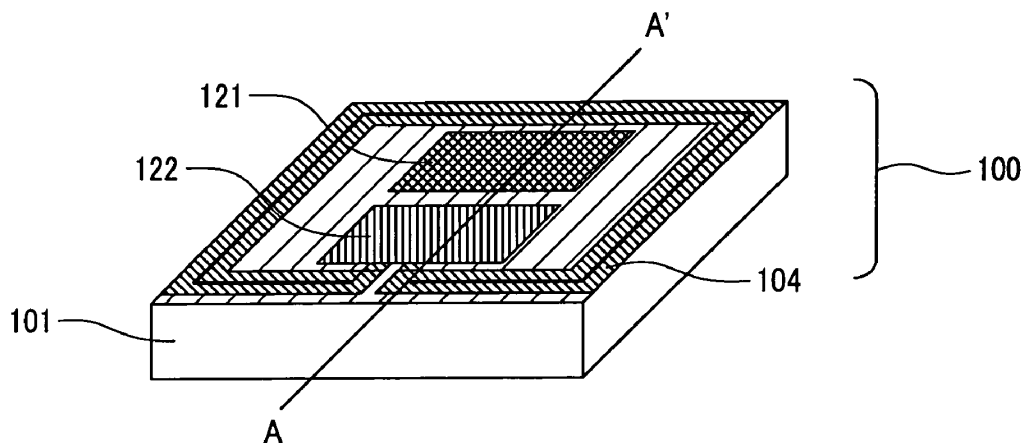
Primary Examiner—Douglas M. Menz

(74) *Attorney, Agent, or Firm*—Antonelli, Terry, Stout &
Kraus, LLP.

(57) **ABSTRACT**

The present invention intends to prevent the communication
distance from becoming shorter with a reduction in size of
a coil antenna to the chip size and with a consequent
decrease of an induced voltage. According to the present
invention there is provided a semiconductor chip having a
coil antenna and a circuit surface and adapted to transmit and
receive signals by radio to and from an external device. The
semiconductor chip has a configuration for increasing an
electromagnetic coupling coefficient between the coil
antenna and the external device. According to a concrete
example thereof, a magnetic material is disposed, the coil
antenna is formed by a stacked structure comprising plural
conductor layers and insulating layers superimposed one on
another, or the coil antenna is disposed outside an external
form of a circuit of the semiconductor chip.

6 Claims, 19 Drawing Sheets



Acrobat 文件



US00735552B2

(12) **United States Patent**
Kwon

(10) **Patent No.:** **US 7,355,552 B2**
(45) **Date of Patent:** ***Apr. 8, 2008**

(54) **CHARACTER PATTERN ANTENNA**

(75) Inventor: **Jae-Yong Kwon**, Seoul (KR)

(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 212 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/236,108**

(22) Filed: **Sep. 26, 2005**

(65) **Prior Publication Data**

US 2006/0066491 A1 Mar. 30, 2006

(30) **Foreign Application Priority Data**

Sep. 24, 2004 (KR) 10-2004-0077468

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

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

(58) **Field of Classification Search** **343/700 MS, 343/702**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,734,350 A * 3/1998 Deming et al. 343/700 MS

5,926,139 A * 7/1999 Korisch 343/702
6,473,044 B2 * 10/2002 Manteuffel et al. 343/702
6,542,126 B2 * 4/2003 Bahr et al. 343/702
6,741,214 B1 * 5/2004 Kadambi et al. 343/700 MS

FOREIGN PATENT DOCUMENTS

KR 1020020091789 12/2002

* cited by examiner

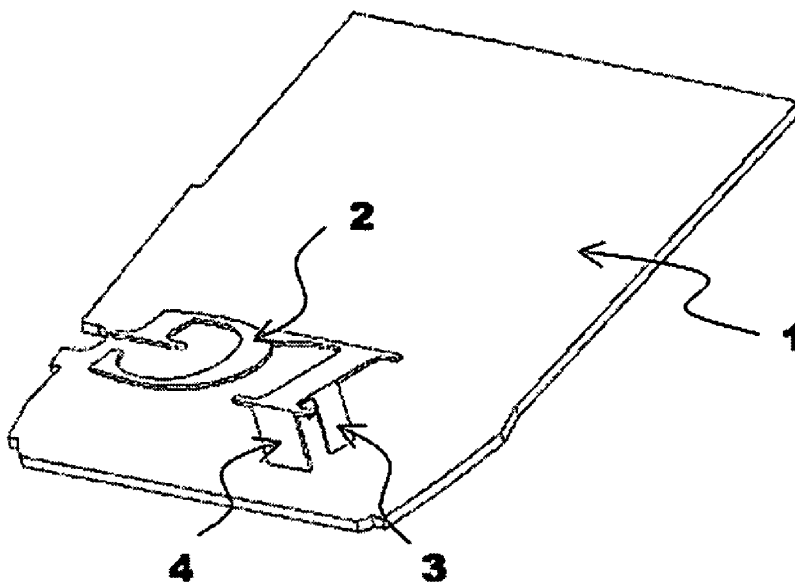
Primary Examiner—Tan Ho

(74) *Attorney, Agent, or Firm*—Lee, hong, Degerman, Kang & Schmadeka

(57) **ABSTRACT**

The present invention relates, in general, to antennas formed in the pattern of characters and, more particularly, to a character pattern antenna, in which a radiation unit thereof is formed in the pattern of a plurality of characters. The character pattern antenna includes a radiation unit, a feeding unit, and a short circuit unit. The radiation unit is formed in a character pattern group to radiate radio waves. The feeding unit is formed on a predetermined portion of the character pattern to provide current. The short circuit unit is formed on a predetermined location of the radiation unit and adapted to function as a ground. As described above, the present invention proposes a character pattern antenna, which allows the pattern thereof to contain a specific meaning while having the performance of an antenna. Accordingly, the present invention is advantageous in that it can increase the freedom of a pattern when an antenna is designed, thus facilitating the design of the antenna.

20 Claims, 4 Drawing Sheets



Acrobat 文件



US00735553B1

(12) **United States Patent**
Ryken, Jr. et al.

(10) **Patent No.:** **US 7,355,553 B1**
(45) **Date of Patent:** **Apr. 8, 2008**

(54) **TEN INCH DIAMETER MICROSTRIP ANTENNA**

(75) Inventors: **Marvin L. Ryken, Jr.**, Oxnard, CA (US); **Albert F. Davis**, Ventura, CA (US)

(73) Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, DC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/645,266**

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

(51) **Int. Cl.**
H01Q 1/28 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** **343/705; 343/700 MS**

(58) **Field of Classification Search** **343/705, 343/708, 700 MS, 846, 853, 829**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,549,168 B1 * 4/2003 Ryken et al. 343/700 MS
6,621,456 B2 * 9/2003 Ryken et al. 343/705
7,109,929 B1 * 9/2006 Ryken et al. 343/700 MS
2006/0250306 A1 * 11/2006 Ryken et al. 343/700 MS

* cited by examiner

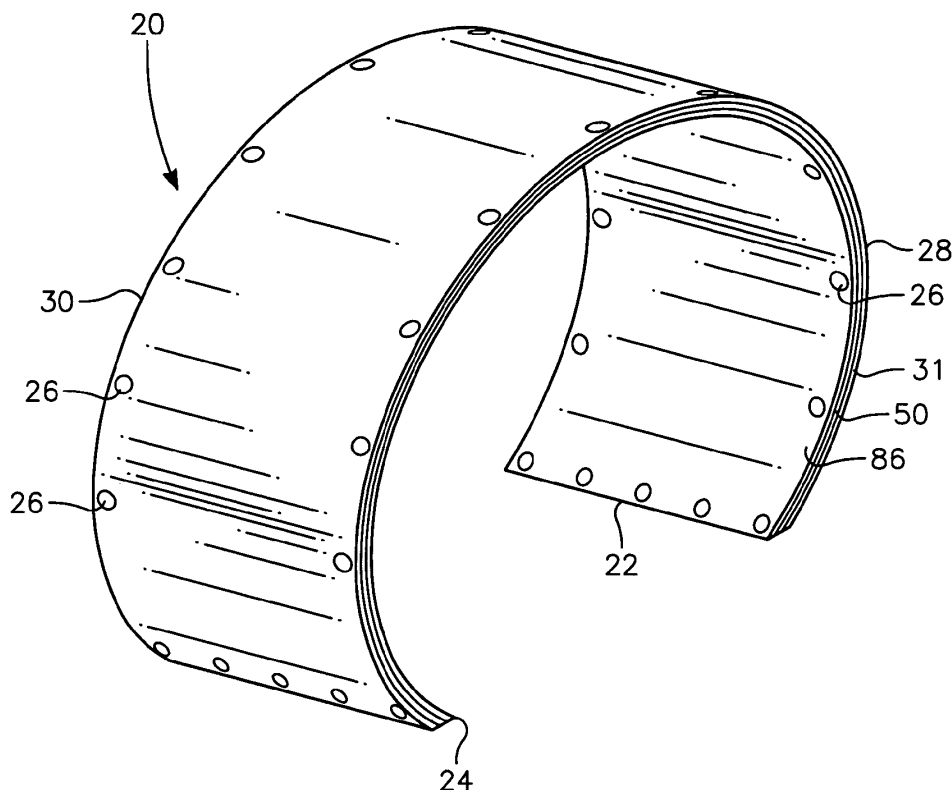
Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—David S. Kalmbaugh

(57) **ABSTRACT**

A microstrip antenna configured to wrap around approximately 270 degrees a projectile's body without interfering with the aerodynamic design of the projectile. The microstrip antenna has two identical grounded quarter wavelength microstrip antenna elements positioned around the circumference of the projectile's body. The antenna has an operating frequency of 425 MHz $\pm$ 375 KHz, a maximum diameter of ten inches and a maximum length of nine inches. The microstrip antenna outputs a pair of equal amplitude flight termination signals and produces a quasi omni-directional radiation pattern with linear polarization.

20 Claims, 4 Drawing Sheets



Acrobat 文件



US00735554B2

(12) **United States Patent**
Boisbouvier et al.

(10) **Patent No.:** **US 7,355,554 B2**
(45) **Date of Patent:** **Apr. 8, 2008**

(54) **METHOD OF PRODUCING A PHOTONIC BANDGAP STRUCTURE ON A MICROWAVE DEVICE AND SLOT TYPE ANTENNAS EMPLOYING SUCH A STRUCTURE**

(75) Inventors: **Nicolas Boisbouvier**, Rennes (FR); **Françoise Le Bolzer**, Rennes (FR); **Ali Louzir**, Rennes (FR); **Anne-Claude Tarot**, Etreilles (FR); **Kouroch Mahdjoubi**, Cesson (FR)

(73) Assignee: **Thomson Licensing**, Boulogne Billancourt (FR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/530,336**

(22) PCT Filed: **Oct. 3, 2003**

(86) PCT No.: **PCT/FR03/50080**

§ 371 (c)(1),

(2), (4) Date: **Nov. 10, 2006**

(87) PCT Pub. No.: **WO2004/034502**

PCT Pub. Date: **Apr. 22, 2004**

(65) **Prior Publication Data**

US 2007/0097005 A1 May 3, 2007

(30) **Foreign Application Priority Data**

Oct. 11, 2002 (FR) 02 12656

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

(52) **U.S. Cl.** 343/767; 343/909

(58) **Field of Classification Search** 343/767, 343/769, 770, 909

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,081,466 A * 1/1992 Bitter, Jr. 343/767
5,519,408 A * 5/1996 Schnetzer 343/767
5,748,152 A * 5/1998 Glabe et al. 343/767
6,518,930 B2 * 2/2003 Itoh et al. 343/767
7,071,889 B2 * 7/2006 McKinzie et al. 343/756

FOREIGN PATENT DOCUMENTS

WO WO 01/95434 12/2001

OTHER PUBLICATIONS

T.J. Ellis et al, Institute of Electrical and Electronics Engineers: "MM-Wave Tapered Slot Antennas on Micromachined Photonic Bandgap Dielectrics", 1996 IEEE MTT-S International Microwave Symposium Digest, San Francisco, Jun. 17-21, 1996, IEEE MTT-S Int'l Microwave Symposium Digest, New York, IEEE, US, vol. 2, Jun. 17, 1996, pp. 1157-1160.

(Continued)

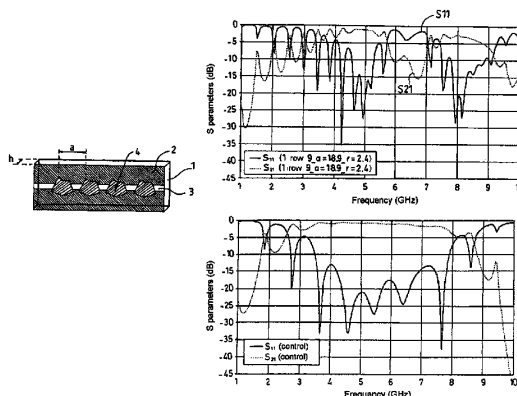
Primary Examiner—Tan Ho

(74) Attorney, Agent, or Firm—Joseph J. Laks; Robert D. Shedd; Brian J. Cromarty

(57) **ABSTRACT**

The invention relates to a method of producing a photonic bandgap structure on a slot-type microwave device which is produced on a metallized substrate. According to the invention, periodically-spaced patterns are formed on the surface of the aforementioned substrate opposite the surface comprising the slot. The invention is suitable for slot-type antennas.

14 Claims, 8 Drawing Sheets



Acrobat 文件



US00735555B2

(12) **United States Patent**
Kitchener et al.

(10) **Patent No.:** **US 7,355,555 B2**
(45) **Date of Patent:** **Apr. 8, 2008**

(54) **ANTENNA**

(75) Inventors: **Dean Kitchener**, Brentwood (GB);
Andrew Urquhart, Bishops Stortford
(GB); **David Adams**, Chelmsford (GB)

(73) Assignee: **Nortel Networks Limited**, St. Laurent,
Quebec (CA)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 168 days.

(21) Appl. No.: **11/225,520**

(22) Filed: **Sep. 13, 2005**

(65) **Prior Publication Data**

US 2007/0057859 A1 Mar. 15, 2007

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

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

(58) **Field of Classification Search** **343/770,**
343/789, 767, 771

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,756,421 A * 7/1956 Harvey et al. 343/770

2,947,988 A * 8/1960 Masters 343/742
5,220,337 A * 6/1993 Ajioka 343/770
5,546,096 A * 8/1996 Wada 343/771
5,929,821 A * 7/1999 Goldstein et al. 343/770
6,137,448 A * 10/2000 Schadler 343/770
7,091,918 B1 * 8/2006 Bhansali et al. 343/767
7,205,952 B2 * 4/2007 Harris 343/791
2003/0080913 A1 * 5/2003 Harris 343/770

* cited by examiner

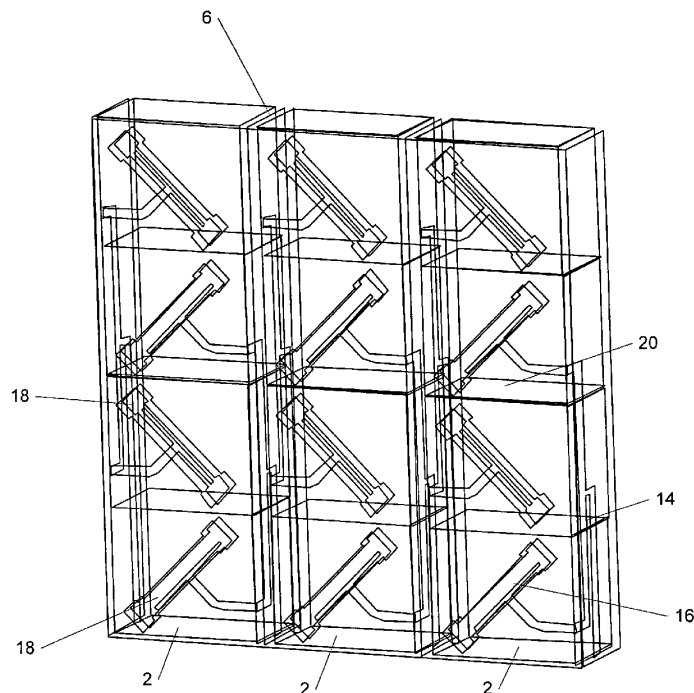
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—Barnes & Thornburg LLP

(57) **ABSTRACT**

An antenna array may be constructed using a plurality of tubes of electrically conducted material in conjunction with an additionally electrically conductive component which covers the front faces of tubes and at least part of the sides. Between the structures, a further electrically conductive material may be placed separated by dielectric material, and may be used to provide radiating elements and a feed structure by producing stripline structures. This structure is thereby able to reduce cavity back slots fed with triplate stripline along the sides of the tubes. This structure, particularly when made from plastics material, is low in complexity and cost and lightweight. These features overcome many of the disadvantages of the existing designs.

38 Claims, 6 Drawing Sheets



Acrobat 文件



US007355556B2

(12) **United States Patent**
Abe et al.

(10) **Patent No.:** **US 7,355,556 B2**
(45) **Date of Patent:** **Apr. 8, 2008**

(54) **ANTENNA AND ELECTRONIC DEVICE**

(75) Inventors: **Kazuaki Abe**, Iruma (JP); **Kaoru Someya**, Kiyose (JP)

(73) Assignee: **Casio Computer Co., Ltd.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 183 days.

(21) Appl. No.: **11/238,034**

(22) Filed: **Sep. 28, 2005**

(65) **Prior Publication Data**

US 2006/0066498 A1 Mar. 30, 2006

(30) **Foreign Application Priority Data**

Sep. 30, 2004 (JP) 2004-287860
Oct. 14, 2004 (JP) 2004-300205
May 26, 2005 (JP) 2005-153916
May 27, 2005 (JP) 2005-155213

(51) **Int. Cl.**
H01Q 7/08 (2006.01)

(52) **U.S. Cl.** **343/788**

(58) **Field of Classification Search** 343/788,
343/718, 787, 702; 455/575.7; 368/47,
368/88, 204

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,220,339 A * 6/1993 Matsushita 343/788
6,664,936 B2 * 12/2003 Ieda et al. 343/866
6,987,490 B2 * 1/2006 Sano 343/788
7,061,439 B1 * 6/2006 Minami et al. 343/718

7,167,140 B2 * 1/2007 Kato et al. 343/788
7,190,638 B2 * 3/2007 Oguchi 368/47
2002/0033777 A1 * 3/2002 Maruyama et al. 343/713
2003/0184489 A1 10/2003 Maruyama et al.
2006/0109188 A1 * 5/2006 Ikeda et al. 343/718

FOREIGN PATENT DOCUMENTS

JP 55-91237 A 7/1980
JP 5-267922 A 10/1993
JP 10-172832 6/1998
JP 11-073608 3/1999
JP 2000-100613 A 4/2000
JP 2002-204122 A 7/2002
JP 2003-283231 A 10/2003
JP 2003-346108 A 12/2003
JP 2004-128956 A 4/2004

(Continued)

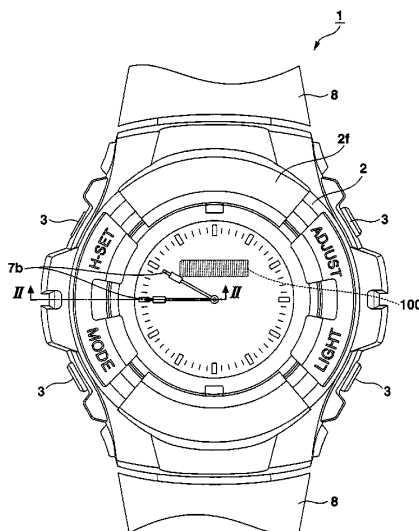
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—Frishauf, Holtz, Goodman & Chick, P.C.

(57) **ABSTRACT**

An antenna includes a rod-like core configured by an amorphous metal formed into a bulk configuration, and a coil wound around the core. An electronic device includes a case encasing the antenna, a sectional area of each longitudinal end portion of the core being larger than that of a central portion of the core. The antenna may be disposed under a radio wave permeable decorative plate in such a manner that a magnetic sheet is attached to each end portion of the core to protrude outwards from the core or that an expanded portion is disposed in each end portion and has such a shape to make a side of a surface of the expanded portion facing the decorative plate receive more radio wave than a side of a surface of the expanded portion opposite to the facing surface in relation to an axial line of the antenna.

9 Claims, 44 Drawing Sheets



Acrobat 文件



US00735557B2

(12) **United States Patent**
Noro et al.

(10) **Patent No.:** **US 7,355,557 B2**
(45) **Date of Patent:** **Apr. 8, 2008**

(54) **ANTENNA UNIT AND FEEDING COMPONENT**

(75) Inventors: **Junichi Noro**, Akita (JP); **Kyuichi Sato**, Akita (JP); **Nobuaki Monma**, Akita (JP); **Shozo Miyamoto**, Akita (JP); **Takumi Suzuki**, Akita (JP)

(73) Assignee: **Mitsumi Electric Co., Ltd.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 265 days.

(21) Appl. No.: **11/320,086**

(22) Filed: **Dec. 28, 2005**

(65) **Prior Publication Data**
US 2006/0214852 A1 Sep. 28, 2006

(30) **Foreign Application Priority Data**
Mar. 28, 2005 (JP) 2005-090852

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

(52) **U.S. Cl.** 343/846; 343/872; 343/767

(58) **Field of Classification Search** 343/846, 343/872, 848, 767, 789, 700 MS, 829-830
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,181,044 A * 1/1993 Matsumoto et al. 343/752

6,049,314 A * 4/2000 Munson et al. 343/846
6,133,883 A * 10/2000 Munson et al. 343/700 MS
6,246,368 B1 * 6/2001 Deming et al. 343/700 MS
6,861,990 B2 * 3/2005 Hung et al. 343/702
6,879,288 B2 * 4/2005 Byrne et al. 343/700 MS

FOREIGN PATENT DOCUMENTS

JP 2005-020644 A 1/2005

* cited by examiner

Primary Examiner—Douglas W. Owens

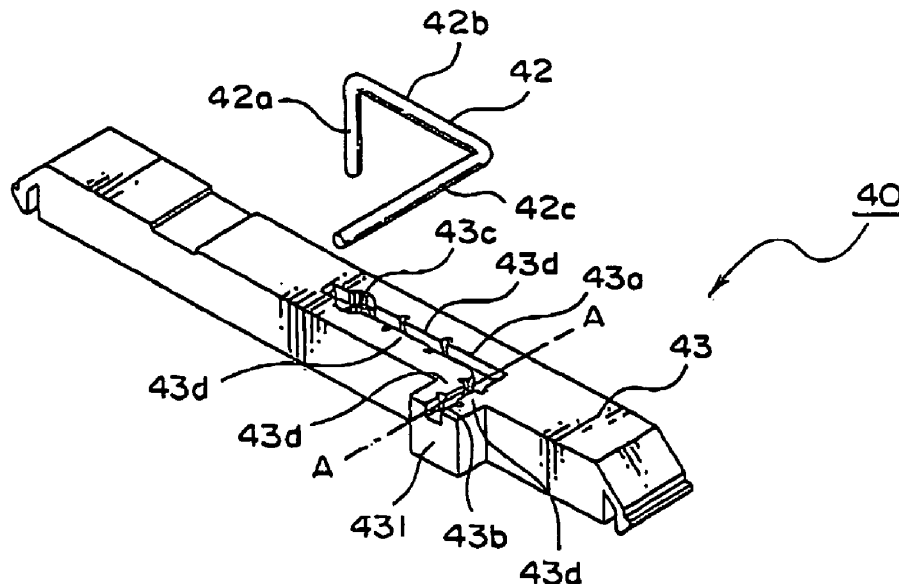
Assistant Examiner—Chuc Tran

(74) *Attorney, Agent, or Firm*—Frishauf, Holtz, Goodman & Chick, P.C.

(57) **ABSTRACT**

A feeding component 40 has a wire (or a feeding line) 42 and an attaching member 43 made of resin. The attaching member 43 provides wire receiving grooves 43a and 43b to receive and support the wire 42. At least one pair of wire holding parts 43d are formed on inner wall defining the wire receiving grooves 43a and 43b. The wire holding parts 43d of each pair are opposite to each other and inclined to narrow a width of the wire receiving groove 43a or 43b with increasing proximity to an upper side of the wire receiving groove 43a or 43b. The wire holding parts 43d hold the wire 42 put into the wire receiving grooves 43a and 43b.

8 Claims, 4 Drawing Sheets



Acrobat 文件



US007355558B2

(12) **United States Patent**
Lee

(10) **Patent No.:** **US 7,355,558 B2**

(45) **Date of Patent:** **Apr. 8, 2008**

(54) **CHIP ANTENNA**

6,819,289 B2 * 11/2004 Kim et al. 343/700 MS
2003/0001793 A1 * 1/2003 Park 343/895

(75) Inventor: **Jae Chan Lee**, Kyungki-do (KR)

(73) Assignee: **Samsung Electro-Mechanics Co. Ltd.**,
Suwon, Kyungki-Do (KR)

FOREIGN PATENT DOCUMENTS

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 88 days.

KR 423395 B 3/2004

(21) Appl. No.: **11/320,197**

* cited by examiner

(22) Filed: **Dec. 28, 2005**

Primary Examiner—Hoang V. Nguyen

Assistant Examiner—Robert Karacsony

(65) **Prior Publication Data**

US 2006/0145928 A1 Jul. 6, 2006

(74) *Attorney, Agent, or Firm*—Volpe and Koenig P.C.

(30) **Foreign Application Priority Data**

Jan. 3, 2005 (KR) 10-2005-0000267

(51) **Int. Cl.**

H01Q 1/36 (2006.01)

H01Q 1/24 (2006.01)

H01Q 1/38 (2006.01)

H01Q 5/00 (2006.01)

H01Q 9/04 (2006.01)

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

(58) **Field of Classification Search** 343/702,
343/700 MS, 895

See application file for complete search history.

(56) **References Cited**

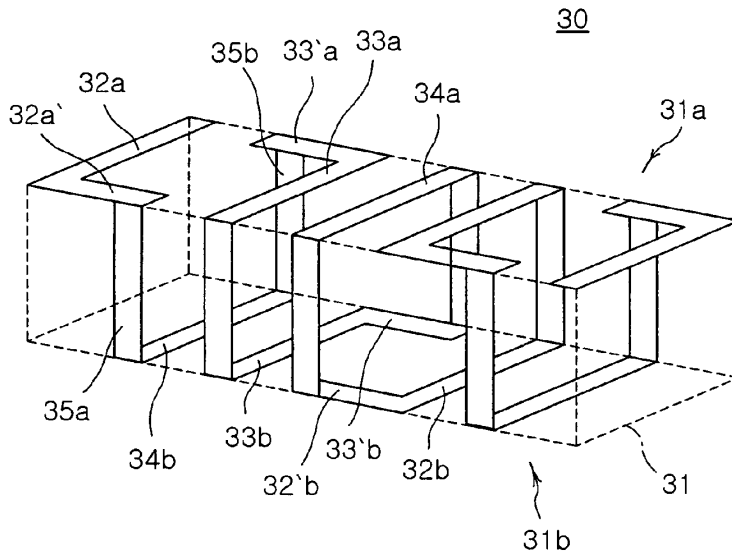
U.S. PATENT DOCUMENTS

6,618,023 B2 9/2003 Park

(57) **ABSTRACT**

The present invention relates to a chip antenna including first and second conductor patterns formed on upper and lower surfaces of a dielectric block in a width direction of the dielectric block. The chip antenna also includes conductive vertical-connecting parts formed in a vertical direction of the dielectric block to connect the first conductor patterns with the second conductor patterns to form a radiation line. The first and second conductor patterns comprise pairs of L-shaped and symmetrical L-shaped conductor patterns having bent parts overlapped in part with each other in a width direction and extended in a longitudinal direction of the dielectric block. Also, horizontal-connecting conductor patterns are formed in a width direction of the dielectric block.

12 Claims, 8 Drawing Sheets



Acrobat 文件



US00735559B2

(12) **United States Patent**
Tikhov et al.

(10) **Patent No.:** **US 7,355,559 B2**
(45) **Date of Patent:** **Apr. 8, 2008**

(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)

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

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

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

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

(65) **Prior Publication Data**

US 2007/0096993 A1 May 3, 2007

Related U.S. Application Data

(62) Division of application No. 11/207,725, filed on Aug.
22, 2005, now Pat. No. 7,289,076.

(30) **Foreign Application Priority Data**

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

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

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

(58) **Field of Classification Search** **343/700 MS,**
343/895, 767, 770, 846
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,906,514 A * 9/1975 Phelan 343/895

6,094,179 A * 7/2000 Davidson 343/895
7,075,493 B2 * 7/2006 Azadegan et al. 343/767
7,190,319 B2 * 3/2007 Forster et al. 343/806
2004/0001023 A1 * 1/2004 Peng 343/725

FOREIGN PATENT DOCUMENTS

EP 1 589 680 A1 10/2005
WO WO 03/034544 A1 4/2003
WO WO 03/094293 A1 11/2003
WO WO 2004/047222 A1 6/2004

OTHER PUBLICATIONS

Azadegan R et al., "Design of miniaturized slot antennas", IEEE
Antennas and Propagation Society International Symposium. 2001
Digest. APS. Boston, MA, Jul. 8-13, 2001, New York, NY: IEEE,
US, vol. 1 of 4, Jul. 8, 2001, pp. 565-568, XP010564702.

* cited by examiner

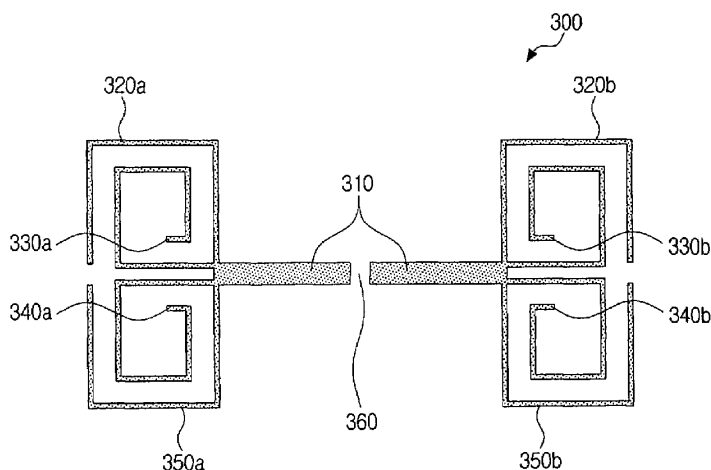
Primary Examiner—Tho Phan

(74) *Attorney, Agent, or Firm*—Sughrue Mion, PLLC

(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.

7 Claims, 13 Drawing Sheets



Acrobat 文件



US007358900B2

(12) **United States Patent**
Song et al.

(10) **Patent No.:** **US 7,358,900 B2**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **SYMMETRIC-SLOT MONOPOLE ANTENNA**

(56)

References Cited

(75) Inventors: **Jia-Jiu Song**, Taipei County (TW);
Jr-Ren Jeng, Taipei (TW)
(73) Assignee: **SmartAnt Telecom.Co., Ltd.**, Hsinchu
(TW)
(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 64 days.

U.S. PATENT DOCUMENTS

5,532,707	A *	7/1996	Klinger et al.	343/793
6,133,883	A *	10/2000	Munson et al.	343/700 MS
6,191,751	B1 *	2/2001	Johnson	343/834
6,344,823	B1 *	2/2002	Deng	343/700 MS
6,411,261	B1 *	6/2002	Lilly	343/756
7,053,855	B2 *	5/2006	Huang	343/843
2004/0008146	A1 *	1/2004	Ikegaya et al.	343/767
2005/0231435	A1 *	10/2005	Ikegaya et al.	343/767

* cited by examiner

Primary Examiner—Hoanganh Le

(74) *Attorney, Agent, or Firm*—Harness, Dickey & Pierce
P.L.C.

(21) Appl. No.: **11/225,182**

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

(65) **Prior Publication Data**

US 2007/0057846 A1 Mar. 15, 2007

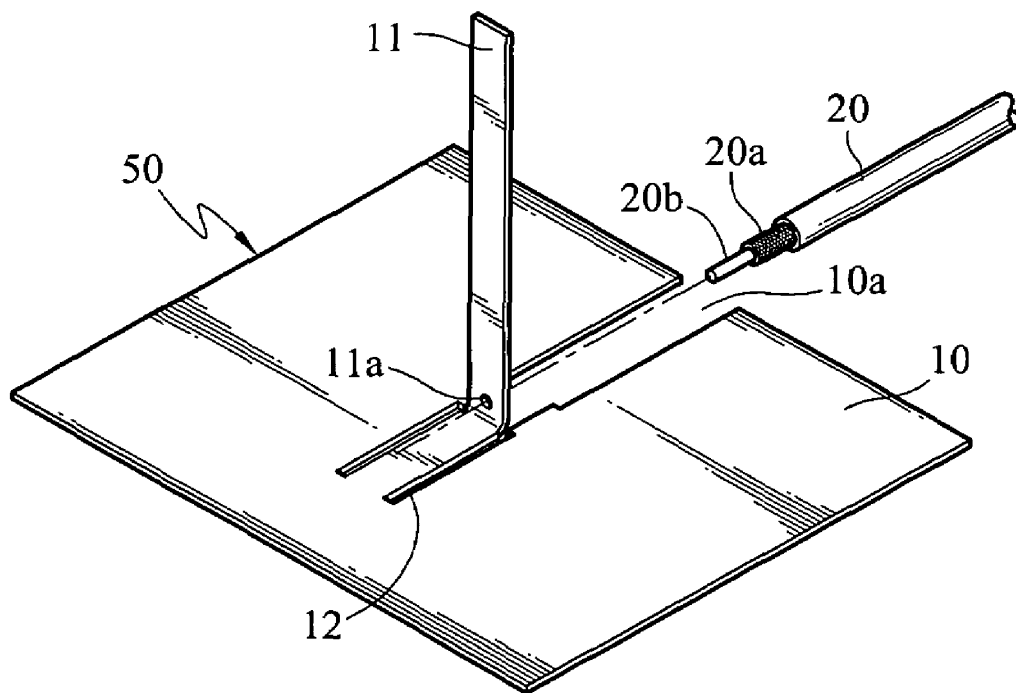
(57)

ABSTRACT

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/700 MS; 343/846**
(58) **Field of Classification Search** **343/700 MS,**
343/767, 770, 846, 848, 893
See application file for complete search history.

A symmetric-slot monopole antenna is provided, including a metallic board. Formed on the metallic board are a ground connection part to provide a ground circuit for the monopole antenna and a radiation part formed integrally on the ground connection part to receive and radiate signals transmitted through a signal cable.

10 Claims, 7 Drawing Sheets



Acrobat 文件



US007358901B2

(12) **United States Patent**
Eberhardt et al.

(10) **Patent No.:** **US 7,358,901 B2**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **ANTENNA SYSTEM AND APPARATUS**

(75) Inventors: **Paul Eberhardt**, Encinitas, CA (US);
Vince Salazar, San Diego, CA (US)

(73) Assignee: **Pulse-LINK, Inc.**, Carlsbad, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 227 days.

(21) Appl. No.: **11/254,148**

(22) Filed: **Oct. 18, 2005**

(65) **Prior Publication Data**

US 2007/0085743 A1 Apr. 19, 2007

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

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

(58) **Field of Classification Search** 343/700 MS,
343/846, 828, 795, 797
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,351,246	B1	2/2002	McCorkle	
6,559,810	B2	5/2003	McCorkle	
6,587,540	B1	7/2003	Johnson et al.	
6,590,545	B2	7/2003	McCorkle	
6,842,141	B2	1/2005	Suh et al.	
6,845,253	B1	1/2005	Schantz	
6,914,573	B1	7/2005	McCorkle	
7,075,483	B2 *	7/2006	Okado	343/700 MS
7,098,856	B2 *	8/2006	Okado	343/702
7,187,329	B2 *	3/2007	Okado	343/700 MS
7,190,320	B2 *	3/2007	Okado	343/806

7,209,089	B2 *	4/2007	Schantz	343/787
2003/0210207	A1	11/2003	Suh	
2005/0059348	A1	3/2005	Chae et al.	
2005/0062670	A1	3/2005	Suh	
2005/0146471	A1	7/2005	Kwon et al.	
2005/0151693	A1	7/2005	Schantz	
2005/0156788	A1	7/2005	Lin	
2005/0162332	A1	7/2005	Schantz	
2005/0168394	A1	8/2005	Kurashima et al.	
2006/0055619	A1 *	3/2006	Sarabandi et al.	343/866

OTHER PUBLICATIONS

Dr. Seong-Youp Suh & Dr. Warren L. Stutzman, Coplanar PICA Antenna, Virginia Tech Antenna Group, www.vtip.org/licensing/disclosures/00-130.htm, 1 page, date is not available.

(Continued)

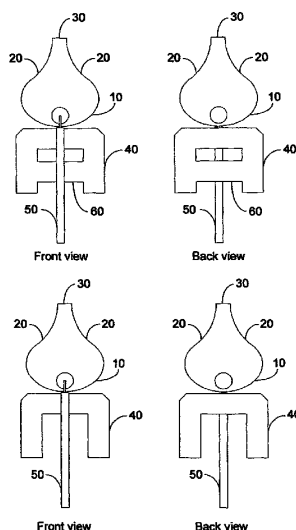
Primary Examiner—Tan Ho

(74) *Attorney, Agent, or Firm*—Peter Martinez

(57) **ABSTRACT**

An antenna design is provided. In one embodiment, the antenna is a planar element with a radiating element containing an elliptical curved portion connected to two curved regions, the curved regions meeting at a geometric construct. Another embodiment provides an antenna constructed with intersecting planar elements. A third embodiment is an antenna that is a solid of revolution of a planar element. Some antenna embodiments include ground plane elements to shape the radiation patterns. This Abstract is provided for the sole purpose of complying with the Abstract requirement rules that allow a reader to quickly ascertain the subject matter of the disclosure contained herein. This Abstract is submitted with the explicit understanding that it will not be used to interpret or to limit the scope or the meaning of the claims.

24 Claims, 8 Drawing Sheets



Acrobat 文件



US007358902B2

(12) **United States Patent**
Erkocevic

(10) **Patent No.:** **US 7,358,902 B2**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **DUAL-BAND ANTENNA FOR A WIRELESS
LOCAL AREA NETWORK DEVICE**

(75) Inventor: **Nedim Erkocevic**, Delfgauw (NL)

(73) Assignee: **Agere Systems Inc.**, Allentown, PA
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/279,520**

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

(65) **Prior Publication Data**

US 2006/0181464 A1 Aug. 17, 2006

Related U.S. Application Data

(63) Continuation of application No. 10/696,852, filed on
Oct. 30, 2003, now Pat. No. 7,057,560.

(60) Provisional application No. 60/468,460, filed on May
7, 2003.

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

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

(58) **Field of Classification Search** **343/702,**
343/700 MS, 846, 848
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,356,492 A 10/1982 Kaloj
5,420,599 A 5/1995 Erkocevic
5,859,614 A 1/1999 Paolella et al.
6,091,366 A 7/2000 Zhang et al.
6,100,848 A 8/2000 Hayes
6,225,951 B1* 5/2001 Holshouser et al. . 343/700 MS
6,377,227 B1 4/2002 Zhu et al.
6,408,190 B1 6/2002 Ying

6,424,317 B2 7/2002 Rudish
6,515,629 B1 2/2003 Kuo et al.
6,529,168 B2 3/2003 Mikkola et al.
6,529,749 B1* 3/2003 Hayes et al. 455/575.7
6,535,170 B2 3/2003 Sawamura et al.
6,567,048 B2 5/2003 McKinzie et al.
6,611,235 B2 8/2003 Barna et al.
6,614,400 B2 9/2003 Egorov
6,683,575 B2* 1/2004 Sekine et al. 343/702
6,734,825 B1 5/2004 Guo et al.
6,795,028 B2 9/2004 Stutzman et al.
6,922,172 B2 7/2005 Oshiyama et al.
2002/0004125 A1 1/2002 Ostrovsky
2002/0175866 A1 11/2002 Gram
2003/0001787 A1 1/2003 Clifton
2003/0207668 A1 11/2003 McFarland et al.
2004/0027288 A1 2/2004 Okubora et al.
2004/0198293 A1 10/2004 Sadler et al.
2004/0212545 A1 10/2004 Li et al.
2006/0097925 A1* 5/2006 Lee 343/700 MS
2006/0109192 A1* 5/2006 Weigand 343/795

FOREIGN PATENT DOCUMENTS

EP 0 986 130 A2 9/1999
EP 1033821 A2 9/2000
EP 1 263 083 A2 12/2002

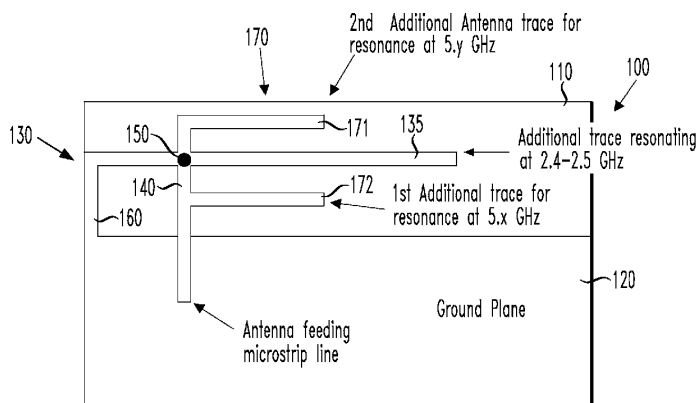
* cited by examiner

Primary Examiner—Huedung Mancuso

(57) **ABSTRACT**

A dual-band antenna, a method of manufacturing the same and a wireless networking card incorporating the antenna. In one embodiment, the antenna includes: (1) a substrate, (2) an inverted F antenna printed circuit supported by the substrate and tuned to resonate in a first frequency band, wherein the inverted F antenna has a ground plane and a radiator located on one plane of the substrate and (3) a monopole antenna printed circuit supported by the substrate and located on a different plane than the ground plane, wherein the monopole antenna printed circuit is tuned to resonate in a second frequency band.

20 Claims, 4 Drawing Sheets



Acrobat 文件



US007358903B1

(12) **United States Patent**
Su et al.

(10) **Patent No.:** **US 7,358,903 B1**

(45) **Date of Patent:** **Apr. 15, 2008**

(54) **TRIPLE-BAND EMBEDDED ANTENNA**

6,995,714 B2 * 2/2006 Sim et al. 343/702

(75) Inventors: **Jia-hung Su**, Tu-Cheng (TW);
Hung-jen Chen, Tu-Cheng (TW); **Kai Shih**,
Tu-Cheng (TW); **Yu-yuan Wu**, Tu-Cheng (TW)

* cited by examiner

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

Primary Examiner—Shih-Chao Chen

(74) *Attorney, Agent, or Firm*—Rosenberg, Klein & Lee

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(57) **ABSTRACT**

(21) Appl. No.: **11/730,400**

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

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 11/12 (2006.01)
H01Q 13/10 (2006.01)

(52) **U.S. Cl.** **343/700 MS; 343/742; 343/770**

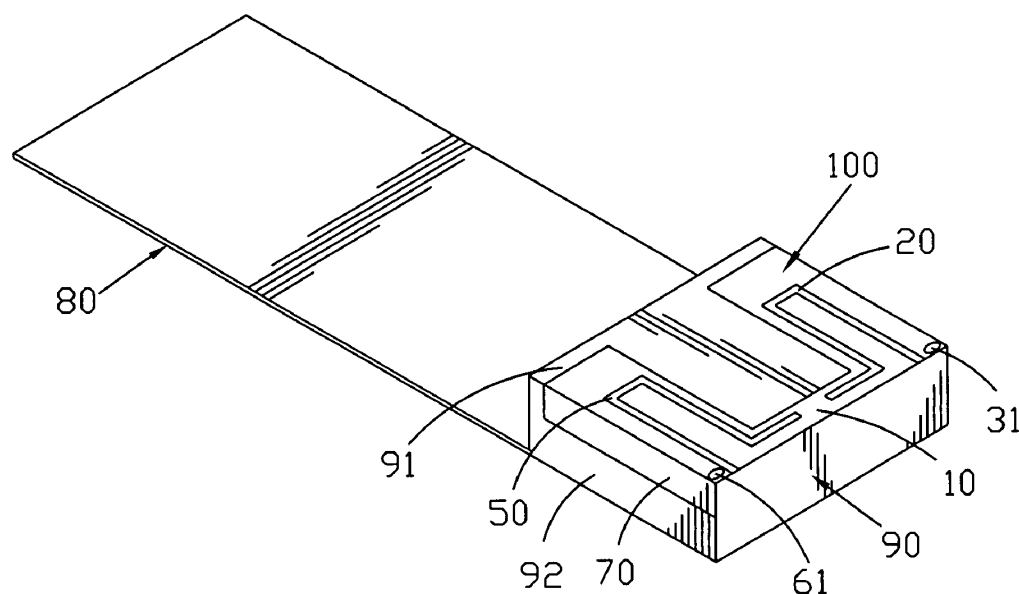
(58) **Field of Classification Search** 343/700 MS,
343/702, 742, 770, 725
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,842,143 B2 * 1/2005 Otaka et al. 343/700 MS

5 Claims, 2 Drawing Sheets



Acrobat 文件



US007358906B2

(12) **United States Patent**
Sato et al.

(10) **Patent No.:** **US 7,358,906 B2**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **ANTENNA DEVICE AND MOBILE COMMUNICATION TERMINAL EQUIPPED WITH ANTENNA DEVICE**

2002/0018020 A1 2/2002 Vernon
2002/0190903 A1 12/2002 Watada et al.
2003/0169209 A1 9/2003 Ohara et al.

FOREIGN PATENT DOCUMENTS

EP 0 903 805 A2 3/1999
EP 0 954 054 A1 11/1999
JP 11-330842 A 11/1999
WO 97/47054 A 12/1997

OTHER PUBLICATIONS

T. Tanaka et al, "Built-in Folded Dipole Antenna for Handset," B-1-197, IEICE General Conference, 2003.
Y. Kim et al, "A Folded Loop Antenna System for Handsets Developed and Based on the Advanced Design Concept," IEICE TRANS. COMMUN., vol. E84-B No. 9, pp. 2468-2475, Sep. 2001.
Antenna Engineering Textbook, Ohm Inc., Tokyo: pp. 112-113 Figs. 4.1 and 4.2; Oct. 1996.
Mushiake Vohida, "VHF (Very High Frequency) Antenna," Section 8.4, Corona Inc., Tokyo: Aug. 1961.

* cited by examiner

Primary Examiner—Tho Phan

(74) Attorney, Agent, or Firm—Frishauf, Holtz, Goodman & Chick, P.C.

(75) Inventors: **Koichi Sato**, Fuchu (JP); **Takashi Amano**, Soka (JP)

(73) Assignee: **Kabushiki Kaisha Toshiba**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 543 days.

(21) Appl. No.: **10/948,877**

(22) Filed: **Sep. 24, 2004**

(65) **Prior Publication Data**

US 2005/0153756 A1 Jul. 14, 2005

(30) **Foreign Application Priority Data**

Jan. 13, 2004 (JP) 2004-005751

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

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

(58) **Field of Classification Search** **343/702, 829, 846**
See application file for complete search history.

(56) **References Cited**

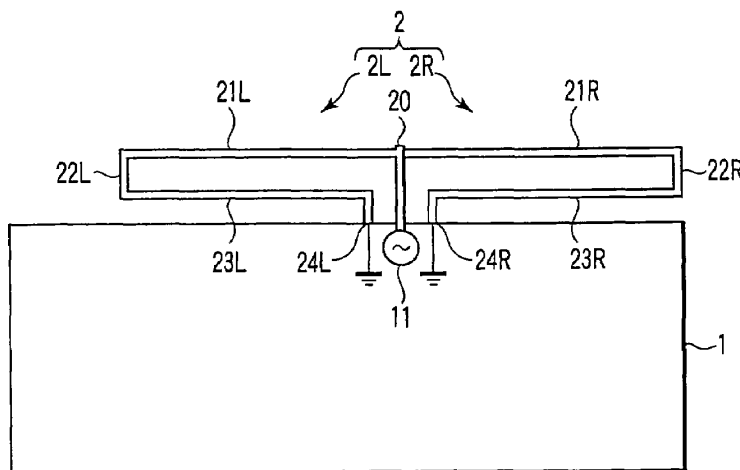
U.S. PATENT DOCUMENTS

6,130,651 A 10/2000 Yanagisawa et al.
6,239,765 B1 5/2001 Johnson et al.
6,252,550 B1 6/2001 Vernon
6,452,556 B1 * 9/2002 Ha et al. 343/702
7,068,230 B2 * 6/2006 Qi et al. 343/702
7,183,983 B2 * 2/2007 Ozden 343/702

(57) **ABSTRACT**

In an antenna device, a half wavelength dipole antenna is folded so as to form a forward path section, a folding section and a backward path section such that the backward path section is connected to the substrate at the ground terminal, and an electric power is supplied from the power supply source at the branching point, so as to configure a folded monopole antenna. Also, an additional antenna is folded similarly and connected to the monopole antenna such that the branching point and the power supply section are shared by the monopole antenna and the additional antenna.

7 Claims, 8 Drawing Sheets



Acrobat 文件



US007358907B2

(12) **United States Patent**
Takaba et al.

(10) **Patent No.:** **US 7,358,907 B2**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **SMALL-SIZED ANTENNA**

(75) Inventors: **Shinichi Takaba**, Hitachi (JP); **Makoto Usui**, Hitachi (JP)

(73) Assignee: **Hitachi Cable, Ltd.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 314 days.

(21) Appl. No.: **11/077,158**

(22) Filed: **Mar. 11, 2005**

(65) **Prior Publication Data**

US 2006/0097928 A1 May 11, 2006

(30) **Foreign Application Priority Data**

Nov. 5, 2004 (JP) 2004-321925

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

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

(58) **Field of Classification Search** 343/702,
343/700 MS, 829, 841, 846

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,856,912 A * 1/1999 Miller et al. 361/737
6,040,803 A * 3/2000 Spall 343/700 MS
6,110,576 A * 8/2000 Decker et al. 428/300.1
6,333,716 B1 * 12/2001 Pontoppidan 343/702
2004/0029329 A1 * 2/2004 Borghs et al. 438/167

FOREIGN PATENT DOCUMENTS

JP 7-288422 10/1995
JP 2002-299934 10/2002

* cited by examiner

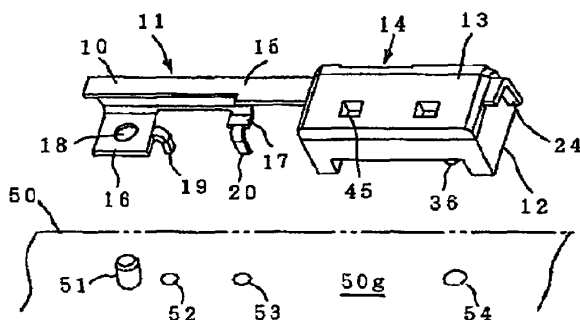
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—McGinn IP Law Group, PLLC

(57) **ABSTRACT**

A small-sized antenna is adapted to be mounted on a circuit substrate. The antenna has an antenna body and a resin-molded body that has a first resin-molded body and a second resin-molded body. The antenna body is sandwiched by the first and second resin-molded bodies. The first resin-molded body engages to the second resin-molded body, and the first resin-molded body is mounted on the circuit substrate.

14 Claims, 5 Drawing Sheets



11:ANTENNA BODY

12:FIRST RESIN-MOLDED BODY

13:SECOND RESIN-MOLDED BODY

50:CIRCUIT SUBSTRATE

50g:GROUND PLANE

54:POSITIONING HOLE



Acrobat 文件



US007358912B1

(12) **United States Patent**
Kish et al.

(10) **Patent No.:** **US 7,358,912 B1**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **COVERAGE ANTENNA APPARATUS WITH
SELECTABLE HORIZONTAL AND
VERTICAL POLARIZATION ELEMENTS**

(75) Inventors: **William Kish**, Saratoga, CA (US);
Victor Shtrom, Sunnyvale, CA (US)

(73) Assignee: **Ruckus Wireless, Inc.**, Sunnyvale, CA
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

6,266,528 B1 7/2001 Farzaneh
6,292,153 B1 9/2001 Aiello et al.
6,307,524 B1 10/2001 Britain
6,317,599 B1 11/2001 Rappaport et al.
6,326,922 B1 12/2001 Hegendoerfer
6,326,924 B1 * 12/2001 Muramoto et al. 343/702
6,337,628 B2 1/2002 Campana, Jr.
6,337,668 B1 1/2002 Ito et al.
6,339,404 B1 1/2002 Johnson et al.

(Continued)

(21) Appl. No.: **11/413,461**

FOREIGN PATENT DOCUMENTS

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

EP 0 534 612 3/1993

Related U.S. Application Data

(60) Provisional application No. 60/694,101, filed on Jun.
24, 2005.

(Continued)

OTHER PUBLICATIONS

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

Ken Tang, et al., "MAC Layer Broadcast Support in 802.11 Wireless
Networks," Computer Science Department, University of Califor-
nia, Los Angeles, 2000 IEEE, pp. 544-548.

(52) **U.S. Cl.** **343/725; 343/727**

(58) **Field of Classification Search** **343/725,**
343/727, 700 MS, 767

See application file for complete search history.

(Continued)

Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—Carr & Ferrell LLP

(56) **References Cited**

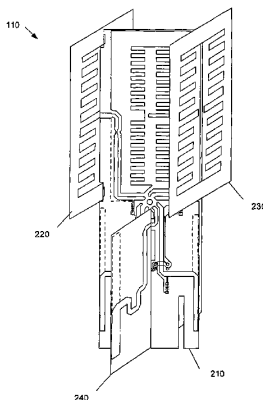
U.S. PATENT DOCUMENTS

4,176,356 A 11/1979 Foster et al.
4,193,077 A 3/1980 Greenberg et al.
4,305,052 A 12/1981 Baril et al.
4,814,777 A 3/1989 Monser
5,173,711 A 12/1992 Takeuchi et al.
5,220,340 A 6/1993 Shafai
5,559,800 A 9/1996 Mousseau et al.
5,754,145 A 5/1998 Evans
5,767,809 A 6/1998 Chuang et al.
5,802,312 A 9/1998 Lazaridis et al.
5,964,830 A 10/1999 Durrett
6,034,638 A 3/2000 Thiel et al.
6,094,177 A 7/2000 Yamamoto

(57) **ABSTRACT**

An antenna apparatus comprises selectable antenna ele-
ments including a plurality of dipoles and/or a plurality of
slot antennas ("slot"). Each dipole and/or each slot provides
gain with respect to isotropic. The dipoles may generate
vertically polarized radiation and the slots may generate
horizontally polarized radiation. Each antenna element may
have one or more loading structures configured to decrease
the footprint (i.e., the physical dimension) of the antenna
element and minimize the size of the antenna apparatus.

17 Claims, 7 Drawing Sheets



Acrobat 文件



US007358914B1

(12) **United States Patent**
Horner

(10) **Patent No.:** **US 7,358,914 B1**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **TAPERED SLOT ANTENNA END CAPS**

FOREIGN PATENT DOCUMENTS

(75) Inventor: **Rob Horner**, San Diego, CA (US)

JP 2003-152433 * 5/2003
JP 2005-20389 * 1/2005

(73) Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, DC (US)

* cited by examiner

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

Primary Examiner—Hoang V Nguyen
(74) *Attorney, Agent, or Firm*—Peter A. Lipovsky; J. Eric Anderson; Ryan J. Friedl

(21) Appl. No.: **11/645,261**

(57) **ABSTRACT**

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

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

(52) **U.S. Cl.** **343/767; 343/770**

(58) **Field of Classification Search** **343/767, 343/770**

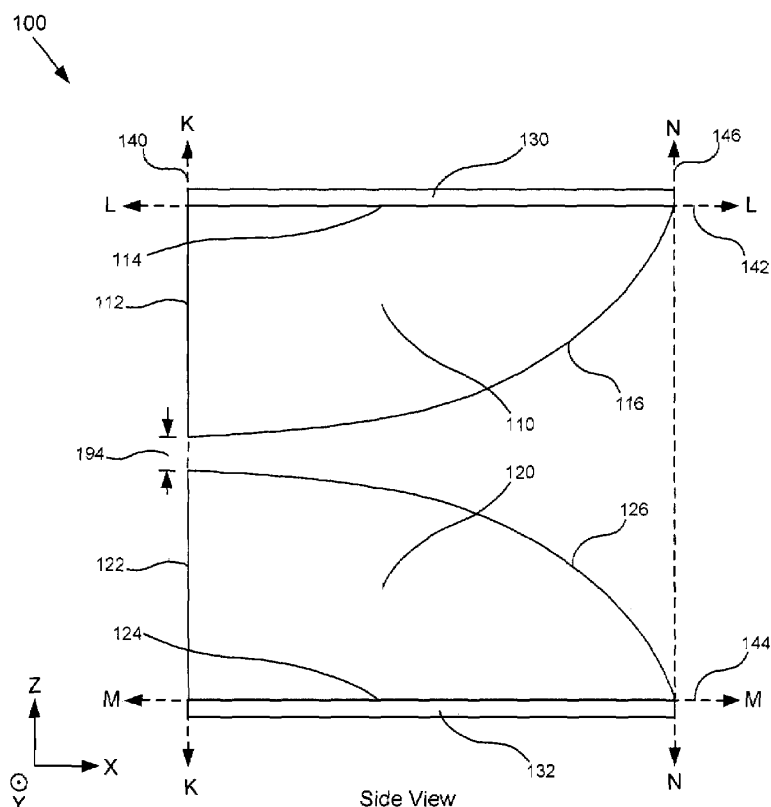
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,185,611 A * 2/1993 Bitter, Jr. 343/702

16 Claims, 8 Drawing Sheets



Acrobat 文件



US007358916B2

(12) **United States Patent**
Milyakh

(10) **Patent No.:** **US 7,358,916 B2**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **POLARIZATION DIVERSITY ANTENNA SYSTEM**

(75) Inventor: **Yaroslav Milyakh**, Suwon-si (KR)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/581,446**

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

(65) **Prior Publication Data**

US 2007/0097007 A1 May 3, 2007

(30) **Foreign Application Priority Data**

Nov. 3, 2005 (KR) 10-2005-0104995

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

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

(58) **Field of Classification Search** 343/770, 343/767, 700 MS, 795

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,410,891 A 10/1983 Schaubert et al.

4,547,779 A * 10/1985 Sanford et al. 343/700 MS
5,828,344 A 10/1998 Alder et al.
5,977,929 A 11/1999 Ryken
6,731,245 B1 * 5/2004 Stotler et al. 343/700 MS
6,967,625 B1 * 11/2005 Honda 343/771
2002/0084942 A1 * 7/2002 Tsai et al. 343/795
2003/0020664 A1 1/2003 Thudor et al.
2005/0168389 A1 * 8/2005 Yuanzhu et al. 343/767

FOREIGN PATENT DOCUMENTS

EP 0 762 542 A2 3/1997
EP 1 291 971 A1 3/2003
KR 10-2005-0022846 A 3/2005

* cited by examiner

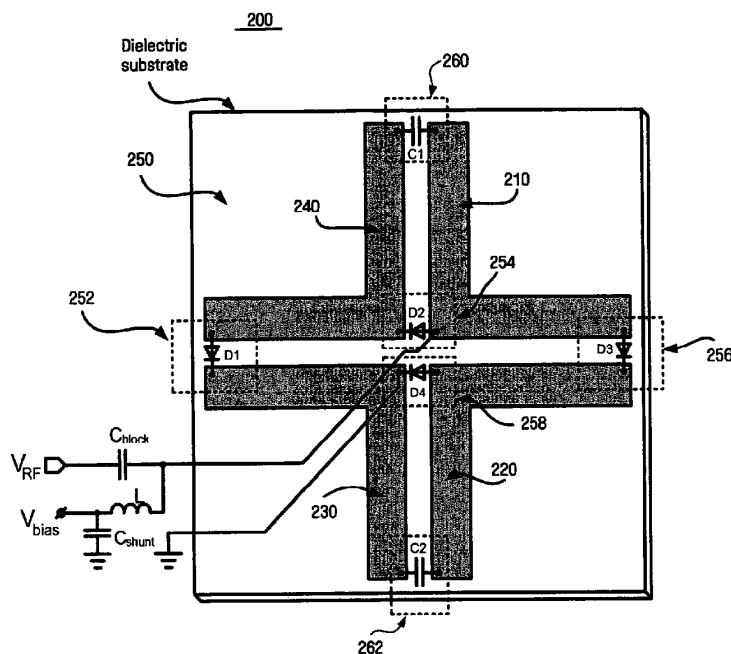
Primary Examiner—Hoanganh Le

(74) *Attorney, Agent, or Firm*—Sughrue Mion, PLLC

(57) **ABSTRACT**

A polarization diversity antenna system includes antenna elements having first to fourth slotlines bent at right angles so that the second slotline is provided adjacent to the first slotline, the third slotline is diagonally opposite to the first slotline and provided adjacent to the second slotline, and the fourth slotline is provided adjacent to the third slotline and diagonally opposite to the second slotline, and a switching network in which coupling units are formed between ends of the horizontal slotlines and between ends of the vertical slotlines that are close to intersections of the vertical and horizontal slotlines to determine polarization.

10 Claims, 6 Drawing Sheets



Acrobat 文件



US007358918B2

(12) **United States Patent**
Itsuji

(10) **Patent No.:** **US 7,358,918 B2**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **PLANAR ANTENNA APPARATUS**

(75) Inventor: **Takeaki Itsuji**, Hiratsuka (JP)

(73) Assignee: **Canon Kabushiki Kaisha**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 239 days.

(21) Appl. No.: **11/230,821**

(22) Filed: **Sep. 21, 2005**

(65) **Prior Publication Data**

US 2006/0061510 A1 Mar. 23, 2006

(30) **Foreign Application Priority Data**

Sep. 21, 2004 (JP) 2004-272676
Mar. 17, 2005 (JP) 2005-077213

(51) **Int. Cl.**
H01Q 13/00 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** **343/772; 343/700 MS**

(58) **Field of Classification Search** **343/700 MS,**
343/795, 845, 846, 772
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,259,407 B1 * 7/2001 Tran 343/700 MS
6,448,553 B1 9/2002 Itsuji et al. 250/306

6,753,746 B2 * 6/2004 Lin et al. 333/246
6,835,925 B2 12/2004 Itsuji et al. 250/234
7,183,977 B2 * 2/2007 Suh 343/700 MS
2006/0085159 A1 4/2006 Itsuji et al. 702/150
2007/0030115 A1 2/2007 Itsuji et al. 340/5.8

FOREIGN PATENT DOCUMENTS

JP 1-300701 12/1989

OTHER PUBLICATIONS

Takuya Taniguchi et al., "Antenna Development For Ultra Wideband Measurement Applications", Technical Report Of IEICE, WBS2003-12, MW2003-24 (May 2003), (w/abstract).
U.S. Appl. No. 10/587,262 (Takeaki Itsuji), pending.

* cited by examiner

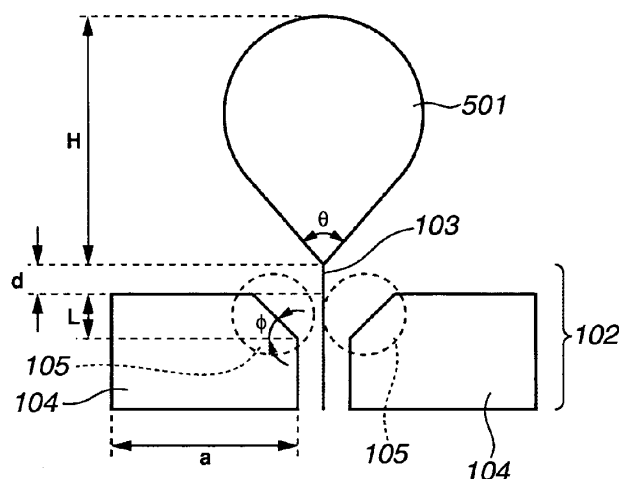
Primary Examiner—Shih-Chao Chen

(74) *Attorney, Agent, or Firm*—Fitzpatrick, Cella, Harper & Scinto

(57) **ABSTRACT**

An antenna apparatus including a dielectric substrate, a planar antenna element disposed on the substrate, and a waveguide for propagating electromagnetic waves to or from the planar antenna element. The waveguide includes at least a first conductor and a second conductor extending along each other. Near a connection portion formed between the first and second conductors and the planar antenna element, there is provided a taper region in which a distance between mutually-facing edge portions of the first conductor and the second conductor increases approximately monotonically toward the planar antenna element.

8 Claims, 20 Drawing Sheets



Acrobat 文件



US007358926B2

(12) **United States Patent**
Komoto et al.

(10) **Patent No.:** **US 7,358,926 B2**
(45) **Date of Patent:** **Apr. 15, 2008**

(54) **ANTENNA DEVICE**

(75) Inventors: **Shinzo Komoto**, Okayama (JP); **Hideto Sadamori**, Okayama (JP); **Setsuo Takesako**, Osaka (JP)

(73) Assignee: **Matsushita Electric Industrial Co., Ltd.**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 91 days.

(21) Appl. No.: **11/398,722**

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

(65) **Prior Publication Data**
US 2006/0227055 A1 Oct. 12, 2006

(30) **Foreign Application Priority Data**
Apr. 7, 2005 (JP) 2005-110615

(51) **Int. Cl.**
H01Q 9/30 (2006.01)

(52) **U.S. Cl.** **343/900; 343/702**

(58) **Field of Classification Search** **343/900, 343/702, 882, 889**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,909,653 A * 6/1999 Imura et al. 455/575.7
6,380,897 B1 * 4/2002 Shaw et al. 343/702

FOREIGN PATENT DOCUMENTS

JP 5-055817 3/1993

* cited by examiner

Primary Examiner—Trinh Dinh

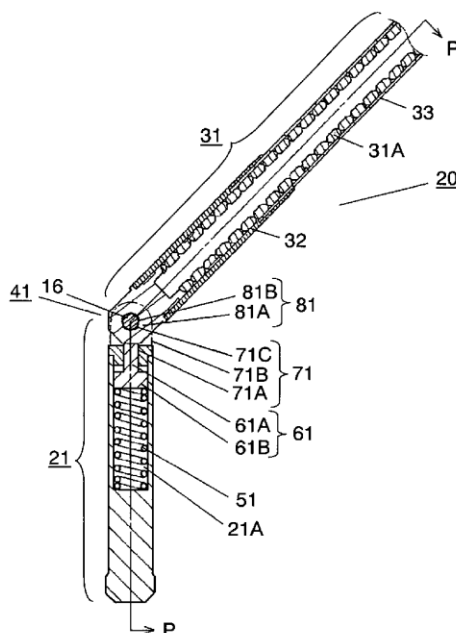
Assistant Examiner—Dieu Hien T Duong

(74) *Attorney, Agent, or Firm*—Wenderoth, Lind & Ponack, L.L.P.

(57) **ABSTRACT**

An antenna device is provided that is preferably used for various wireless devices such as television receivers and the like. An antenna rod can be stopped at a predetermined angle position via a hinge mechanism. The antenna device includes a hinge mechanism by which a biasing force of a coil spring stored in an antenna base causes an upper end of a circular-cylindrical projection of an abutting member to be abutted with an end face of a projection section of an intermediate member fixed to a lower part or antenna rod, thereby stopping the antenna rod at a predetermined angle position. When the antenna rod is moved to a different angle position, the abutting member has a biased movement in the downward direction. This can suppress the wear of the circular-cylindrical projection.

19 Claims, 8 Drawing Sheets



Acrobat 文件



US007362271B2

(12) **United States Patent**
Iwai et al.

(10) **Patent No.:** **US 7,362,271 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **ANTENNA APPARATUS, COMMUNICATION APPARATUS, AND ANTENNA APPARATUS DESIGNING METHOD**

(75) Inventors: **Hiroshi Iwai**, Kantano (JP); **Atsushi Yamamoto**, Osaka (JP); **Kenichi Yamada**, Yokohama (JP); **Shinji Kamaeguchi**, Kadoma (JP)

(73) Assignee: **Matsushita Electric Industrial Co., Ltd.**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/347,060**

(22) Filed: **Jan. 17, 2003**

(65) **Prior Publication Data**

US 2003/0179143 A1 Sep. 25, 2003

(30) **Foreign Application Priority Data**

Jan. 18, 2002 (JP) 2002-010572

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

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

(58) **Field of Classification Search** **343/700 MS, 343/895, 767**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,568,155 A * 10/1996 Tsunekawa et al. ... 343/700 MS
5,711,013 A * 1/1998 Collett et al. 455/558
5,945,954 A * 8/1999 Johnson 343/700 MS
6,025,802 A * 2/2000 Eggleston et al. ... 343/700 MS
6,025,816 A * 2/2000 Dent et al. 343/895

6,147,649 A * 11/2000 Ivrisimtzis et al. . 343/700 MS
6,411,826 B1 * 6/2002 Camp, Jr. 455/566
6,429,818 B1 * 8/2002 Johnson et al. 343/702
6,429,829 B1 * 8/2002 Hirai et al. 343/895
6,452,549 B1 * 9/2002 Lo 343/700 MS
6,459,916 B1 * 10/2002 Suguro 343/702
6,486,834 B2 * 11/2002 Tsai 343/702
6,498,586 B2 * 12/2002 Pankinaho 343/700 MS
6,535,167 B2 * 3/2003 Masuda et al. 343/700 MS
6,545,642 B1 * 4/2003 Doub et al. 343/700 MS
6,567,053 B1 * 5/2003 Yablonovitch et al. 343/700 MS
6,642,904 B2 * 11/2003 Yokoshima et al. 343/829
6,765,536 B2 * 7/2004 Phillips et al. 343/702

(Continued)

FOREIGN PATENT DOCUMENTS

EP 1 168 491 A1 1/2002

(Continued)

OTHER PUBLICATIONS

European Search Report for EP 03 00 0641, dated Jul. 19, 2004.

Primary Examiner—Wilson Lee

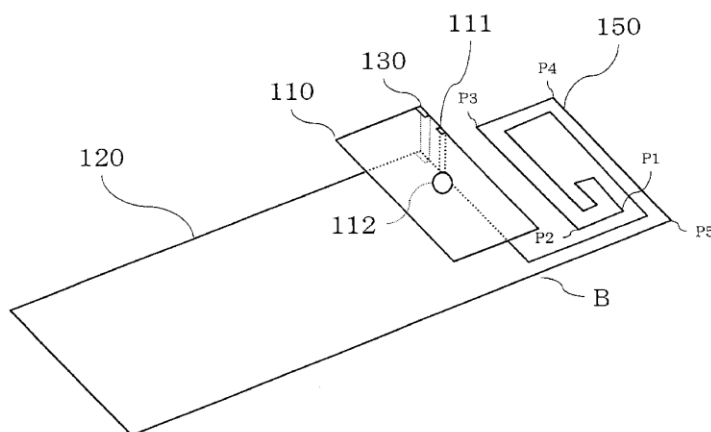
(74) *Attorney, Agent, or Firm*—RatnerPrestia

(57) **ABSTRACT**

For a PDC (Personal Digital Cellular) folding cellular phone that uses, for example, an 800-MHz band for communication, it is desirable to reduce a height of an antenna apparatus in order to reduce a thickness of the cellular phone.

An antenna apparatus including an antenna element having a feeding plate, a ground plate arranged opposite the antenna element, a short circuit section that connects the antenna element and the ground plate together, and one or more ground wires each connected to the ground plate at a predetermined position and each having a (1) linear shape or a (2) bent or curved shape.

3 Claims, 27 Drawing Sheets



Acrobat 文件



US007362272B2

(12) **United States Patent**
Chang et al.

(10) **Patent No.:** **US 7,362,272 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **CIRCULARLY POLARIZED ANTENNA**

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

(73) Assignees: **Tatung Company**, Taipei (TW);
Tatung University, Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 58 days.

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

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

(65) **Prior Publication Data**

US 2007/0096989 A1 May 3, 2007

(30) **Foreign Application Priority Data**

Nov. 1, 2005 (TW) 94138300 A

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

(52) **U.S. Cl.** **343/700 MS; 343/820; 343/732**

(58) **Field of Classification Search** **343/700 MS, 343/820, 732**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,953,781 A * 9/1960 Donnellan et al. 342/361

6,952,183 B2 * 10/2005 Yuanzhu 343/700 MS
7,026,998 B2 * 4/2006 Chang et al. 343/700 MS
7,138,949 B1 * 11/2006 Ryken et al. 343/700 MS

* cited by examiner

Primary Examiner—Trinh Dinh

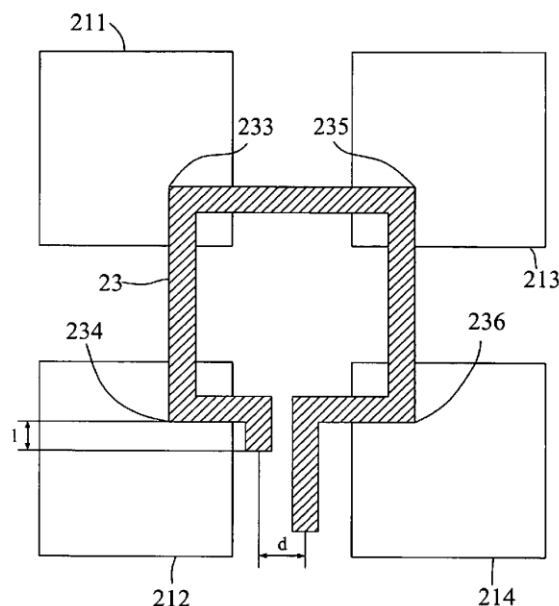
Assistant Examiner—Dieu Hien T Duong

(74) *Attorney, Agent, or Firm*—Bacon & Thomas, PLLC

(57) **ABSTRACT**

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 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.

5 Claims, 8 Drawing Sheets



Acrobat 文件



US007362273B2

(12) **United States Patent**
Sarehraz et al.

(10) **Patent No.:** **US 7,362,273 B2**

(45) **Date of Patent:** **Apr. 22, 2008**

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

(75) Inventors: **Mohammad 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)

(73) Assignee: **University of South Florida**, Tampa,
FL (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 4 days.

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

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

(65) **Prior Publication Data**

US 2007/0096990 A1 May 3, 2007

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.

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

(52) **U.S. CL.** **343/700 MS; 343/771**

(58) **Field of Classification Search** **343/700 MS,**
343/771, 772; 333/252; 455/81
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,841,308	A *	6/1989	Terakawa et al.	343/771
5,936,493	A *	8/1999	Hulderman et al.	333/252
7,142,165	B2 *	11/2006	Sanchez et al.	343/771
2001/0049266	A1 *	12/2001	Hayata et al.	455/81
2002/0067314	A1 *	6/2002	Takimoto et al.	343/713

* cited by examiner

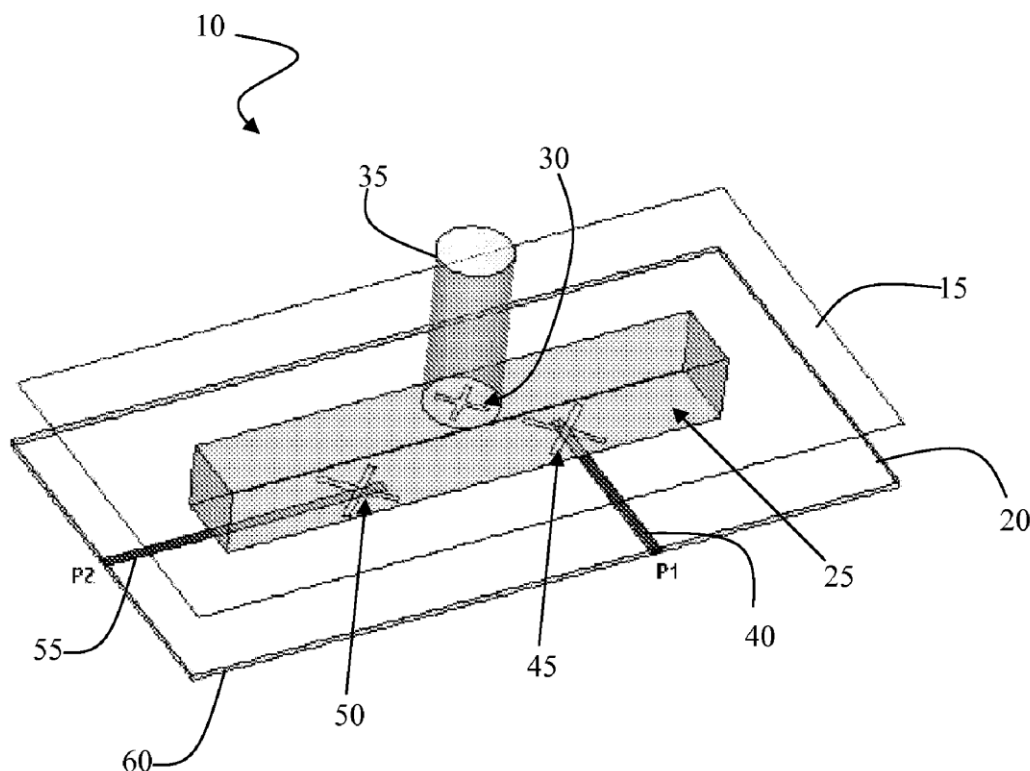
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—Moll L. Sauter; Smith &
Hopen, P.A.

(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.

15 Claims, 4 Drawing Sheets



Acrobat 文件



US007362274B1

(12) **United States Patent**
Lien

(10) **Patent No.:** **US 7,362,274 B1**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **COUPLED FEED-IN BUTTERFLY SHAPED LEFT/RIGHT HAND CIRCULARLY POLARIZED MICROSTRIP ANTENNA**

(76) Inventor: **Huan-Cheng Lien**, No. 13, Alley 36, Lane 457, Siping Rd., Douliou City, Yunlin County 640 (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/563,682**

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

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

(52) **U.S. Cl.** **343/700 MS; 343/750**

(58) **Field of Classification Search** **343/700 MS**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,274,273 B2 * 9/2007 Hirose et al. 333/134

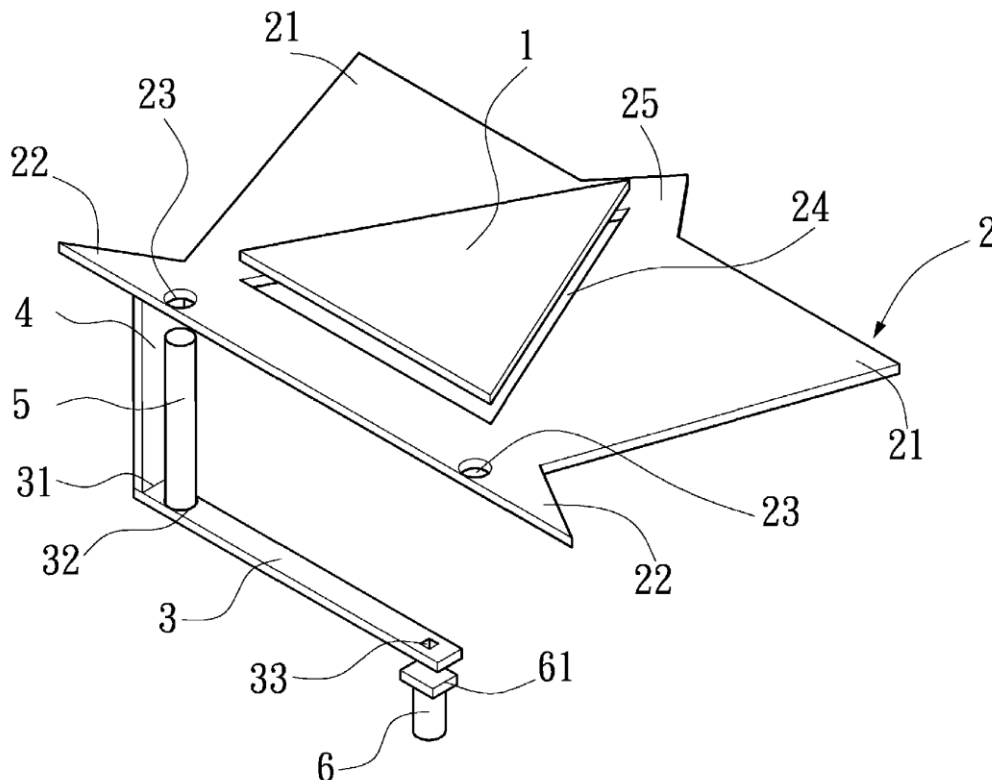
2007/0188384 A1 * 8/2007 Liu 343/700 MS
* cited by examiner

Primary Examiner—Trinh Vo Dinh

(57) **ABSTRACT**

A coupled feed-in butterfly shaped left/right hand circularly polarized microstrip antenna includes a delta resonator, a butterfly shaped radiator, an elongated rectangular feed line, a connecting sheet, a cylindrical conductor, a signal receiving adapter, and a feed-in terminal. All the above components are disposed in parallel in the three dimensional space. The butterfly shaped radiator has a cavity formed at the position corresponding to the delta resonator. A pair of front wing tips and a pair of rear wing tips are respectively formed symmetrically at the front corners and the rear corners of the butterfly shaped radiator. The elongated rectangular feed line is electrically connected to the butterfly shaped radiator with the connecting sheet, and the cylindrical conductor is facing to a circular hole formed on the butterfly shaped radiator in the manner able to adjust the impedance bandwidth. With this structure, a left/right hand circularly polarized microstrip antenna having broader impedance and axial ratio bandwidth can be obtained.

3 Claims, 9 Drawing Sheets



Acrobat 文件



US007362275B2

(12) **United States Patent**
Tu et al.

(10) **Patent No.:** **US 7,362,275 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **INTERNAL ANTENNA AND MOTHERBOARD ARCHITECTURE**

(75) Inventors: **Jerome Tu**, Saratoga, CA (US);
Weiping Dou, San Jose, CA (US)

(73) Assignee: **Palm, Inc.**, Sunnyvale, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 51 days.

6,806,835 B2	10/2004	Iwai et al.	
6,861,989 B2	3/2005	Morningstar et al.	
6,894,649 B2 *	5/2005	Ostervall	343/702
6,914,570 B2	7/2005	Asrani et al.	
7,099,632 B2 *	8/2006	Hong et al.	455/90.3
7,199,762 B2 *	4/2007	Liu et al.	343/702
2004/0046701 A1 *	3/2004	Huber et al.	343/702
2004/0253972 A1 *	12/2004	Iwai et al.	455/550.1
2007/0052589 A1 *	3/2007	Liu	343/700 MS

(21) Appl. No.: **11/355,159**

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

(65) **Prior Publication Data**

US 2007/0188391 A1 Aug. 16, 2007

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

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

(58) **Field of Classification Search** 343/702,
343/700 MS, 846, 848, 841; 455/90.3, 117,
455/575.5

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,011,519 A 1/2000 Sadler et al.

* cited by examiner

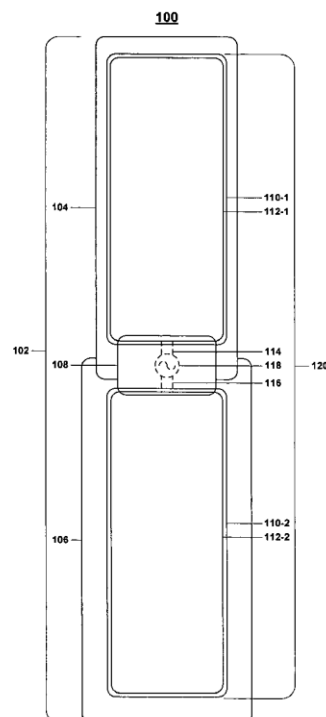
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—Kacvinsky LLC

(57) **ABSTRACT**

Various embodiments of an internal antenna and motherboard architecture are described. In one embodiment, a wireless device may include a housing enclosing a first motherboard and a second motherboard. The ground plane of the first motherboard may be coupled to the ground plane of the second motherboard within the housing. The first motherboard and the second motherboard may act as an internal antenna system for the wireless device. Other embodiments are described and claimed.

20 Claims, 13 Drawing Sheets



Acrobat 文件



US007362276B2

(12) **United States Patent**
Liao et al.

(10) **Patent No.:** **US 7,362,276 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **HAND-HELD COMMUNICATION DEVICE
WITH A ROTATABLE ANTENNA**

(75) Inventors: **Kuo-Chu Liao**, Taipei (TW);
Ching-Chung Tang, Taipei (TW);
Chung-Yuan Kuang, Taipei (TW)

(73) Assignee: **ASUSTeK Computer Inc.**, Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/527,673**

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

(65) **Prior Publication Data**

US 2007/0080875 A1 Apr. 12, 2007

(30) **Foreign Application Priority Data**

Sep. 29, 2005 (TW) 94133985 A

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

(52) **U.S. Cl.** 343/702; 343/882

(58) **Field of Classification Search** 343/702,
343/872, 881, 882

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2005/0035912 A1 *	2/2005	Takagi	343/702
2006/0017626 A1 *	1/2006	Kannan et al.	343/702
2006/0022878 A1 *	2/2006	Seo et al.	343/702

* cited by examiner

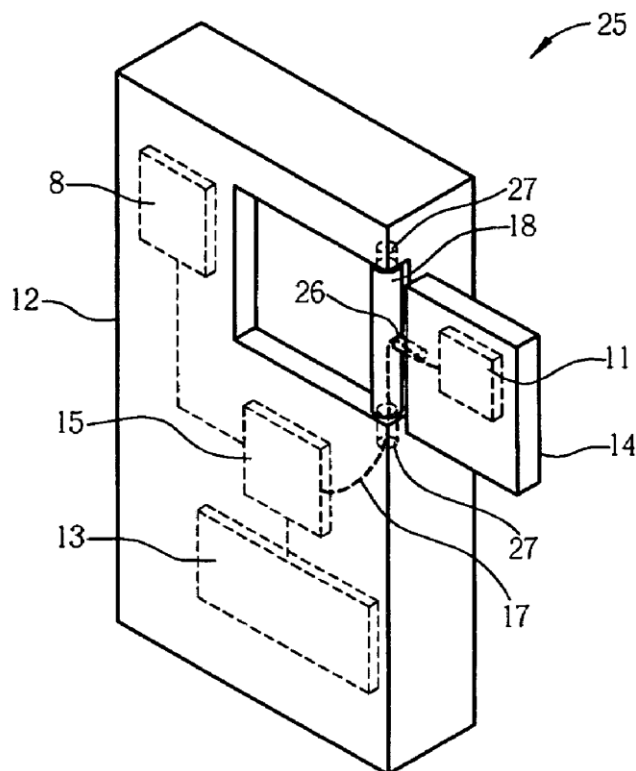
Primary Examiner—Tho Phan

(74) *Attorney, Agent, or Firm*—Birch, Stewart, Kolasch & Birch, LLP

(57) **ABSTRACT**

Hand-held communication device includes a first housing, a rotation axle connected to the first housing in a rotatable manner, a second housing, an antenna installed inside the second housing, and a rod with one end connected to the rotation axle in a rotatable manner and the other end connected to the second housing. The antenna can be positioned to optimize radio frequency signal reception by rotating the rotation axle with respect to the first housing and rotating the rod with respect to the rotation axle.

8 Claims, 8 Drawing Sheets



Acrobat 文件



US007362277B2

(12) **United States Patent**
Su

(10) **Patent No.:** **US 7,362,277 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **MULTI-BAND ANTENNA**

(56) **References Cited**

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

U.S. PATENT DOCUMENTS

(73) Assignee: **Hon Hai Precision Ind. Co., Ltd.**,
Taipei Hsien (TW)

6,812,892	B2 *	11/2004	Tai et al.	343/700 MS
6,861,986	B2	3/2005	Fang	
6,864,854	B2 *	3/2005	Dai et al.	343/846
2005/0073462	A1 *	4/2005	Lin et al.	343/702
2005/0168384	A1 *	8/2005	Wang et al.	343/700 MS
2005/0259024	A1 *	11/2005	Hung et al.	343/770

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

* cited by examiner

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

Primary Examiner—Hoang V Nguyen

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

(74) *Attorney, Agent, or Firm*—Wei Te Chung

(65) **Prior Publication Data**

US 2007/0109200 A1 May 17, 2007

(57) **ABSTRACT**

(30) **Foreign Application Priority Data**

Nov. 14, 2005 (TW) 94139847 A

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.

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

H01Q 1/38 (2006.01)

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

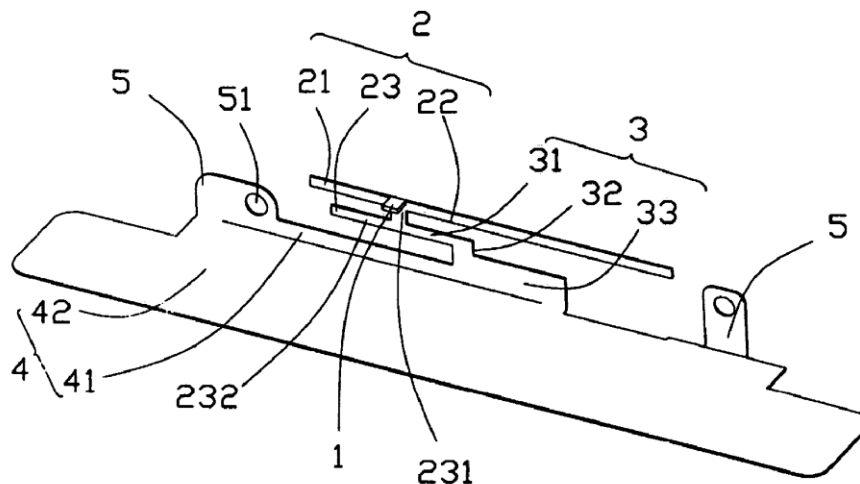
(58) **Field of Classification Search** **343/700 MS,**
343/702, 846, 829, 830

See application file for complete search history.

19 Claims, 2 Drawing Sheets

10

~



Acrobat 文件



US007362280B2

(12) **United States Patent**
Shtrom et al.

(10) **Patent No.:** **US 7,362,280 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **SYSTEM AND METHOD FOR A MINIMIZED ANTENNA APPARATUS WITH SELECTABLE ELEMENTS**

5,220,340 A 6/1993 Shafai
5,754,145 A 5/1998 Evans
5,767,809 A 6/1998 Chuang et al.

(75) Inventors: **Victor Shtrom**, Sunnyvale, CA (US);
William S. Kish, Saratoga, CA (US)

(Continued)

FOREIGN PATENT DOCUMENTS

(73) Assignee: **Ruckus Wireless, Inc.**, Sunnyvale, CA (US)

EP 0534612 3/1993

(Continued)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 106 days.

OTHER PUBLICATIONS

U.S. Appl. No. 11/022,080, Victor Shtrom, Circuit Board Having a Peripheral Antenna Apparatus with Selectable Antenna Elements, filed Dec. 23, 2004.

(21) Appl. No.: **11/041,145**

(Continued)

(22) Filed: **Jan. 21, 2005**

Primary Examiner—Shih-Chao Chen

(65) **Prior Publication Data**

(74) *Attorney, Agent, or Firm*—Carr & Ferrell LLP

US 2006/0038735 A1 Feb. 23, 2006

(57) **ABSTRACT**

Related U.S. Application Data

(60) Provisional application No. 60/602,711, filed on Aug. 18, 2004, provisional application No. 60/603,157, filed on Aug. 18, 2004.

A system and method for a wireless link to a remote receiver includes a communication device for generating RF and an antenna apparatus for transmitting the RF. The antenna apparatus comprises a plurality of substantially coplanar modified dipoles. Each modified dipole provides gain with respect to isotropic and a horizontally polarized directional radiation pattern. Further, each modified dipole has one or more loading structures configured to decrease the footprint (i.e., the physical dimension) of the modified dipole and minimize the size of the antenna apparatus. The modified dipoles may be electrically switched to result in various radiation patterns. With multiple of the plurality of modified dipoles active, the antenna apparatus may form an omnidirectional horizontally polarized radiation pattern. One or more directors may be included to concentrate the radiation pattern. The antenna apparatus may be conformally mounted to a housing containing the communication device and the antenna apparatus.

(51) **Int. Cl.**
H01Q 9/28 (2006.01)
H01Q 1/48 (2006.01)

(52) **U.S. Cl.** **343/795; 343/846**

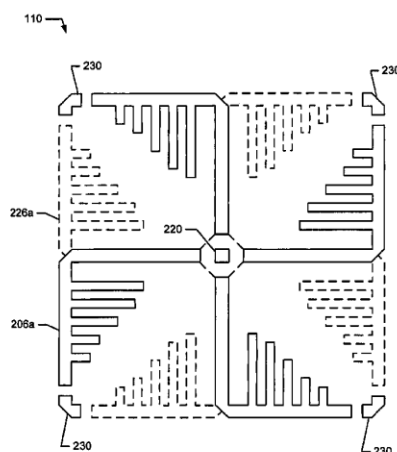
(58) **Field of Classification Search** **343/700 MS, 343/793, 795, 846, 876**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,176,356 A 11/1979 Foster et al.
4,193,077 A 3/1980 Greenberg et al.
4,305,052 A 12/1981 Baril et al.
4,814,777 A 3/1989 Monser
5,173,711 A 12/1992 Takeuchi et al.

24 Claims, 5 Drawing Sheets



Acrobat 文件



US007362281B2

(12) **United States Patent**
Huang et al.

(10) **Patent No.:** **US 7,362,281 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

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

(75) Inventors: **Chi-Fang Huang**, Taipei (TW);
Jing-Qing Zhan, Taipei (TW)

(73) Assignees: **Tatung Company**, Taipei (TW);
Tatung University, Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/557,500**

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

(65) **Prior Publication Data**
US 2008/0001838 A1 Jan. 3, 2008

(30) **Foreign Application Priority Data**
Jun. 29, 2006 (TW) 95123484 A

(51) **Int. Cl.**
H01Q 9/28 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** **343/795; 343/700 MS**

(58) **Field of Classification Search** 343/700 MS,
343/795, 829
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,989,794 B2 *	1/2006	Tran	343/702
7,015,868 B2 *	3/2006	Puente Baliarde et al.	343/800
7,026,997 B2 *	4/2006	Rahola	343/700 MS
7,113,141 B2 *	9/2006	Almog et al.	343/795
7,148,850 B2 *	12/2006	Puente Baliarda et al.	343/700 MS
7,202,822 B2 *	4/2007	Baliarda et al.	343/700 MS

* cited by examiner

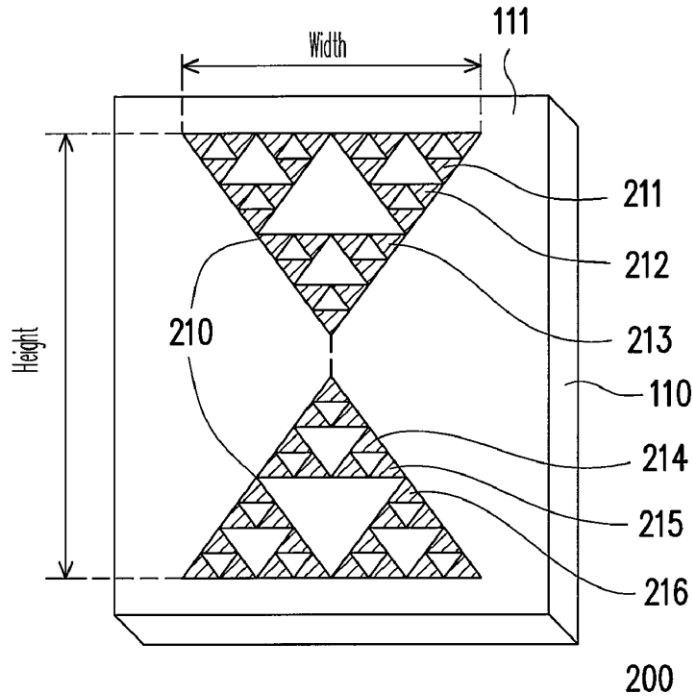
Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—Jianq Chyun IP Office

(57) **ABSTRACT**

A planar antenna for a radio frequency identification tag which receives or transmits an electromagnetic signal is provided. The planar antenna comprises a dielectric slab and a fractal dipole antenna. The height of the fractal dipole antenna is 0.3 to 0.7 times of the half wavelength of the electromagnetic signal, and the width of the fractal dipole antenna is 0.7 to 1.1 times of the half wavelength of the electromagnetic signal. The planar antenna achieves miniaturization and a good matching by utilizing the optimal size of the fractal dipole antenna.

16 Claims, 3 Drawing Sheets



Acrobat 文件



US007362283B2

(12) **United States Patent**
Quintero Illera et al.

(10) **Patent No.:** **US 7,362,283 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **MULTILEVEL AND SPACE-FILLING
GROUND-PLANES FOR MINIATURE AND
MULTIBAND ANTENNAS**

(75) Inventors: **Ramiro Quintero Illera**, Barcelona
(ES); **Carles Puente Baliarda**,
Barcelona (ES)

(73) Assignee: **Fractus, S.A.**, Barcelona (ES)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/797,732**

(22) Filed: **Mar. 10, 2004**

(65) **Prior Publication Data**

US 2004/0217916 A1 Nov. 4, 2004

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

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

(58) **Field of Classification Search** **343/700 MS,**
343/846, 848, 828, 829, 702
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,696,438 A 10/1972 Ingerson
5,262,792 A 11/1993 Egashira
5,497,167 A * 3/1996 Luoma 343/828
5,646,637 A 7/1997 Miller
5,703,600 A 12/1997 Burrell et al.
6,002,367 A 12/1999 Engblom et al.
6,140,975 A * 10/2000 Cohen 343/846
6,218,992 B1 4/2001 Sadler
6,271,798 B1 * 8/2001 Endo et al. 343/713
6,285,326 B1 9/2001 Diximus et al.

6,359,589 B1 * 3/2002 Bae 343/700 MS
6,377,217 B1 4/2002 Zhu et al.
6,388,620 B1 5/2002 Bhattacharyya
6,400,330 B1 * 6/2002 Maruyama et al. 343/788
6,462,710 B1 * 10/2002 Carson et al. 343/700 MS
6,466,176 B1 10/2002 Maoz et al.
6,717,494 B2 * 4/2004 Kikuchi et al. 333/243
6,885,880 B1 * 4/2005 Ali 455/575.7
2001/0033250 A1 10/2001 Keilen et al.
2002/0177416 A1 11/2002 Boyle
2004/0058723 A1 3/2004 Mikkola et al.
2004/0061648 A1 * 4/2004 Pros et al. 343/700 MS

FOREIGN PATENT DOCUMENTS

CA 2416437 A1 7/2001
EP 0519508 A1 6/1992

(Continued)

OTHER PUBLICATIONS

Manteuffel, Dirk et al., "Investigation on Integrated Antennas for GSM Mobile Phones", IMST GmbH, 4 pages, Millennium Conference on Antennas and Propagation, ESA, AP 2000, Davos, Switzerland, Apr. 2000.

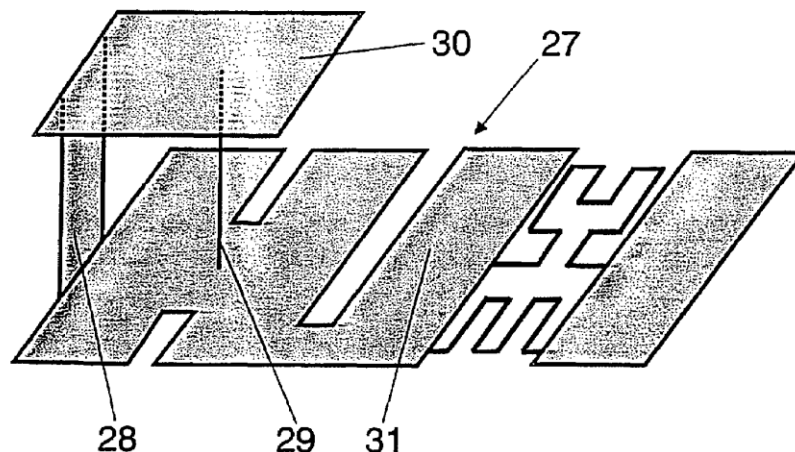
(Continued)

Primary Examiner—Hoanganh Le
(74) *Attorney, Agent, or Firm*—Winstead PC

(57) **ABSTRACT**

An antenna system includes one or more conductive elements acting as radiating elements, and a multilevel or space-filling ground-plane, wherein said ground-plane has a particular geometry which affects the operating characteristics of the antenna. The return loss, bandwidth, gain, radiation efficiency, and frequency performance can be controlled through multilevel and space-filling ground-plane design. Also, said ground-plane can be reduced compared to those of antennas with solid ground-planes.

36 Claims, 19 Drawing Sheets



Acrobat 文件



US007362285B2

(12) **United States Patent**
Webb et al.

(10) **Patent No.:** **US 7,362,285 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

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

5,340,954 A 8/1994 Hoffman et al.
5,736,965 A 4/1998 Mosebrook et al.
5,818,128 A 10/1998 Hoffman et al.
5,838,226 A 11/1998 Houggy et al.
5,848,054 A 12/1998 Mosebrook et al.
5,905,442 A 5/1999 Mosebrook et al.

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

(Continued)

FOREIGN PATENT DOCUMENTS

(73) Assignee: **Lutron Electronics Co., Ltd.**,
Coopersburg, PA (US)

DE 88 00 025 U1 4/1988

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 276 days.

(Continued)

Primary Examiner—Trinh Vo Dinh

(74) Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb &
Soffen, LLP

(21) Appl. No.: **10/873,033**

(22) Filed: **Jun. 21, 2004**

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2005/0280598 A1 Dec. 22, 2005

(51) **Int. Cl.**

H01Q 7/00 (2006.01)

(52) **U.S. Cl.** **343/866**; 343/867; 343/841;
235/451

(58) **Field of Classification Search** 343/700 MS,
343/702, 741, 742, 866, 867, 870; 235/451
See application file for complete search history.

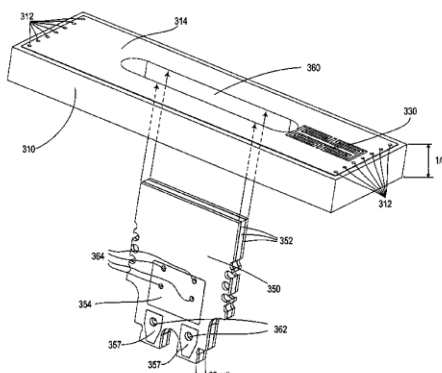
(56) **References Cited**

U.S. PATENT DOCUMENTS

3,049,711 A * 8/1962 Hooper 343/702
3,550,137 A 12/1970 Kuecken 343/744
3,588,905 A 6/1971 Dunlavy 343/856
4,864,588 A 9/1989 Simpson et al.
4,932,037 A 6/1990 Simpson et al.
4,995,053 A 2/1991 Simpson et al.
5,225,847 A 7/1993 Roberts et al. 343/745
5,239,205 A 8/1993 Hoffman et al.

A compact antenna for use in a device for controlling the power delivered to an electric load and operable to transmit or receive radio frequency signals at a specified frequency is presented. The antenna comprises a first loop of conductive material having a capacitance and an inductance forming a circuit being resonant at the specified frequency, and a second loop of conductive material having two ends adapted to be electrically coupled to an electronic circuit. The second loop is substantially only magnetically coupled to the first loop and is electrically isolated from the first loop. In a first embodiment of the antenna, the first and second loops are formed on respective first and second printed circuit boards, which allow for a small, low-cost antenna that is easy to manufacture and maximizes efficiency. When the antenna is installed in a load control device, such as a dimmer, the first loop of the antenna is mounted on an outer surface of the device. The second loop of the antenna may be at a high-voltage potential such as line voltage.

18 Claims, 13 Drawing Sheets



Acrobat 文件



US007362286B2

(12) **United States Patent**
Fang

(10) **Patent No.:** **US 7,362,286 B2**
(45) **Date of Patent:** **Apr. 22, 2008**

(54) **DUAL BAND ANTENNA DEVICE, WIRELESS COMMUNICATION DEVICE AND RADIO FREQUENCY CHIP USING THE SAME**

(75) Inventor: **Shyh-Tirng Fang**, Tainan (TW)

(73) Assignee: **Mediatek Inc.**, Hsin-Chu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 270 days.

(21) Appl. No.: **11/236,199**

(22) Filed: **Sep. 27, 2005**

(65) **Prior Publication Data**

US 2006/0082506 A1 Apr. 20, 2006

(30) **Foreign Application Priority Data**

Oct. 14, 2004 (TW) 93131132 A

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

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

(58) **Field of Classification Search** **343/895, 343/700 MS, 702**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,111,545 A * 8/2000 Saari 343/702

6,124,831 A * 9/2000 Rutkowski et al. ... 343/700 MS
6,130,651 A 10/2000 Yanagisawa et al. 343/895
6,295,029 B1 9/2001 Chen et al. 343/700
6,320,545 B1 * 11/2001 Nagumo et al. 343/700 MS
6,337,663 B1 1/2002 Chi-Ming 343/702
6,504,511 B2 1/2003 Andersson 343/702
6,535,170 B2 3/2003 Sawamura et al. 343/702
6,750,821 B2 6/2004 Fang et al. 343/700
6,963,307 B2 * 11/2005 Mohamadi 343/700 MS

FOREIGN PATENT DOCUMENTS

TW 507399 11/2001
TW 518804 11/2001
TW 519779 2/2003

* cited by examiner

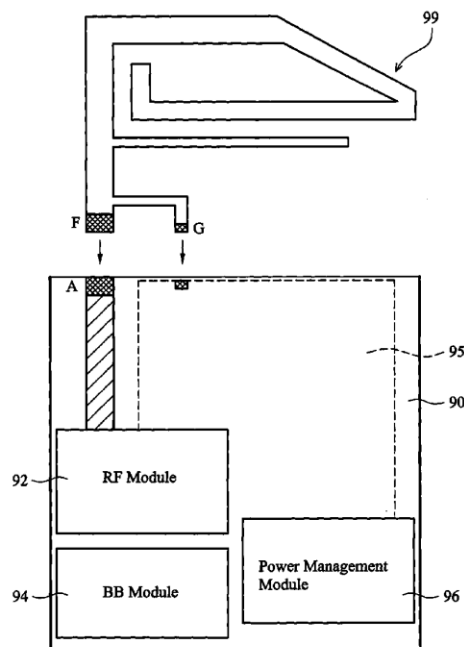
Primary Examiner—Hoanganh Le

(74) *Attorney, Agent, or Firm*—Thomas, Kayden, Horstemeyer & Risley

(57) **ABSTRACT**

A dual band antenna device operable in a first frequency band and a second frequency band is disclosed. The device comprises a first radiation body and a second radiation body. The first radiation body forms a single path with at least two bend portions. A portion of the second radiation body is parallel to a portion of the first radiation body in a specific distance. In addition, a wireless communication device and radio frequency chip having a built in dual band antenna device are also disclosed.

44 Claims, 10 Drawing Sheets



Acrobat 文件



US007365684B2

(12) **United States Patent**
Liang et al.

(10) **Patent No.:** **US 7,365,684 B2**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **ANTENNA HAVING A FILTER AND A SIGNAL FEED-IN POINT**

(75) Inventors: **Jia-Haur Liang**, Kaohsiung (TW);
Ting-Yi Tsai, Taipei (TW)

(73) Assignee: **Accton Technology Corporation**,
Hsinchu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 64 days.

(21) Appl. No.: **11/255,657**

(22) Filed: **Oct. 21, 2005**

(65) **Prior Publication Data**

US 2006/0273975 A1 Dec. 7, 2006

(30) **Foreign Application Priority Data**

Jun. 1, 2005 (TW) 94118077 A

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

(52) **U.S. Cl.** **343/700 MS; 343/795; 343/909**

(58) **Field of Classification Search** **343/700 MS; 343/795, 909**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,896,563 A * 4/1999 Kawanami et al. 455/82

6,466,172 B1 * 10/2002 Ryken et al. 343/700 MS
6,529,092 B2 * 3/2003 Fuke et al. 333/99 S
6,603,373 B2 * 8/2003 Tsujiguchi 333/204
6,630,907 B1 * 10/2003 Ryken et al. 343/700 MS
6,954,177 B2 * 10/2005 Channabasappa
et al. 343/700 MS
7,102,586 B2 * 9/2006 Liang et al. 343/795
7,138,949 B1 * 11/2006 Ryken et al. 343/700 MS
7,205,894 B1 * 4/2007 Savage 340/568.6
2003/0197653 A1 * 10/2003 Barber et al. 343/742

* cited by examiner

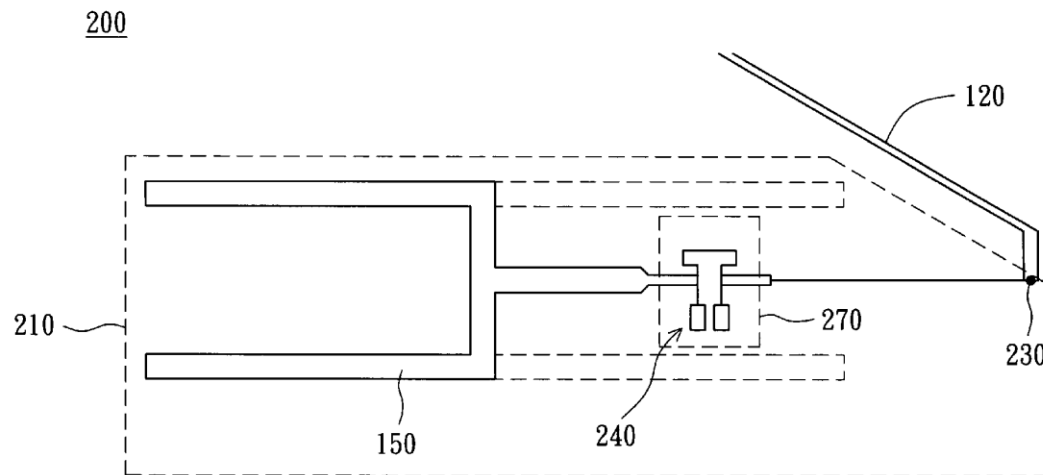
Primary Examiner—Tan Ho

(74) *Attorney, Agent, or Firm*—Thomas, Kayden,
Horstemeyer & Risley

(57) **ABSTRACT**

An antenna structure used in an electronic device includes a signal transmission line and an antenna unit. The signal transmission line is electrically coupled to the electronic device. The antenna unit includes a signal feed-in point, a filter, and a radiation part. The signal feed-in point is electrically coupled to the electronic device via the signal transmission line. The filter has a first end electrically coupled to the signal feed-in point. The radiation part is electrically coupled to a second end of the filter.

21 Claims, 4 Drawing Sheets



Acrobat 文件



US007365685B2

(12) **United States Patent**
Takeuchi et al.

(10) **Patent No.:** **US 7,365,685 B2**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **ANTENNA DEVICE**

(75) Inventors: **Shoichi Takeuchi**, Aiko-gun (JP);
Hiroyuki Hayakawa, Aiko-gun (JP);
Koichi Osada, Aiko-gun (JP); **Ryuta**
Sonoda, Aiko-gun (JP)

(73) Assignee: **Asahi Glass Company, Limited**, Tokyo
(JP)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 92 days.

(21) Appl. No.: **11/256,050**

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

(65) **Prior Publication Data**

US 2006/0109178 A1 May 25, 2006

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2004/
005880, filed on Apr. 23, 2004.

(30) **Foreign Application Priority Data**

Apr. 24, 2003 (JP) 2003-119944
Aug. 1, 2003 (JP) 2003-285224
Mar. 9, 2004 (JP) 2004-065647

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

(52) **U.S. Cl.** **343/700 MS; 343/713**

(58) **Field of Classification Search** 343/700 MS,
343/711, 713, 846

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,994,820 A 2/1991 Suzuki et al.
5,355,143 A * 10/1994 Zurcher et al. 343/700 MS
5,757,327 A * 5/1998 Yajima et al. 343/713
5,760,744 A 6/1998 Sauer

5,880,694 A * 3/1999 Wang et al. 343/700 MS
5,977,915 A * 11/1999 Bergstedt et al. 343/700 MS
6,164,984 A 12/2000 Schreiner
6,307,515 B1 10/2001 Sauer et al.
6,342,856 B1 1/2002 Nakano et al.
6,593,887 B2 7/2003 Luk et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 1 091 444 A2 4/2001

(Continued)

OTHER PUBLICATIONS

Girish Kumar, et al., Broadband Microstrip Antennas, Artech
House, Inc., 2003, pp. 4 to 7, 60 to 63 and 130-139.

(Continued)

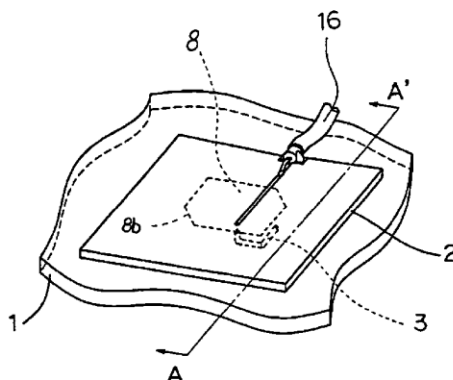
Primary Examiner—Tan Ho

(74) *Attorney, Agent, or Firm*—Oblon, Spivak, McClelland,
Maier & Neustadt, P.C.

(57) **ABSTRACT**

A antenna device, which includes a first dielectric substrate
having a patch conductor disposed thereon; a second dielec-
tric substrate having a grounding conductor disposed on a
confronting substrate surface confronting the patch conduc-
tor; and a conductor for electromagnetic coupling, extending
from the confronting substrate surface of the second dielec-
tric substrate toward the first dielectric substrate, is pro-
vided. The antenna device is small and is capable of being
mounted to a windowpane for a vehicle since the conductor
for electromagnetic coupling is not connected to the ground-
ing conductor with respect to a direct current and since the
conductor for electromagnetic coupling and the patch con-
ductor are electromagnetically coupled each other.

67 Claims, 14 Drawing Sheets



Acrobat 文件



US007365687B2

(12) **United States Patent**
Borleske et al.

(10) **Patent No.:** **US 7,365,687 B2**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **ANTENNA WITH DISK RADIATOR USED IN
AUTOMATIC METER READING (AMR)
DEVICE**

(75) Inventors: **Andrew J. Borleske**, Garner, NC (US);
Mark R. Wolski, Cedarburg, WI (US);
Charles Cunningham, Jr., Raleigh, NC
(US); **Garry M. Loy**, Raleigh, NC
(US)

(73) Assignee: **Elster Electricity, LLC**, Raleigh, NC
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/408,565**

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

(65) **Prior Publication Data**
US 2007/0247380 A1 Oct. 25, 2007

Related U.S. Application Data
(60) Provisional application No. 60/673,862, filed on Apr.
22, 2005.

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

(52) **U.S. Cl.** **343/700 MS; 343/719**
(58) **Field of Classification Search** **343/719,**
343/700 MS, 846, 872; 340/870.02, 870.01
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,298,894 A * 3/1994 Cerny et al. 340/870.02
6,177,883 B1 * 1/2001 Jennetti et al. 340/870.02
6,300,907 B1 * 10/2001 Lazar et al. 343/700 MS
6,812,902 B2 * 11/2004 Rossman et al. 343/725
6,819,292 B2 * 11/2004 Winter 343/702
2007/0018849 A1 * 1/2007 Salser, Jr. 340/870.02

* cited by examiner

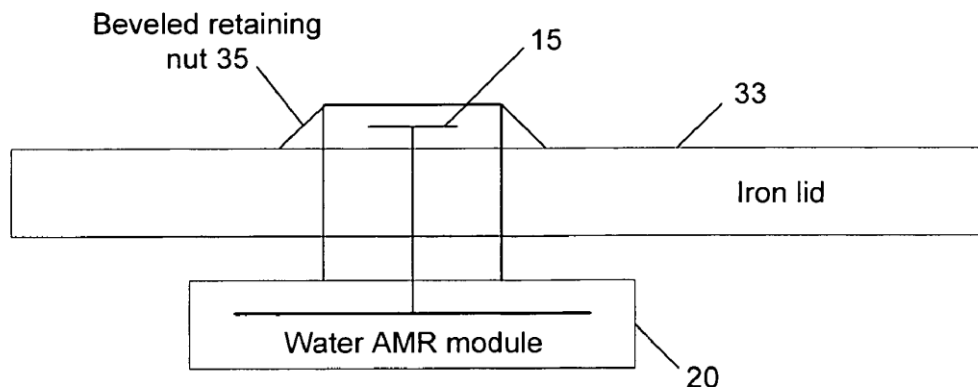
Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—Woodcock & Washburn LLP

(57) **ABSTRACT**

An antenna for use in an automatic meter reading (AMR) module comprises a pin and a radiator. The radiator may be a disk radiator for example, that comprises an opening which may receive the pin. Desirably, the pin is affixed to the radiator at one end, and is disposed on a ground plane at the other end. The antenna may be a top loaded short monopole antenna, for example. Additionally, the antenna may be used in a module for a water meter. The pin and disk radiator may be stamped from a single sheet of material.

17 Claims, 7 Drawing Sheets



Acrobat 文件



US007365688B2

(12) **United States Patent**
Tseng et al.

(10) **Patent No.:** **US 7,365,688 B2**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **FLAT MINIATURIZED ANTENNA OF A WIRELESS COMMUNICATION DEVICE**

(56) **References Cited**

U.S. PATENT DOCUMENTS

(75) Inventors: **Kuan-Hsueh Tseng**, Taipei Hsien (TW); **Chih-Lung Chen**, Taipei Hsien (TW)

5,986,609 A *	11/1999	Spall	343/702
6,392,599 B1 *	5/2002	Ganeshmoorthy et al.	343/700 MS
6,946,997 B2 *	9/2005	Yuanzhu	343/700 MS
7,106,253 B2 *	9/2006	Yuanzhu	343/700 MS
2002/0024474 A1 *	2/2002	Chen	343/792

(73) Assignee: **Wistron NeWeb Corporation**, Hsi-Chih, Taipei Hsien (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

* cited by examiner

(21) Appl. No.: **11/464,208**

Primary Examiner—Hoang V Nguyen

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

(74) *Attorney, Agent, or Firm*—Winston Hsu

(65) **Prior Publication Data**

US 2008/0018537 A1 Jan. 24, 2008

(57) **ABSTRACT**

(30) **Foreign Application Priority Data**

Jul. 20, 2006 (TW) 95126493 A

A flat miniaturized antenna of a wireless communication device includes a baseboard, a sleeve conductor formed on the baseboard and coupled to system ground, a meander-shaped conductor formed inside the sleeve conductor and isolated from the sleeve conductor, having a wide end and a narrow end, a feed-in end formed on the wide end of meander-shaped conductor, for transmitting wireless signals to the wireless communication device, and a branch conductor coupled to the meander-shaped conductor.

(51) **Int. Cl.**

H01Q 1/38 (2006.01)

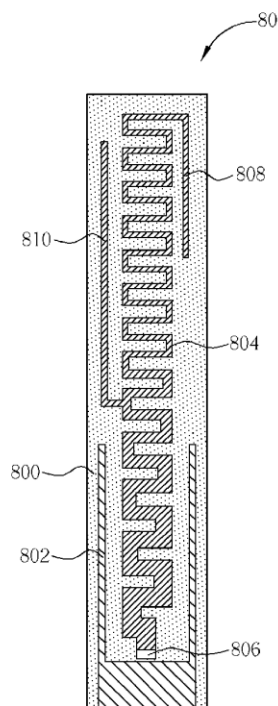
H01Q 1/36 (2006.01)

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

(58) **Field of Classification Search** 343/700 MS, 343/702, 895, 792, 846

See application file for complete search history.

13 Claims, 14 Drawing Sheets



Acrobat 文件



US007365689B2

(12) **United States Patent**
Lee

(10) **Patent No.:** **US 7,365,689 B2**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **METAL INVERTED F ANTENNA**

(75) Inventor: **Chang-Jung Lee**, Longtan Township,
Taoyuan County (TW)

(73) Assignee: **Arcadyan Technology Corporation**,
Hsinchu (TW)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/473,268**

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

(65) **Prior Publication Data**

US 2007/0296636 A1 Dec. 27, 2007

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

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

(58) **Field of Classification Search** **343/702,**
343/700 MS, 829, 846

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,597,317 B2 * 7/2003 Talvitie 343/700 MS

6,876,329 B2 * 4/2005 Milosavljevic 343/700 MS
6,911,945 B2 * 6/2005 Korva 343/702
6,985,108 B2 * 1/2006 Mikkola et al. 343/700 MS
2005/0264455 A1 * 12/2005 Talvitie et al. 343/702

* cited by examiner

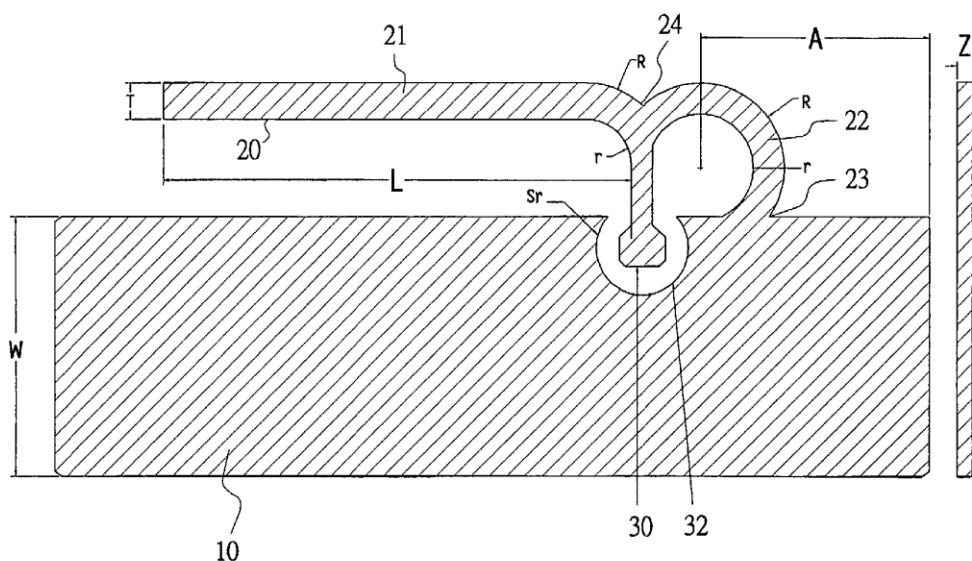
Primary Examiner—Tho Phan

(74) *Attorney, Agent, or Firm*—Birch, Stewart, Kolasch &
Birch, LLP

(57) **ABSTRACT**

The present invention discloses an antenna structure comprising a ground plane; a radiator having a curved shape portion and a rectangular portion connected to the ground plane via a first end of the curved shape portion and grounded by a ground point of the ground plane, the rectangular portion being connected to a second end of the curved shape portion; and a feed point projected into a groove within the ground plane and connected to the second end of the curved shape portion of the radiator; and wherein the ground plane is extended over the rectangular portion of the radiator.

14 Claims, 6 Drawing Sheets



Acrobat 文件



US007365692B1

(12) **United States Patent**
Su et al.

(10) **Patent No.:** **US 7,365,692 B1**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **WIDEBAND OMNIDIRECTIONAL ANTENNA
FOR PLUG AND PLAY DEVICE**

(75) Inventors: **Saou-Wen Su**, Taipei (TW);
Horng-Ming Tai, Taipei (TW)

(73) Assignee: **Lite-On Technology Corp.**, Neihu,
Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/670,428**

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

(30) **Foreign Application Priority Data**

Oct. 11, 2006 (TW) 95137404 A

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

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

(58) **Field of Classification Search** **343/702,**
343/700 MS

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2001/0015705 A1* 8/2001 Scordilis 343/845

2005/0024268 A1* 2/2005 McKinzie et al. ... 343/700 MS
2005/0062670 A1 3/2005 Suh et al.
2005/0243009 A1 11/2005 Wong et al.
2007/0194997 A1* 8/2007 Nakanishi et al. 343/702

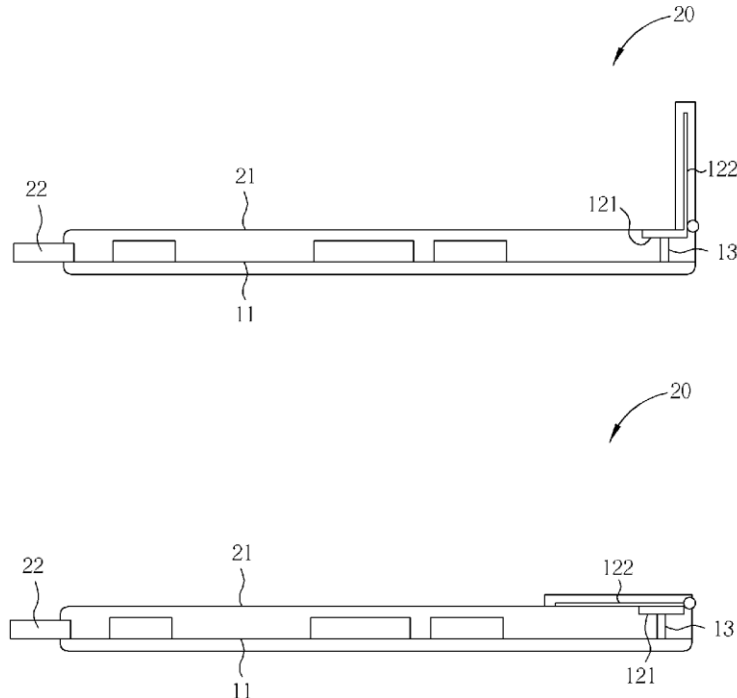
* cited by examiner

Primary Examiner—Trinh Dinh
Assistant Examiner—Dieu Hien T Duong
(74) *Attorney, Agent, or Firm*—Winston Hsu

(57) **ABSTRACT**

A wideband omnidirectional antenna for a plug and play device includes a system ground plane, a radiating element, a feeding element. The radiating element is installed above an edge of the system ground plane and comprises a first sub-radiating element and a second sub-radiating element. The first sub-radiating element is parallel to the system ground plane. The second sub-radiating element is electronically connected to an edge of the first sub-radiating element in a foldable manner. The second sub-radiating element is approximately perpendicular to the first sub-radiating element and extends in an upright direction above the system ground plane when in use condition, and is approximately parallel to the first sub-radiating element and extends horizontally above the system ground plane when not in use condition. The feeding element is electronically connected to a signal source and is used for transmitting signals outputted from the signal source to the radiating element.

8 Claims, 13 Drawing Sheets



Acrobat 文件



US007365693B2

(12) **United States Patent**
Hoshiai et al.

(10) **Patent No.:** **US 7,365,693 B2**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **ANTENNA DEVICE, ELECTRONIC APPARATUS AND VEHICLE USING THE SAME ANTENNA DEVICE**

(75) Inventors: **Akihiro Hoshiai**, Osaka (JP); **Susumu Fukushima**, Osaka (JP); **Yosuke Wada**, Nara (JP)

(73) Assignee: **Matsushita Electric Industrial Co., Ltd.**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 3 days.

(21) Appl. No.: **11/528,038**

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

(65) **Prior Publication Data**

US 2007/0069964 A1 Mar. 29, 2007

(30) **Foreign Application Priority Data**

Sep. 29, 2005 (JP) 2005-284337
Feb. 7, 2006 (JP) 2006-029363

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

(52) **U.S. Cl.** **343/711; 343/713; 343/700 MS**

(58) **Field of Classification Search** **343/711, 343/713**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,418,543 A * 5/1995 Bolton 343/713

FOREIGN PATENT DOCUMENTS

JP 2005-130292 5/2005

* cited by examiner

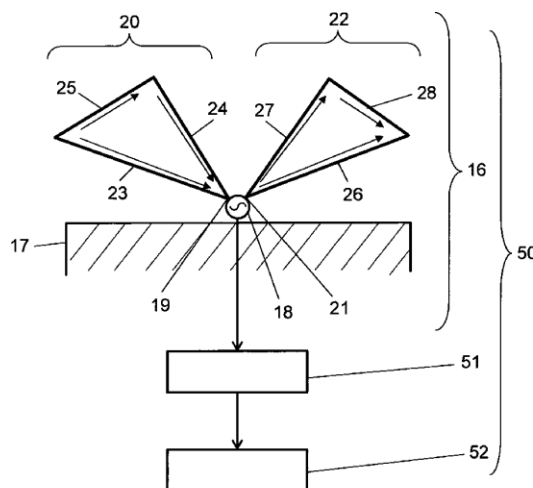
Primary Examiner—Trinh Vo Dinh

(74) *Attorney, Agent, or Firm*—RatnerPrestia

(57) **ABSTRACT**

An antenna device includes a grounding subject, a feeder insulated from the grounding subject, a first conductor shaping like substantially a looped triangle and coupled to the feeder at a first feeder top, and a second conductor symmetric to the first conductor with respect to a phantom line extending through the feeder and coupled to the feeder at a second feeder top. The first feeder top is placed closest to the grounding subject among other elements of the first conductor, and the second feeder top is placed closest to the grounding subject among other elements of the second conductor. The foregoing structure allows a high electrical field section of a first side of the first conductor and that of a first side of the second conductor to leave further away from the grounding subject.

9 Claims, 6 Drawing Sheets



Acrobat 文件



US007365698B2

(12) **United States Patent**
Dwyer et al.

(10) **Patent No.:** **US 7,365,698 B2**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **DIPOLE ANTENNA**

(75) Inventors: **Bradley Lance Dwyer**, Forest Hill (AU); **Warwick Thomas Armstrong**, Warrandyte (AU); **Robert Andrew Daly**, Chirnside Park (AU); **Mark Anthony Mezzapica**, Mosman (AU)

(73) Assignee: **RF Industries Pty Ltd**, North Rocks, South Wales (AU)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/465,159**

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

(65) **Prior Publication Data**

US 2007/0040758 A1 Feb. 22, 2007

(30) **Foreign Application Priority Data**

Aug. 19, 2005 (AU) 2005904524

(51) **Int. Cl.**
H01Q 9/16 (2006.01)

(52) **U.S. Cl.** **343/792; 343/795**

(58) **Field of Classification Search** 343/795, 343/700 MS, 792, 790, 812, 813
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,198,831 A 3/1993 Burrell et al.
6,339,408 B1 1/2002 Edvardsson et al.

6,809,697 B2 * 10/2004 Churng-Jou et al. 343/792
7,164,389 B1 * 1/2007 Platt 343/790
2006/0232493 A1 * 10/2006 Huang et al. 343/895

FOREIGN PATENT DOCUMENTS

EP 0274592 7/1988
EP 0521511 1/1993
WO WO2004/093243 10/2004

* cited by examiner

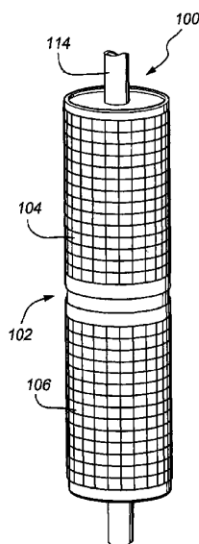
Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—Baker & Daniels LLP

(57) **ABSTRACT**

A method of manufacturing a dipole antenna comprises the steps of forming first and second radiating elements on the surface of a flexible substrate, the radiating elements including respective feed points for making operative electrical contact with a feed line including corresponding first and second feed conductors. The radiating elements are arranged on the substrate such that, in use, an input impedance of the dipole antenna is substantially matched to a characteristic impedance of the feed line over a selected frequency band. The flexible substrate is then formed into a substantially cylindrical shape. The resulting antenna comprises an integral dipole antenna member having radiating elements disposed on a surface of a substantially cylindrical substrate. The antenna avoids the need to separately manufacture the radiating elements, and subsequently to assemble the elements to form a dipole antenna. The antenna is simple to construct, has a relatively low number of mechanical and electrical joints and contacts, and may provide improved mechanical stability and electrical performance as compared with prior art antennas.

20 Claims, 8 Drawing Sheets



Acrobat 文件



US007365702B2

(12) **United States Patent**
Liu

(10) **Patent No.:** **US 7,365,702 B2**
(45) **Date of Patent:** **Apr. 29, 2008**

(54) **ANTENNA DEVICE**

(75) Inventor: **I-Ru Liu**, Taipei (TW)

(73) Assignee: **Accton Technology Corporation**,
Hsinchu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 75 days.

(21) Appl. No.: **11/352,997**

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

(65) **Prior Publication Data**

US 2007/0188395 A1 Aug. 16, 2007

(51) **Int. Cl.**

H01Q 15/14 (2006.01)

H01Q 21/12 (2006.01)

H01Q 21/00 (2006.01)

H01Q 19/10 (2006.01)

H01Q 19/30 (2006.01)

(52) **U.S. Cl.** **343/912**; 343/815; 343/817;
343/818; 343/819; 343/834; 343/835

(58) **Field of Classification Search** 343/912,
343/815, 817, 818, 819, 834, 835

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,774,859 B2 * 8/2004 Schantz et al. 343/742

* cited by examiner

Primary Examiner—Hoang V Nguyen

Assistant Examiner—Robert Karacsony

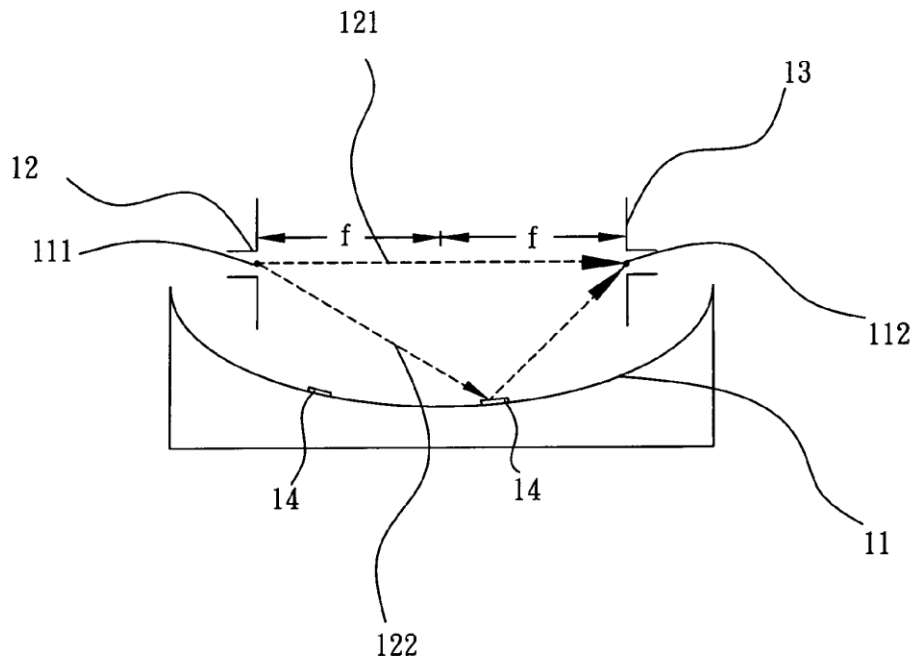
(74) *Attorney, Agent, or Firm*—Birch, Stewart, Kolasch & Birch, LLP

(57) **ABSTRACT**

An antenna device includes a first elliptic reflective surface, a first antenna and a second antenna. The first elliptic reflective surface has a first focus and a second focus. The first antenna is disposed on the first focus, and the second antenna is disposed on the second focus. The first antenna transmits a first signal and a second signal, and the second antenna receives the first signal and the second signal. The first signal is transmitted directly to the second antenna from the first antenna. The second signal is reflected by the first elliptic reflective surface and transmitted to the second antenna.

21 Claims, 5 Drawing Sheets

1



Acrobat 文件