



US007728773B2

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

(10) **Patent No.:** **US 7,728,773 B2**
(45) **Date of Patent:** **Jun. 1, 2010**

(54) **MULTI-BAND ANTENNA**

(75) Inventors: **Sae-Won Oh**, Incheon (KR);
Seung-Yong Lee, Pucheon-si (KR)

(73) Assignee: **Ace Antenna Corp.**, Incheon (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 186 days.

(21) Appl. No.: **12/090,045**

(22) PCT Filed: **Oct. 11, 2006**

(86) PCT No.: **PCT/KR2006/004083**

§ 371 (c)(1),
(2), (4) Date: **Apr. 11, 2008**

(87) PCT Pub. No.: **WO2007/043800**

PCT Pub. Date: **Apr. 19, 2007**

(65) **Prior Publication Data**

US 2008/0252532 A1 Oct. 16, 2008

(30) **Foreign Application Priority Data**

Oct. 11, 2005 (KR) 10-2005-0095578
Oct. 11, 2005 (KR) 10-2005-0095583

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

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

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

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,021,810 A * 5/1977 Urpo et al. 343/731

6,512,493 B2 * 1/2003 Park et al. 343/895
6,822,609 B2 * 11/2004 Mendolia et al. 343/700 MS
7,095,372 B2 * 8/2006 Soler Castany
et al. 343/700 MS
7,518,554 B2 * 4/2009 Bateman et al. 343/700 MS

FOREIGN PATENT DOCUMENTS

EP 1372213 12/2003
KR 1020040095689 11/2004
WO WO 02/065582 8/2002

OTHER PUBLICATIONS

International Search Report for PCT/KR2006/004083, mailed Jan. 18, 2007.

* cited by examiner

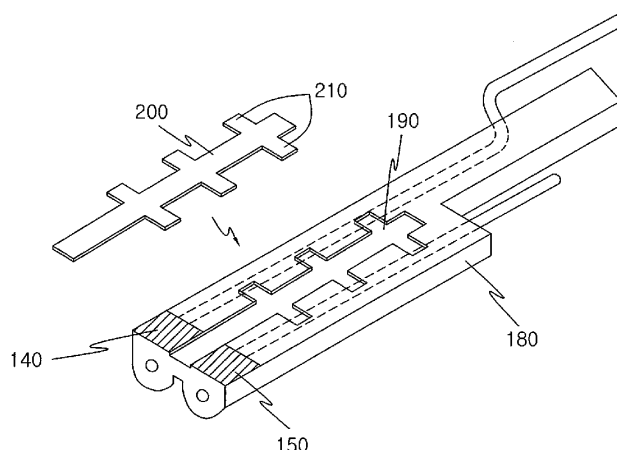
Primary Examiner—Tho G Phan

(74) Attorney, Agent, or Firm—LRK Patent Law Firm

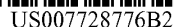
(57) **ABSTRACT**

The present invention relates to a multi-band antenna and, more particularly, to a sub multi-band antenna, in which a planer conducting part, which has a plurality of protruding portions, is inserted into a depression, which is formed on the surface of a body part formed through injection molding using a mold having a specific shape to surround first and second wire members, and the fitting depression of a fastening part, which is formed through the cutting or die casting of a metal material, and to a sub-band built-in chip antenna, in which sub radiation patterns having a predetermined length are formed on the interior surface of a body part, which is formed through injection molding using a dielectric material or is formed of a layered substrate a dielectric material.

13 Claims, 8 Drawing Sheets



Acrobat 文件



(10) **Patent No.:** US 7,728,776 B2
(45) **Date of Patent:** Jun. 1, 2010

- ## (54) DUAL-BAND ANTENNA

- (75) Inventors: **Ching-Chi Lin**, Taipei Hsien (TW); **Jia-Hung Su**, Taipei Hsien (TW); **Kai Shih**, Taipei Hsien (TW); **Yu-Yuan Wu**, Taipei Hsien (TW)

- (73) Assignee: **Cheng Uei Precision Industry Co., Ltd.**, 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 188 days.

- (21) Appl. No.: 11/858,520

- (22) Filed: **Sep. 20, 2007**

- (65) **Prior Publication Data**

- US 2009/0079643 A1 Mar. 26, 2009

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

- (52) **U.S. Cl.** 343/702; 343/745

- (58) **Field of Classification Search** 343/702,
343/745

- See application file for complete search history.

- (56)
- References Cited**

- U.S. PATENT DOCUMENTS

- 2005/0259024 A1* 11/2005 Hung et al. 343/770

- | | | | | |
|--------------|-----|---------|------------------------|----------|
| 2006/0187121 | A1* | 8/2006 | Chang et al. | 343/7 MS |
| 2007/0241976 | A1* | 10/2007 | Montgomery et al. | 343/745 |
| 2008/0150829 | A1* | 6/2008 | Lin et al. | 343/860 |

* cited by examiner

Primary Examiner—Douglas W Owens

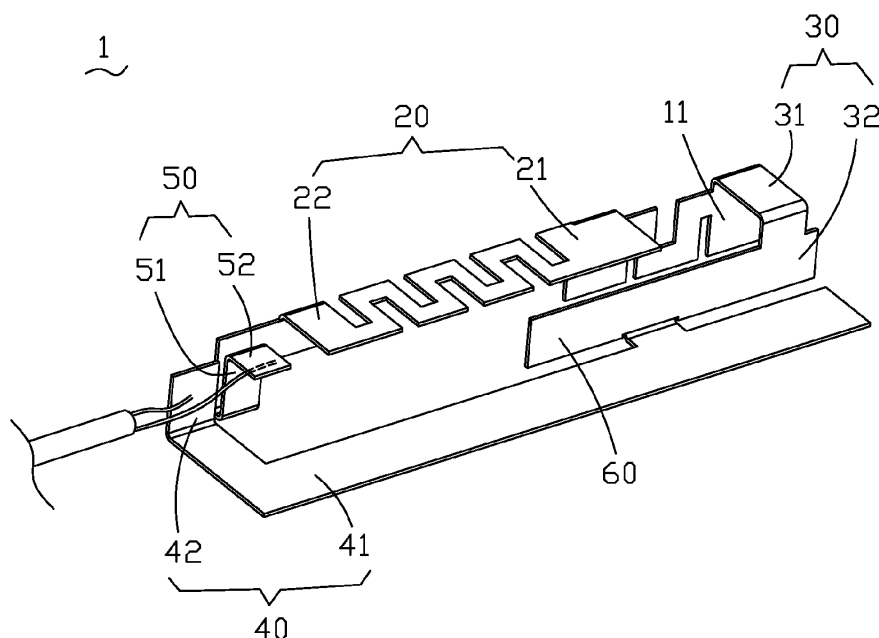
Assistant Examiner—Kyana R Robinson

- (74) *Attorney, Agent, or Firm*—WPAT, P.C.; Anthony King

- (57) **ABSTRACT**

A dual-band antenna has a first meandering portion, a second meandering portion and a connection portion defining two ends. The first meandering portion and the second meandering portion have different length. One end of the first meandering portion connects one end of the second meandering portion. The other end of the first meandering portion connects one end of the connection portion. The other end of the second meandering portion connects a feeding portion. The other end of the connection portion connects a ground portion. The feeding portion, the second meandering portion, the first meandering portion and the connection portion obtain an electrical resonance corresponding to a first frequency range. The second meandering portion obtains an electrical resonance corresponding to a second frequency range.

10 Claims, 3 Drawing Sheets



Acrobat 文件



US007728777B2

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

(10) **Patent No.:** **US 7,728,777 B2**
(45) **Date of Patent:** **Jun. 1, 2010**

(54) **ANTENNA DEVICE FOR RADIO
TELEPHONES**

(75) Inventors: **Dietmar Gapski**, Bocholt (DE);
Stephan Herrmann, Bottrop (DE)

(73) Assignee: **Gigaset Communications GmbH**,
Munich (DE)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 219 days.

(21) Appl. No.: **11/922,677**

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

(86) PCT No.: **PCT/EP2006/061555**

§ 371 (c)(1),

(2), (4) Date: **Dec. 21, 2007**

(87) PCT Pub. No.: **WO2007/000360**

PCT Pub. Date: **Jan. 4, 2007**

(65) **Prior Publication Data**

US 2009/0231209 A1 Sep. 17, 2009

(30) **Foreign Application Priority Data**

Jun. 29, 2005 (DE) 10 2005 030 384

(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, 846, 873

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,737,323	A	4/1998	Lansdowne	
6,101,371	A	8/2000	Barber et al.	
6,504,511	B2	1/2003	Andersson	
6,957,080	B2 *	10/2005	Guetre et al.	455/552.1
2002/0030627	A1 *	3/2002	Cassel	343/702
2004/0150569	A1 *	8/2004	Proctor et al.	343/702

(Continued)

FOREIGN PATENT DOCUMENTS

DE 20112076 U1 10/2001

(Continued)

OTHER PUBLICATIONS

English translations of Abstracts for WO 2004/066444 A1, DE 101
24 766 C1, WO 01/80355 A1, DE 102 59 839 A1, EP 0 986 106 A1,
DE 696 22 451 T2, DE 201 12 076 U1 and FR 2 748 161.

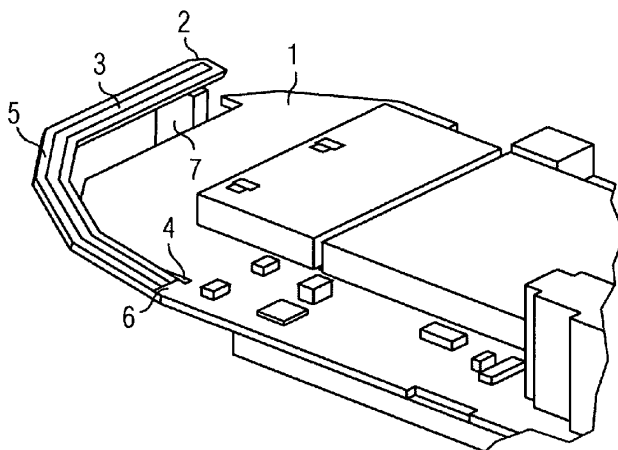
Primary Examiner—HoangAnh T Le

(74) *Attorney, Agent, or Firm*—Staas & Halsey LLP

(57) **ABSTRACT**

An antenna device for radio telephone based on a printed
circuit board antenna or a strip conductor antenna and simple
to produce and has a high efficiency, but nevertheless ensures
that the user of the radio telephone is less exposed to the
effects of electromagnetic radiation and the parasitic interference
of the telephone caused by the user is reduced. To this
end, the strip conductor carrier is cut around strip conductors
used as the antenna up to a section used for the connection of
the strip conductor used as the antenna to the other strip
conductors of the strip conductor carrier. Furthermore, at
least when the strip conductor carrier is mounted in the radio
telephone, the cut-out regions of the strip conductor carrier,
carrying the strip conductor used as the antenna is deflected
out of the plane of the other regions of the strip conductor
carrier.

6 Claims, 2 Drawing Sheets



Acrobat 文件



US007728778B2

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

(10) **Patent No.:** **US 7,728,778 B2**
(45) **Date of Patent:** **Jun. 1, 2010**

(54) **PORTABLE ELECTRONIC DEVICE WITH
RECEIVER AND ANTENNA**

(75) Inventors: **Mei-Tsu Tsao**, Tu-Cheng (TW);
Hung-Chuan Wen, Tu-Cheng (TW)

(73) Assignee: **Chi Mei Communication Systems,
Inc.**, Tu-Cheng, Taipei County (TW)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 165 days.

(21) Appl. No.: **11/952,967**

(22) Filed: **Dec. 7, 2007**

(65) **Prior Publication Data**
US 2009/0021433 A1 Jan. 22, 2009

(30) **Foreign Application Priority Data**
Jul. 18, 2007 (CN) 2007 1 0075207

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

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

(58) **Field of Classification Search** 343/702,
343/700 MS; 455/575.5, 557
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,961,022 B1 * 11/2005 Tay et al. 343/702
7,408,514 B2 * 8/2008 Go 343/702
2006/0089184 A1 * 4/2006 Kim et al. 455/575.5
* cited by examiner

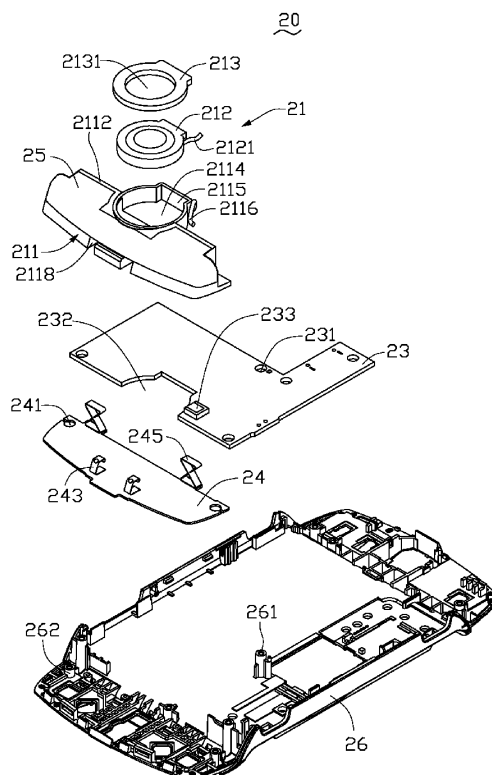
Primary Examiner—HoangAnh T Le

(74) *Attorney, Agent, or Firm*—Jeffrey T. Knapp

(57) **ABSTRACT**

A portable electronic device (22) includes a receiver (21), an antenna (25) attached to the receiver, an antenna circuit board (24) electrically connected with the antenna, and a container (26). The receiver has a resonance cavity (2113) defined therein. The antenna circuit board is fixed to the receiver and is used for obturating the resonance cavity. The container is used for receiving the antenna circuit board and the receiver therein.

14 Claims, 3 Drawing Sheets



Acrobat 文件



US007728780B2

(12) **United States Patent**
Ishida

(10) **Patent No.:** **US 7,728,780 B2**
(45) **Date of Patent:** **Jun. 1, 2010**

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

7,236,070 B2 * 6/2007 Ajioka et al. 333/247
7,372,408 B2 * 5/2008 Gaucher et al. 343/700 MS
7,583,237 B2 * 9/2009 Noro et al. 343/860

(75) Inventor: **Masaaki Ishida**, Kawasaki (JP)

FOREIGN PATENT DOCUMENTS

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

JP 2006-33076 2/2006

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 205 days.

* cited by examiner

(21) Appl. No.: **12/129,087**

Primary Examiner—Hoang V Nguyen
(74) *Attorney, Agent, or Firm*—Oblon, Spivak, McClelland, Maier & Neustadt, L.L.P.

(22) Filed: **May 29, 2008**

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2008/0297422 A1 Dec. 4, 2008

(30) **Foreign Application Priority Data**

May 30, 2007 (JP) 2007-144030

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

H01Q 1/48 (2006.01)

(52) **U.S. Cl.** **343/702**; 343/846

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

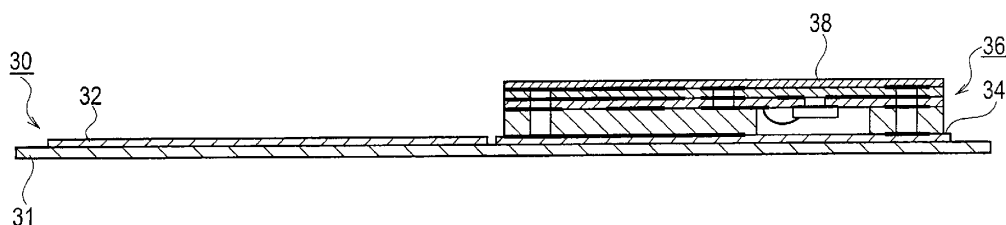
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,753,815 B2 * 6/2004 Okubora et al. 343/700 MS
6,985,111 B2 * 1/2006 Hara et al. 343/702

9 Claims, 9 Drawing Sheets



Acrobat 文件



US007728783B2

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

(10) **Patent No.:** **US 7,728,783 B2**
(45) **Date of Patent:** **Jun. 1, 2010**

(54) **ANTENNA STRUCTURE**

(75) Inventors: **Jia-Hung Su**, Tu-Cheng (TW);
Ching-Chi Lin, Tu-Cheng (TW);
Hung-Jen Chen, Tu-Cheng (TW); **Kai Shih**, Tu-Cheng (TW); **Yu-Yuan Wu**, Tu-Cheng (TW)

(73) Assignee: **Cheng Uei Precision Industry Co., Ltd.**, 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 202 days.

(21) Appl. No.: **11/828,934**

(22) Filed: **Jul. 26, 2007**

(65) **Prior Publication Data**

US 2009/0027275 A1 Jan. 29, 2009

(51) **Int. Cl.**
H01Q 1/48 (2006.01)
H01Q 9/42 (2006.01)

(52) **U.S. Cl.** **343/846; 343/829**

(58) **Field of Classification Search** **343/700 MS, 343/702, 829, 846, 828, 848**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,650,294 B2 * 11/2003 Ying et al. 343/700 MS

* cited by examiner

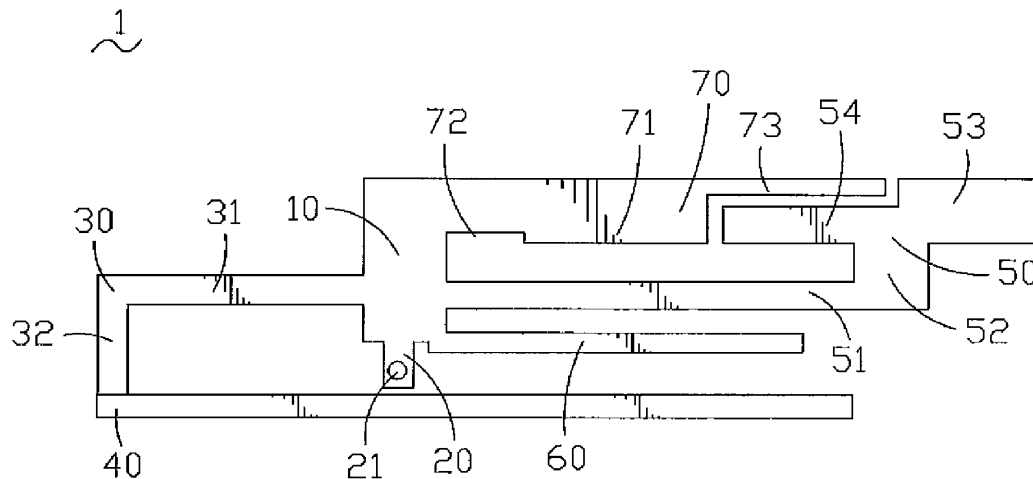
Primary Examiner—Michael C Wimer

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

(57) **ABSTRACT**

An antenna structure includes a connection portion. A feed portion connecting to the connection portion defines a feed point thereon. An inductance portion extends from the connection portion, and a free end of the inductance portion connects to a ground end. A capacitance portion that is in a long narrow strip shape extends from the connection portion and is parallel with and adjacent to the ground end. And radiating portions connect to the connection portion respectively. The antenna structure employs the inductance portion, the capacitance portion and the ground end to simulate a LC parallel connection to substitute for an inductor and a capacitor. Therefore, the antenna structure achieves an aim of adjusting a resonance frequency and an impedance matching without the inductor and the capacitor, simplifying the design of the antenna structure, decreasing the manufacture cost and attaining a good performance.

15 Claims, 2 Drawing Sheets



Acrobat 文件



US007728785B2

(12) **United States Patent**
Ozden

(10) **Patent No.:** **US 7,728,785 B2**
(45) **Date of Patent:** **Jun. 1, 2010**

(54) **LOOP ANTENNA WITH A PARASITIC RADIATOR**

(75) Inventor: **Sinasi Ozden**, Copenhagen (DK)

(73) Assignee: **Nokia Corporation**, Espoo (FI)

(*) 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.: **11/350,155**

(22) Filed: **Feb. 7, 2006**

(65) **Prior Publication Data**

US 2007/0182658 A1 Aug. 9, 2007

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

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

(58) **Field of Classification Search**
343/702, 748, 895, 700 MS; 455/575.1,
455/575.7

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,605,104	A *	9/1971	Weston et al.	343/837
4,644,364	A *	2/1987	Parks	343/825
4,866,453	A *	9/1989	Nagy et al.	343/712
5,198,826	A *	3/1993	Ito	343/726
5,406,297	A *	4/1995	Caswell et al.	343/741
5,627,550	A	5/1997	Sanad	343/700
5,680,144	A	10/1997	Sanad	343/700
5,767,813	A *	6/1998	Verma et al.	343/744
6,028,567	A	2/2000	Lahti	343/895
6,034,651	A *	3/2000	Enguent	343/895
6,236,368	B1 *	5/2001	Johson	343/702
6,249,255	B1	6/2001	Eggleston	343/702
6,480,155	B1	11/2002	Eggleston	343/700
6,707,428	B2	3/2004	Gram	343/700
6,765,536	B2	7/2004	Phillips et al.	343/702
6,885,342	B2 *	4/2005	Saegrov et al.	343/700 MS
6,917,335	B2 *	7/2005	Kadambi et al.	343/700 MS

6,917,339	B2	7/2005	Li et al.	343/702
7,119,748	B2	10/2006	Autti	343/702
7,298,338	B2	11/2007	Vesterinen	343/702

(Continued)

FOREIGN PATENT DOCUMENTS

EP 0923-158 A2 6/1999

(Continued)

OTHER PUBLICATIONS

Virga, K.L., et al., "Low-Profile Enhanced-Bandwidth PIFA Antennas for Wireless Communications Packaging", IEEE Transactions on Microwave Theory and Techniques, vol. 45, No. 10, Oct. 1997, pp. 1879-1888.

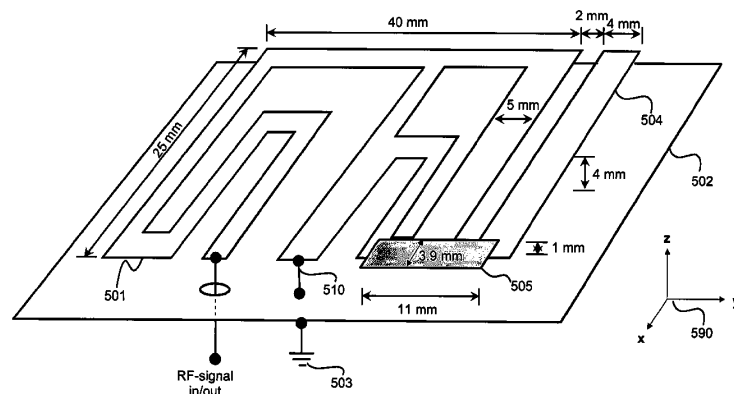
Primary Examiner—Huedung Mancuso

(74) Attorney, Agent, or Firm—Harrington & Smith

(57) **ABSTRACT**

It is an objective of the present invention to provide an antenna construction that allows the thickness of an antenna structure be lower than that of planar antennas according to prior art without sacrificing the radiation efficiency at the desired RF-bands as 900 MHz GSM and 1800 MHz/1900 MHz DCS/PCS. A further object of the invention is to provide an antenna construction that is insensitive to changes in positions of electrically conductive objects in the vicinity. The objectives of the invention are achieved by a loop antenna structure equipped with an electrically conductive parasitic radiator that is electro-magnetically coupled with the antenna loop. Performance at the DCS/PCS bands can be further improved by using an electrically conductive tuner element that provides a stronger electromagnetic coupling between the antenna loop and the parasitic radiator.

22 Claims, 9 Drawing Sheets



Acrobat 文件



US007729721B2

(12) **United States Patent**
Kim

(10) **Patent No.:** **US 7,729,721 B2**
(45) **Date of Patent:** **Jun. 1, 2010**

(54) **ANTENNA INTEGRATED SPEAKER ASSEMBLY, MANUFACTURING METHOD THEREOF, AND WIRELESS COMMUNICATION DEVICE HAVING THE SAME**

(75) Inventor: **Hyun-Jun Kim**, Gyeonggi-Do (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 879 days.

(21) Appl. No.: **11/521,450**

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

(65) **Prior Publication Data**
US 2007/0066274 A1 Mar. 22, 2007

(30) **Foreign Application Priority Data**
Sep. 16, 2005 (KR) 10-2005-0087119
Sep. 16, 2005 (KR) 10-2005-0087120

(51) **Int. Cl.**
H04M 1/00 (2006.01)
H04B 1/08 (2006.01)

(52) **U.S. Cl.** **455/550.1; 455/350; 455/575.7**

(58) **Field of Classification Search** 455/550.1,
455/557, 90.1, 90.3, 575.1, 575.3, 575.7,
455/350, 569.1, 562.1, 274, 347
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,167,130 B2 * 1/2007 Hayes 343/702
7,376,447 B2 * 5/2008 Yoshida et al. 455/569.1

* cited by examiner

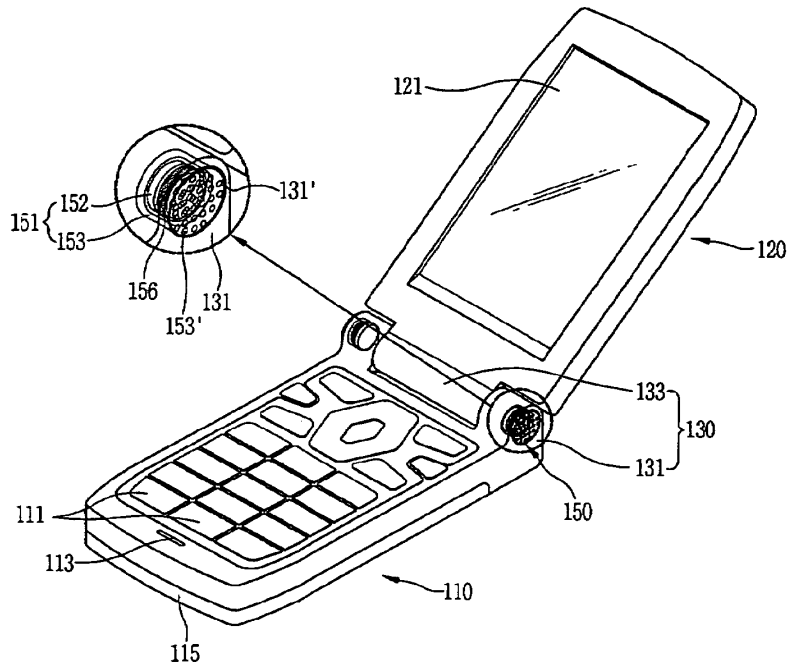
Primary Examiner—Eugene Yun

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

(57) **ABSTRACT**

An antenna integrated speaker assembly, a manufacturing method thereof, and a wireless communication device having the same. The antenna integrated speaker assembly comprises a speaker unit for outputting sound corresponding to an electric signal of a controller; and an antenna unit formed at the speaker unit, for transceiving an electric signal by an interwork with the controller. Accordingly, an installation space for an antenna and a speaker is minimized.

15 Claims, 6 Drawing Sheets



Acrobat 文件



US007733271B2

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

(10) **Patent No.:** **US 7,733,271 B2**

(45) **Date of Patent:** **Jun. 8, 2010**

(54) **DUAL-BAND PLANAR INVERTED-F ANTENNA**

(75) Inventors: **Young-min Moon**, Seoul (KR);
Young-eil Kim, Suwon-si (KR);
Gyoo-soo Chae, Cheonan-si (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 11 days.

(21) Appl. No.: **11/347,217**

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

(65) **Prior Publication Data**

US 2006/0176226 A1 Aug. 10, 2006

(30) **Foreign Application Priority Data**

Feb. 4, 2005 (KR) 10-2005-0010759

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

(52) **U.S. Cl.** **343/700 MS; 343/833; 343/834**

(58) **Field of Classification Search** **343/700 MS; 343/833-834**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,742,359 A * 5/1988 Ishino et al. 343/895
5,966,097 A * 10/1999 Fukasawa et al. 343/700 MS
6,707,428 B2 * 3/2004 Gram 343/700 MS
6,795,028 B2 * 9/2004 Stutzman et al. 343/702
7,026,996 B2 * 4/2006 Harano 343/700 MS
7,026,999 B2 4/2006 Umehara et al.
7,084,813 B2 * 8/2006 Pathak et al. 343/700 MS
7,173,567 B2 * 2/2007 Inatsugu et al. 343/702
7,215,289 B2 * 5/2007 Harano 343/702

2003/0169209 A1 * 9/2003 Ohara et al. 343/895
2005/0285596 A1 * 12/2005 Suzuki et al. 324/318
2006/0022889 A1 * 2/2006 Chiang et al. 343/833
2007/0057849 A1 * 3/2007 Moon et al. 343/700 MS
2007/0069958 A1 * 3/2007 Ozkar 343/700 MS
2008/0168384 A1 * 7/2008 Platzer et al. 715/784

FOREIGN PATENT DOCUMENTS

JP 61232704 10/1986

(Continued)

OTHER PUBLICATIONS

"Antenna Frequency Scaling" from "The ARRL Antenna Book", Published by The American Radio Relay League, Copyright ©1988, p. 2-24 to 2-25.*

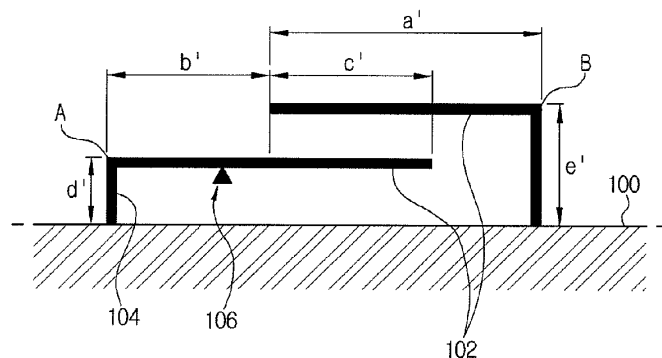
Primary Examiner—Trinh V Dinh

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

(57) **ABSTRACT**

An improved and more compact structure of a built-in antenna for handheld terminals, improving radiation pattern and efficiency. Provided is a planar inverted-F antenna having a radiation part having an inductive radiation portion and a parasitic radiation portion which are spaced in a certain distance apart from a ground surface, a power-supply part horizontally spaced apart from the ground surface and for directly supplying currents to the connected inductive radiation portion, and connection parts for connecting the radiation portions to the ground. The planar inverted-F antenna has an inductive antenna portion and a parasitic antenna portion, thereby reducing its volume compared to the conventional inverted-F antenna. Complicated manufacturing and processing procedures are simplified by connecting the power-supplying part and a PCB.

12 Claims, 7 Drawing Sheets



Acrobat 文件



US007733276B2

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

(10) **Patent No.:** **US 7,733,276 B2**
(45) **Date of Patent:** **Jun. 8, 2010**

(54) **ANTENNA SYSTEM FOR NOTEBOOK
COMPUTER AND METHOD FOR
COMMUNICATING IN MULTIPLE
WIRELESS SYSTEMS**

(75) Inventors: **Shmuel Levy**, Q. Tivon (IL); **David G.
Leeper**, Scottsdale, AZ (US)

(73) Assignee: **Intel Corporation**, Santa Clara, CA
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 881 days.

(21) Appl. No.: **11/558,139**

(22) Filed: **Nov. 9, 2006**

(65) **Prior Publication Data**

US 2008/0111746 A1 May 15, 2008

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 3/24 (2006.01)

(52) **U.S. Cl.** **343/702; 343/876; 343/858**

(58) **Field of Classification Search** None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,057,866 A * 5/2000 Haneda et al. 347/118
6,667,723 B2 * 12/2003 Forrester 343/858
2008/0096492 A1 * 4/2008 Yoon 455/83

* cited by examiner

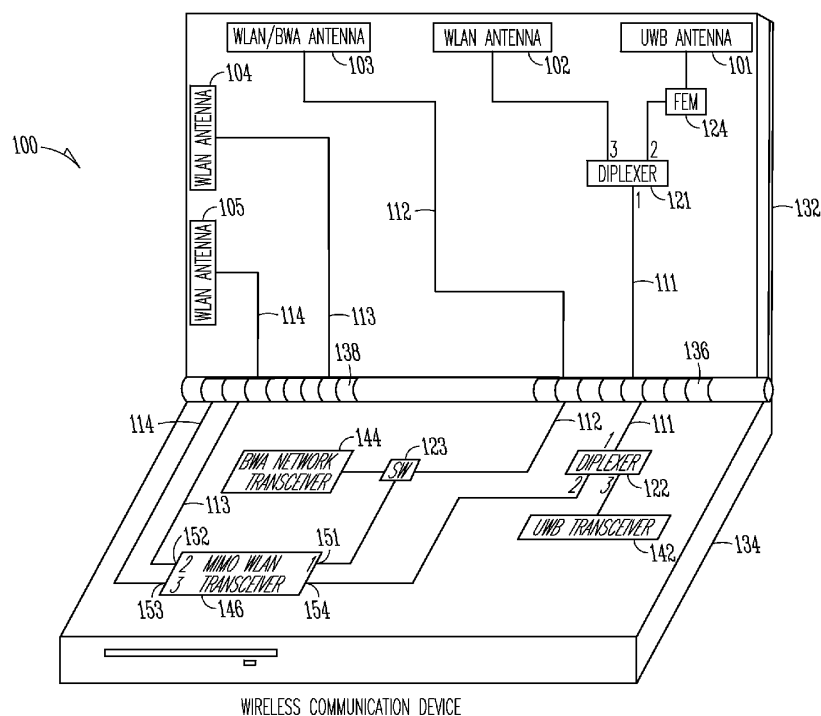
Primary Examiner—Trinh V Dinh

(74) Attorney, Agent, or Firm—Schwegman, Lundberg &
Woessner, P.A.; Gregory J. Gorrie

(57) **ABSTRACT**

Embodiments of an antenna system for notebook, laptop and portable computers and methods for communicating in multiple wireless systems are generally described herein. Other embodiments may be described and claimed. In some embodiments, a notebook computer comprises a plurality of transceivers, a plurality of antennas coupled to the transceivers with coaxial cables, and signal separation circuitry coupled to at least one of the coaxial cables to allow the at least one coaxial cable to be shared by two or more of the transceivers.

11 Claims, 1 Drawing Sheet



Acrobat 文件



US007733277B2

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

(10) **Patent No.:** **US 7,733,277 B2**

(45) **Date of Patent:** **Jun. 8, 2010**

(54) **WIDE BAND ANTENNA**

7,319,432 B2 * 1/2008 Andersson 343/702
2005/0068234 A1 * 3/2005 Hung et al. 343/702

(75) Inventors: **Ching-Chi Lin**, Taipei Hsien (TW);
Jia-Hung Su, Taipei Hsien (TW); **Kai Shih**, Taipei Hsien (TW); **Yu-Yuan Wu**, Taipei Hsien (TW)

FOREIGN PATENT DOCUMENTS

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

TW 095216657 9/2006

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 364 days.

* cited by examiner

Primary Examiner—Shih-Chao Chen

(74) Attorney, Agent, or Firm—WPAT, P.C.; Anthony King

(21) Appl. No.: **11/782,224**

(57) **ABSTRACT**

(22) Filed: **Jul. 24, 2007**

(65) **Prior Publication Data**

US 2009/0027273 A1 Jan. 29, 2009

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/38 (2006.01)
H01Q 19/10 (2006.01)

(52) **U.S. Cl.** **343/702**; 343/700 MS;
343/818

(58) **Field of Classification Search** 343/700 MS,
343/702, 818, 846
See application file for complete search history.

(56) **References Cited**

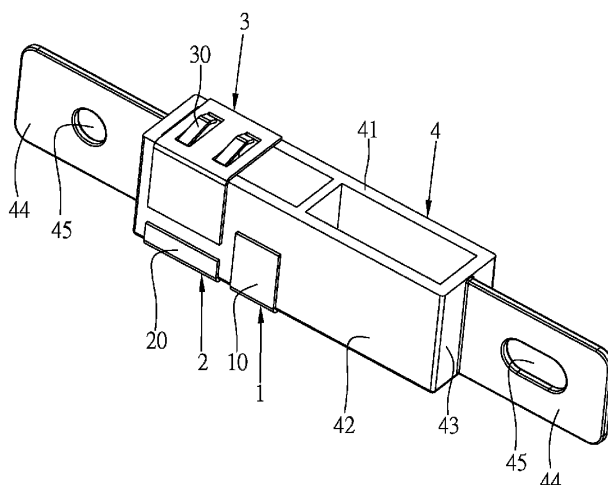
U.S. PATENT DOCUMENTS

7,196,664 B2 * 3/2007 Asai 343/700 MS

5 Claims, 4 Drawing Sheets

A wide band antenna mounted to a dielectric element has a first patch, a second patch spaced from the first patch and a ground patch. The first patch has a first portion with a feeding point thereat and a second portion connecting the first portion. The second patch has a third portion and a fourth portion connecting the third portion. The first portion and the second portion of the first patch space from and parallel the third portion and the fourth portion of the second patch respectively. The ground patch is close to the first portion of the first patch and the third portion of the second patch. The first patch obtains a first frequency range. The second patch responses electromagnetic energy from the first patch to obtain a second frequency range. Scope of the first and the second frequency ranges covers portion of ultra wide band communication frequency.

100
~



Acrobat 文件



US007733278B2

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

(10) **Patent No.:** **US 7,733,278 B2**
(45) **Date of Patent:** **Jun. 8, 2010**

(54) **PORTABLE WIRELESS DEVICE**

(75) Inventors: **Yoshihiro Kanasaki**, Ishikawa (JP);
Akiyoshi Takeuchi, Ishikawa (JP);
Yutaka Saito, Ishikawa (JP); **Kouta**
Aoki, Kanagawa (JP)

7,162,284 B2 * 1/2007 Kobayashi et al. 455/575.5
7,376,449 B2 * 5/2008 Mizuta et al. 455/575.3
7,436,364 B2 * 10/2008 Nishikido et al. 343/702
7,529,571 B2 * 5/2009 Byun et al. 455/575.4

(Continued)

(73) Assignee: **Panasonic Corporation**, Osaka (JP)

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 229 days.

JP 3-280625 12/1991

(Continued)

(21) Appl. No.: **11/817,512**

OTHER PUBLICATIONS

(22) PCT Filed: **Feb. 21, 2006**

International Search Report Dated Apr. 4, 2006.

(86) PCT No.: **PCT/JP2006/303012**

§ 371 (c)(1),
(2), (4) Date: **Aug. 31, 2007**

Primary Examiner—Hoang V Nguyen
(74) *Attorney, Agent, or Firm*—Pearne & Gordon LLP

(57) **ABSTRACT**

(87) PCT Pub. No.: **WO2006/092979**

PCT Pub. Date: **Sep. 8, 2006**

(65) **Prior Publication Data**

US 2009/0033563 A1 Feb. 5, 2009

(30) **Foreign Application Priority Data**

Mar. 4, 2005 (JP) 2005-060787

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

(52) **U.S. Cl.** **343/702; 455/575.4**

(58) **Field of Classification Search** 343/702,
343/846; 455/575.1, 575.3, 575.4, 575.7,
455/575.8, 90.1, 90.3

See application file for complete search history.

(56) **References Cited**

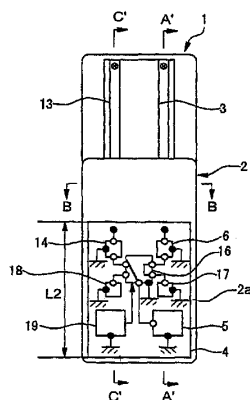
U.S. PATENT DOCUMENTS

7,106,260 B2 * 9/2006 Ryu et al. 343/702

A portable wireless device is provided that eliminates the need for an antenna protruding from an housing by including a first housing and a second housing operating as a dipole antenna thus ensuring portability and delivering a high antenna performance despite its compact, low-profile and lightweight design.

The portable wireless device according to the invention includes a first housing 1; a second housing 2; and a sliding unit 21 for slidably coupling the first housing 1 and the second housing 2 to each other; wherein the first housing 1 is arranged a predetermined spacing apart from the second housing 2 and includes a power feeding unit 7 for feeding power: between the first housing 1 and the second housing 2 and wherein the first housing 1 and the second housing 2 operate as a dipole antenna. The portable wireless device does not include an antenna protruding from an housing. This ensures portability and delivers a high antenna performance despite its compact, low-profile and lightweight design.

5 Claims, 8 Drawing Sheets



Acrobat 文件



US007733279B2

(12) **United States Patent**
Hozouri

(10) **Patent No.:** **US 7,733,279 B2**
(45) **Date of Patent:** **Jun. 8, 2010**

(54) **MULTI-BAND OR WIDE-BAND ANTENNA INCLUDING DRIVEN AND PARASITIC TOP-LOADING ELEMENTS**

6,788,257 B2 9/2004 Fang et al.

(Continued)

(76) Inventor: **Behzad Tavassoli Hozouri**, 3707 Poinciana Dr. #91, Santa Clara, CA (US) 95051

FOREIGN PATENT DOCUMENTS

KR 10-2007-7022833 11/2009

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 289 days.

(Continued)

OTHER PUBLICATIONS

(21) Appl. No.: **11/918,021**

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

(86) PCT No.: **PCT/US2006/013128**

§ 371 (c)(1),

(2), (4) Date: **Oct. 5, 2007**

Guo, Yong-Xin et al., a Quarter-Wave U-Shaped Patch Antenna With Two Unequal Arms for Wideband and Dual-Frequency Operation, IEEE Transactions on Antennas and Propagation, vol. 50, No. 8, Aug. 2002.

(Continued)

Primary Examiner—Hoang Anh T Le

(74) Attorney, Agent, or Firm—Workman Nydegger

(87) PCT Pub. No.: **WO2006/110564**

PCT Pub. Date: **Oct. 19, 2006**

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2009/0109096 A1 Apr. 30, 2009

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

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

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

See application file for complete search history.

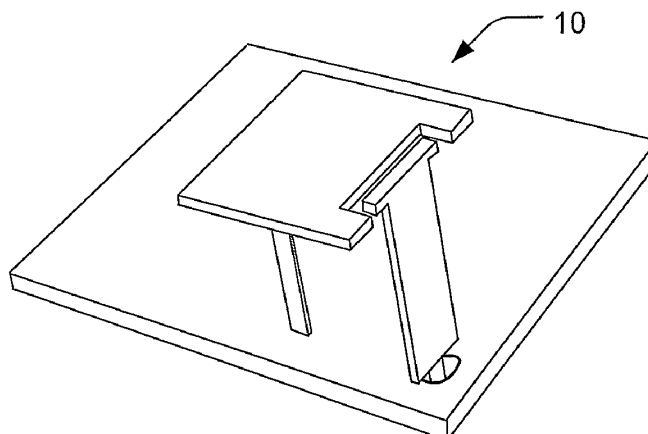
(56) **References Cited**

U.S. PATENT DOCUMENTS

4,907,006 A 3/1990 Nishikawa et al.
5,532,708 A 7/1996 Krenz et al.
6,433,756 B1 8/2002 Sievenpiper et al.
6,670,921 B2 12/2003 Sievenpiper et al.
6,727,854 B2 4/2004 Fang et al.

A monopole-type antenna (10) for multi- or wide-band use to transmit or receive radio frequency electromagnetic energy. A feed point (12) provides energy into the antenna or receives energy from the antenna. A driven radiating section (16) includes a first top-loading element (22) and a feed conductor (20) that electrically connects the feed point linearly to the first top-loading element, yet with the driven radiating section not electrically connected to a grounding surface (14). A parasitic radiating section (18) includes a second top-loading element (26) and a bridge conductor (24) that electrically connects the second top-loading element linearly to the grounding surface. When energy is then provided at the feed point and conducted to the driven radiating section, it produces a first resonance mode, coupling at least some of the energy into and exciting the parasitic radiating section to produce a second resonance mode.

18 Claims, 6 Drawing Sheets



Acrobat 文件



US007733286B2

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

(10) **Patent No.:** **US 7,733,286 B2**
(45) **Date of Patent:** **Jun. 8, 2010**

(54) **WIDEBAND PRINTED DIPOLE ANTENNA
FOR WIRELESS APPLICATIONS**

(75) Inventors: **Wen-Shan Chen**, Kaohsiung (TW);
Yen-Hao Yu, Taipei (TW)

(73) Assignee: **Southern Taiwan University**, Tainan
County (TW)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 186 days.

(21) Appl. No.: **12/126,960**

(22) Filed: **May 26, 2008**

(65) **Prior Publication Data**

US 2009/0289867 A1 Nov. 26, 2009

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

(52) **U.S. Cl.** **343/795**; 343/793; 343/700 MS

(58) **Field of Classification Search** 343/700 MS,
343/793, 795, 820

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,814,783	A *	3/1989	Shelton et al.	343/795
7,289,065	B2 *	10/2007	Prieto-Burgos et al.	343/700 MS
7,355,559	B2 *	4/2008	Tikhov et al.	343/895
7,429,953	B2 *	9/2008	Buris et al.	343/700 MS

* cited by examiner

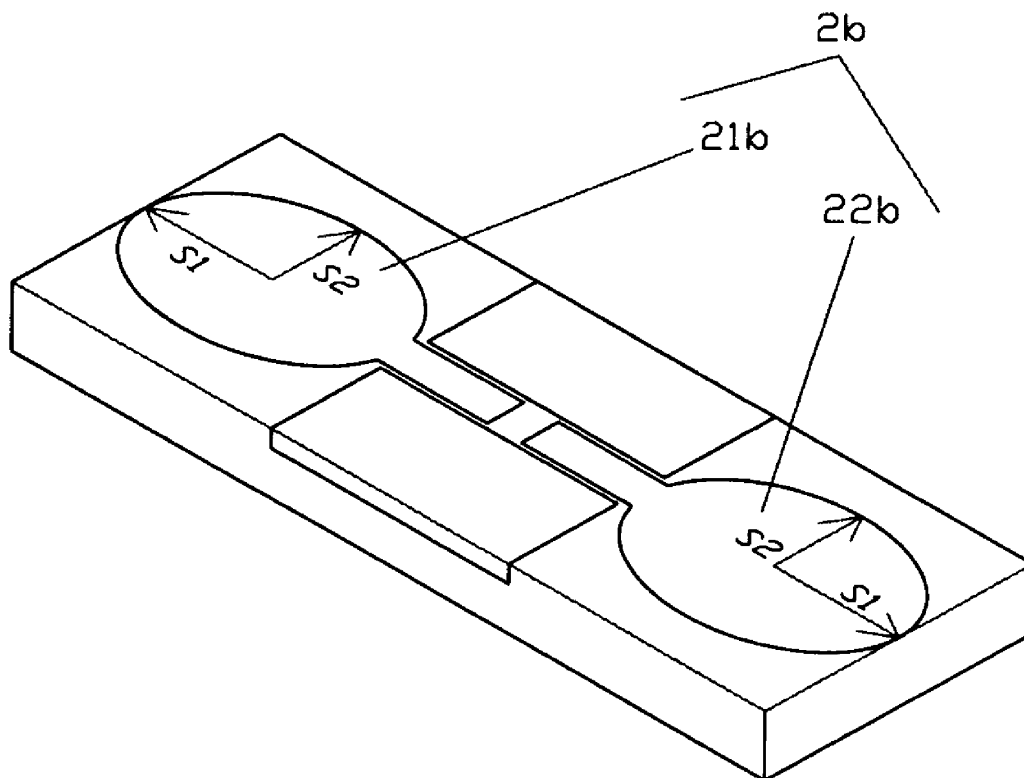
Primary Examiner—Hoang V Nguyen

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

(57) **ABSTRACT**

In a broadband printed dipole antenna for wireless applications, metal plates of a radiation portion, a feed-in portion and a bandwidth modulation portion are formed on a substrate. Two radiation portions come with a specific shape and have an interval between the two radiation portions. The feed-in portion is composed of two separated long bars and coupled to one of the specific shaped radiation portions. The bandwidth modulation portion is disposed symmetrically adjacent to the feed-in portion, such that the impedance matching can be adjusted to form a broadband dipole antenna for WiMAX applications.

6 Claims, 27 Drawing Sheets



Acrobat 文件



US007737897B2

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

(10) **Patent No.:** **US 7,737,897 B2**
(45) **Date of Patent:** **Jun. 15, 2010**

(54) **PORTABLE WIRELESS APPARATUS**

2006/0121933 A1 * 6/2006 Ikeda 455/550.1
2009/0128424 A1 * 5/2009 Suzuki et al. 343/702

(75) Inventors: **Akiyoshi Takeuchi**, Ishikawa (JP);
Yutaka Saito, Ishikawa (JP); **Kouta Aoki**, Kanagawa (JP)

(73) Assignee: **Panasonic Corporation**, Kadoma-shi (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.: **11/815,312**

(22) PCT Filed: **Feb. 1, 2006**

(86) PCT No.: **PCT/JP2006/301687**

§ 371 (c)(1),
(2), (4) Date: **Sep. 17, 2008**

(87) PCT Pub. No.: **WO2006/082860**

PCT Pub. Date: **Aug. 10, 2006**

(65) **Prior Publication Data**

US 2009/0033562 A1 Feb. 5, 2009

(30) **Foreign Application Priority Data**

Feb. 1, 2005 (JP) 2005-025007

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

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

(58) **Field of Classification Search** 343/702,
343/745, 748, 850; 455/575.7
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,978,165 B2 * 12/2005 Martinez et al. 455/575.7
7,479,927 B2 * 1/2009 Scarpelli 343/702
2004/0130442 A1 * 7/2004 Breed et al. 340/443

FOREIGN PATENT DOCUMENTS

EP 1755190 A1 2/2007
JP 06-216621 8/1994
JP 07-023450 1/1995
JP 10-190330 7/1998
JP 2001-156898 6/2001
JP 2002-335180 11/2002
JP 2002-353719 12/2002

(Continued)

Primary Examiner—Huedung Mancuso

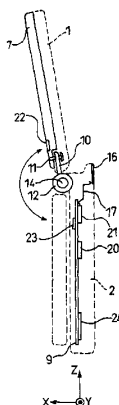
(74) *Attorney, Agent, or Firm*—Christensen O'Connor Johnson Kindness PLLC

(57) **ABSTRACT**

The present invention provides a folding type and portable wireless apparatus with a built-in antenna, particularly a portable wireless apparatus that reduces a local average SAR and improves performance of antenna.

A housing open/close detecting unit 6 detects open/close of bodies 1 and 2. When the bodies 1 and 2 are open, a first antenna 4 and a wireless circuit 24 are connected and resonant frequency of a second antenna 5 is adjusted into a first frequency bandwidth, and when the bodies 1 and 2 are closed, the resonant frequency of the second antenna 5 is adjusted into the first frequency bandwidth and a second frequency bandwidth and a wireless circuit 24 is connected. Therefore, when the bodies 1 and 2 are open, it is possible to reduce a local average SAR by separating an antenna current. Further, when the bodies 1 and 2 are closed, it is possible to obtain a high antenna gain.

3 Claims, 5 Drawing Sheets



Acrobat 文件



US007737901B2

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

(10) **Patent No.:** **US 7,737,901 B2**
(45) **Date of Patent:** **Jun. 15, 2010**

(54) **MULTI-BAND ANTENNA**

(75) Inventors: **Wen-Fong Su**, Tu-Cheng (TW);
Hsien-Sheng Tseng, Tu-Cheng (TW);
Shang-Jen Chen, Tu-Cheng (TW);
Lung-Shena Tai, Tu-Cheng (TW)

(73) Assignee: **Hon Hai Precision Ind. Co., Ltd.**, 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 175 days.

(21) Appl. No.: **11/824,784**

(22) Filed: **Jul. 3, 2007**

(65) **Prior Publication Data**

US 2008/0001826 A1 Jan. 3, 2008

(30) **Foreign Application Priority Data**

Jul. 3, 2006 (CN) 09 5 124096

(51) **Int. Cl.**

H01Q 1/48 (2006.01)

H01Q 13/10 (2006.01)

(52) **U.S. Cl.** **343/767**; 343/729; 343/846

(58) **Field of Classification Search** 343/700 MS,
343/702, 829, 767, 795, 846

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,828,340 A 10/1998 Johnson
6,661,380 B1 * 12/2003 Bancroft et al. 343/700 MS
7,042,414 B1 5/2006 Lee

* cited by examiner

Primary Examiner—Michael C Wimer

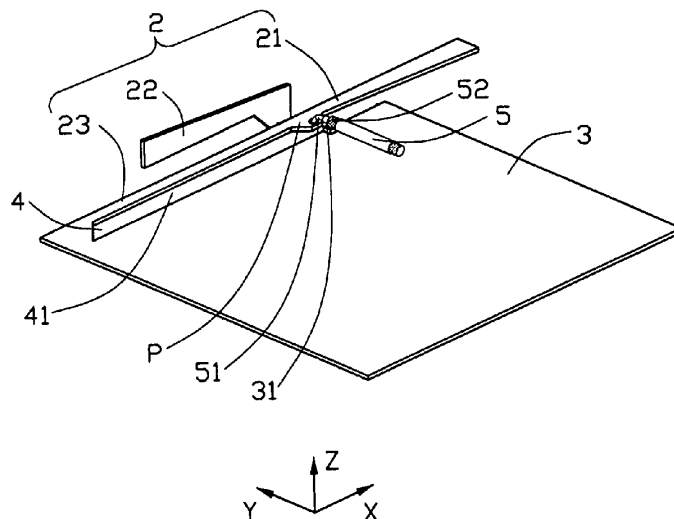
(74) *Attorney, Agent, or Firm*—Wei Te Chung; Andrew C.
Cheng; Ming Chieh Chang

(57) **ABSTRACT**

A multi-band antenna, made by an integral plate and comprises a radiating element, a grounding element, a slit formed as part of the plate, and a feeding line; wherein horizontal conductive portion of said plate are separated from each other with said slit between them and serve as the radiating element and the ground element respectively; the feeding line, comprising an inner conductor connected with the radiating element and an outer conductor connected with the grounding element; wherein said radiating element comprising at least two radiating portions defining at least one radiating arm with gradually increasing width, and at least two radiating portion cooperatively acting to achieve a Ultra Wide Band antenna.

18 Claims, 3 Drawing Sheets

1
~



Acrobat 文件



US007737905B1

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

(10) **Patent No.:** **US 7,737,905 B1**
(45) **Date of Patent:** **Jun. 15, 2010**

(54) **BROADBAND FERRITE LOADED LOOP ANTENNA**

(75) Inventors: **John Harold Meloling**, San Diego, CA (US); **David Carlos Dawson**, Lemon Grove, CA (US); **Peder Meyer Hansen**, San Diego, 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 183 days.

(21) Appl. No.: **12/200,425**

(22) Filed: **Aug. 28, 2008**

(51) **Int. Cl.**
H01Q 7/08 (2006.01)
H01Q 1/00 (2006.01)

(52) **U.S. Cl.** **343/788; 343/787**

(58) **Field of Classification Search** **343/788; 343/787**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,376,941 A 3/1983 Zenel

4,774,519 A 9/1988 Pease et al.
4,805,232 A * 2/1989 Ma 455/291
4,978,966 A 12/1990 Takizawa et al.
5,517,202 A 5/1996 Patel et al.
5,561,438 A * 10/1996 Nakazawa et al. 343/787
5,933,117 A 8/1999 Gerhard

* cited by examiner

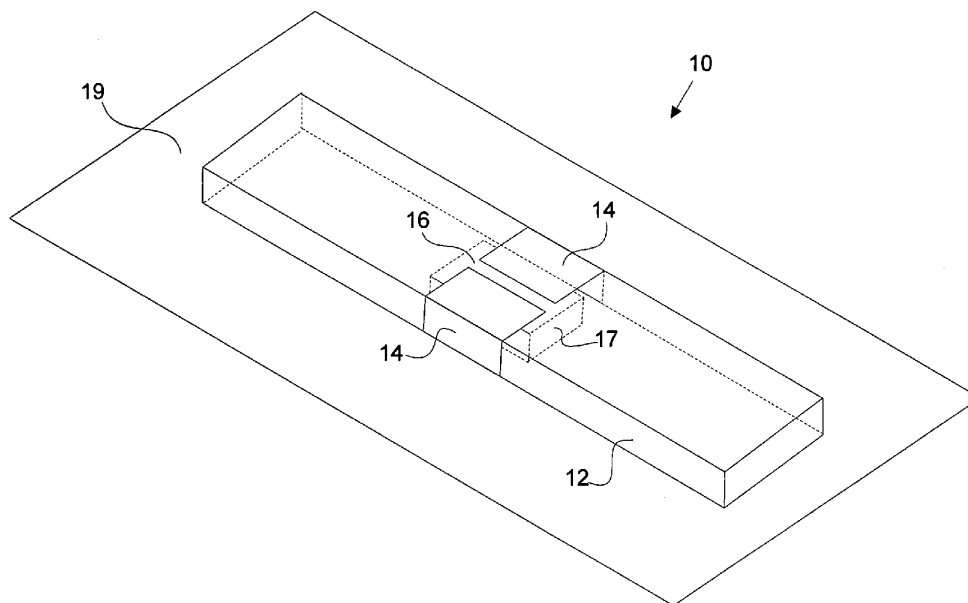
Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—Kyle Eppele; J. Eric Anderson

(57) **ABSTRACT**

A ferrite-loaded broadband loop antenna having nearly comparable transmit/receive characteristics is disclosed. The antenna contains a low loss ferrite core having a width-to-height ratio of approximately 24 and a depth-to-height ratio of approximately 6, and an antenna feed plate assembly centered about the long axis of the ferrite core, having a width-to-height ratio of approximately 6 and a width-to-depth ratio of approximately 1, and a balanced feed located at the center of the antenna feed plate assembly, positioned on the radiating side of the antenna, and a low loss center element in the ferrite core, the center element having at least one of a loss tangent and a permeability that is lower than the ferrite core, and a grounding surface coupled to the antenna feed plates.

20 Claims, 9 Drawing Sheets



Acrobat 文件



US007737907B2

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

(10) **Patent No.:** **US 7,737,907 B2**
(45) **Date of Patent:** **Jun. 15, 2010**

(54) **PLANAR ANTENNA**

(75) Inventors: **Tiao-Hsing Tsai**, Yungho (TW);
Chih-Wei Liao, Yilan Shien (TW);
Chao-Hsu Wu, Tao Yuan Shien (TW)

(73) Assignee: **Quanta Computer Inc.** (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 31 days.

(21) Appl. No.: **12/174,757**

(22) Filed: **Jul. 17, 2008**

(65) **Prior Publication Data**

US 2009/0237308 A1 Sep. 24, 2009

(30) **Foreign Application Priority Data**

Mar. 19, 2008 (TW) 97109619 A

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

(52) **U.S. Cl.** **343/828**; 343/702; 343/829

(58) **Field of Classification Search** 343/700 MS,
343/702, 846, 828–830, 833

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,999,031 B2 * 2/2006 Berezin et al. 343/702

* cited by examiner

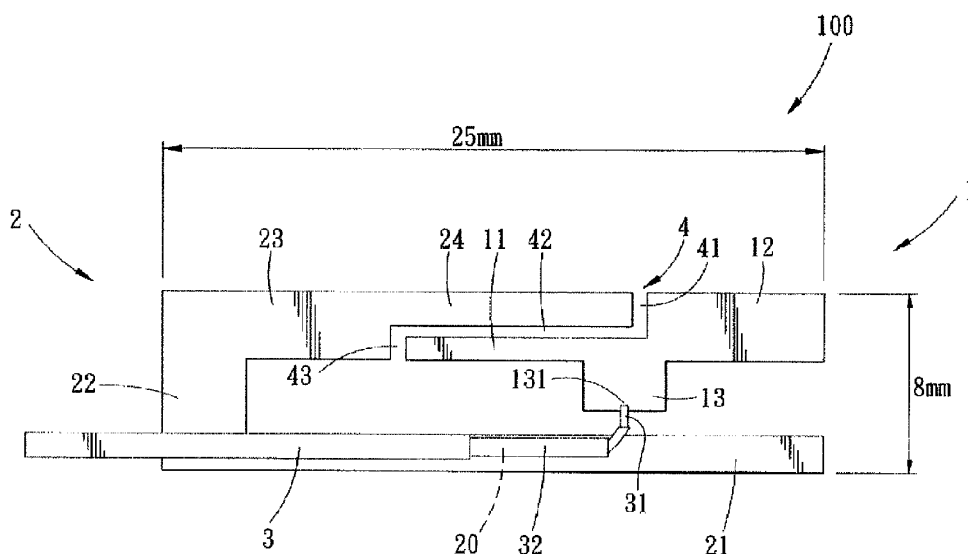
Primary Examiner—Michael C Wimer

(74) *Attorney, Agent, or Firm*—Sunstein Kann Murphy & Timbers LLP

(57) **ABSTRACT**

An antenna includes first and second radiating elements. The first radiating element is operable in a first frequency range. The second radiating element cooperates with the first radiating element to define a slot therebetween in such a manner that the second radiating element is coupled electromagnetically to the first radiating element. The construction as such permits operation of the second radiating element in a second frequency range different from the first frequency range, and a third frequency range different from the first and second frequency ranges.

19 Claims, 7 Drawing Sheets



Acrobat 文件



US007737908B2

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

(10) **Patent No.:** **US 7,737,908 B2**

(45) **Date of Patent:** **Jun. 15, 2010**

(54) **ANTENNA APPARATUS**

(75) Inventors: **Masahiro Yanagi**, Shinagawa (JP); **Shigemi Kurashima**, Shinagawa (JP); **Hideki Iwata**, Shinagawa (JP); **Takashi Yuba**, Shinagawa (JP); **Masahiro Kaneko**, Shinagawa (JP); **Yuriko Segawa**, Shinagawa (JP); **Takashi Arita**, Shinagawa (JP); **Toshihiro Kusagaya**, Shinagawa (JP); **Kazuhiko Ikeda**, Iiyama (JP); **Hiroshi Matsumiya**, Iiyama (JP); **Kazuo Nomura**, Iiyama (JP)

(73) Assignee: **Fujitsu Component 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 335 days.

(21) Appl. No.: **11/581,376**

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

(65) **Prior Publication Data**
US 2007/0229360 A1 Oct. 4, 2007

(30) **Foreign Application Priority Data**
Mar. 30, 2006 (JP) 2006-094429
Sep. 6, 2006 (JP) 2006-242016

(51) **Int. Cl.**
H01Q 1/40 (2006.01)

(52) **U.S. Cl.** **343/846**; 343/700 MS;
343/873

(58) **Field of Classification Search** 343/700 MS,
343/829, 830, 846, 872, 873
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,170,013	A *	10/1979	Black		343/700 MS
4,661,821	A *	4/1987	Smith		343/743
4,700,194	A *	10/1987	Ogawa et al.		343/700 MS
5,913,174	A *	6/1999	Casarez et al.		455/557
6,037,912	A *	3/2000	DeMarre		343/815
6,313,798	B1 *	11/2001	Bancroft et al.		343/700 MS
2005/0285805	A1 *	12/2005	Ikeda et al.		343/713
2008/0055183	A1 *	3/2008	Yuba et al.		343/872

FOREIGN PATENT DOCUMENTS

JP 2000-196327 7/2000

OTHER PUBLICATIONS

Takuya Taniguchi et al., "An Omnidirectional and Low-VSWR Antenna for the FCC-Approved UWB Frequency Band", *The Institute of Electronics, Information and Communication Engineers*, B-1-133, 2003.

* cited by examiner

Primary Examiner—Tho G Phan

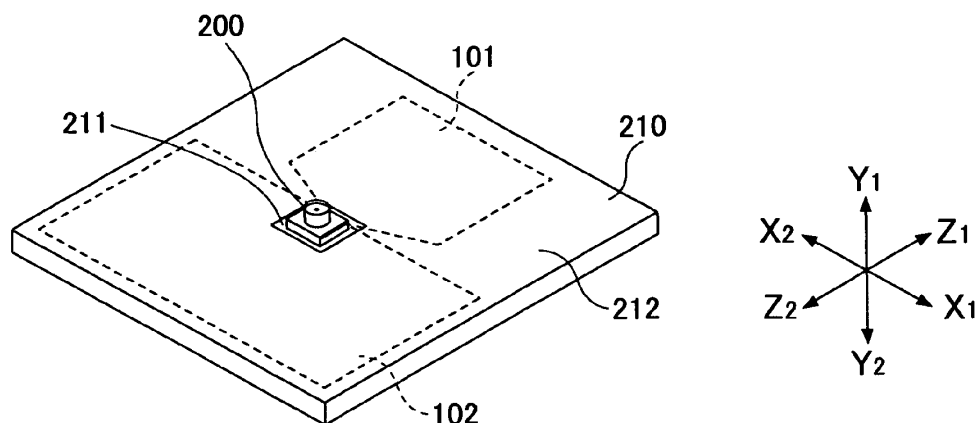
(74) Attorney, Agent, or Firm—Staas & Halsey LLP

(57) **ABSTRACT**

A disclosed antenna apparatus includes: a punched out antenna element made of a sheet metal; a punched out ground element made of a sheet metal, the ground element facing the antenna element; and a surface mount type coaxial connector mounted across the antenna element and the ground element.

3 Claims, 27 Drawing Sheets

100



Acrobat 文件



US007737909B2

(12) **United States Patent**
Pan

(10) **Patent No.:** **US 7,737,909 B2**

(45) **Date of Patent:** **Jun. 15, 2010**

(54) **ANTENNA STRUCTURE FOR TWO
OVERLAPPING FREQUENCY BANDS**

(75) Inventor: **Sheng-Gen Pan**, Kamp-Lintfort (DE)

(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 493 days.

(21) Appl. No.: **10/539,665**

(22) PCT Filed: **Nov. 18, 2003**

(86) PCT No.: **PCT/DE03/03821**

§ 371 (c)(1),
(2), (4) Date: **Jun. 14, 2005**

(87) PCT Pub. No.: **WO2004/054036**

PCT Pub. Date: **Jun. 24, 2004**

(65) **Prior Publication Data**

US 2006/0152429 A1 Jul. 13, 2006

(30) **Foreign Application Priority Data**

Dec. 12, 2002 (DE) 102 58 184

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

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

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

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,835,538	A	5/1989	McKenna et al.	343/700 MS
5,966,097	A	10/1999	Fukasawa et al.	343/700 MS
6,320,545	B1	11/2001	Nagumo et al.	343/700 MS
6,639,555	B1 *	10/2003	Kane et al.	343/700 MS

FOREIGN PATENT DOCUMENTS

AU	55898 73	11/1974
DE	37 86 913 T2	8/1988
DE	44 23 191	1/1996
DE	197 20 773	2/1998
EP	0 279 050	8/1988
EP	0 884 796	12/1998
EP	1 198 026	4/2002
EP	1 376 761	1/2004
WO	WO 99/22420	5/1999
WO	WO 02/075853	9/2002

* cited by examiner

Primary Examiner—Douglas W Owens

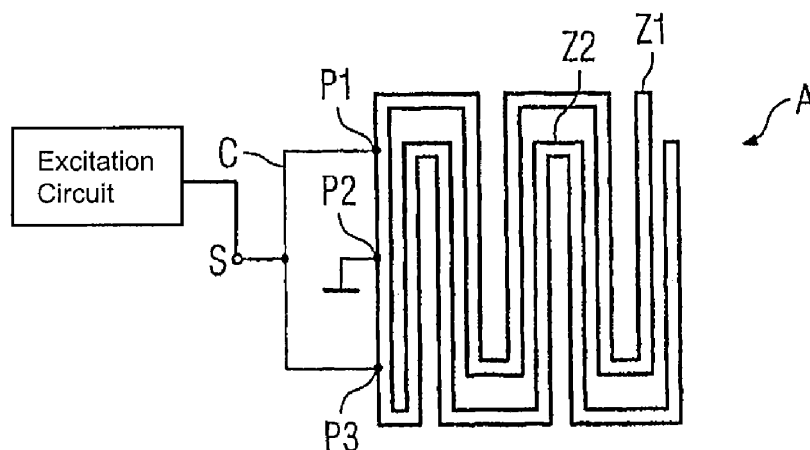
Assistant Examiner—Dieu Hien T Duong

(74) *Attorney, Agent, or Firm*—K&L Gates LLP

(57) **ABSTRACT**

The present disclosure relates to a substantially flat antenna structure which includes a frame earth terminal and at least one HF feed connection, which can be used for at least two frequency bands. From one foot area outwards, which includes the frame earth terminal, the antenna structure includes two antenna branches. Two distanced HF feed connections are provided in the foot area. The two antenna branches of the antenna structure are embodied in such a way that the associated frequency bands overlap.

5 Claims, 2 Drawing Sheets



Acrobat 文件



US007741999B2

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

(10) **Patent No.:** **US 7,741,999 B2**
(45) **Date of Patent:** **Jun. 22, 2010**

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

2006/0202900 A1 * 9/2006 Simile 343/792.5
2006/0238432 A1 * 10/2006 Mikami et al. 343/795
2007/0216589 A1 * 9/2007 Li et al. 343/713

(75) Inventors: **Frank Mierke**, Munich (DE); **Gerald Schillmeier**, Munich (DE)

FOREIGN PATENT DOCUMENTS

(73) Assignee: **Kathrein-Werke KG**, Rosenheim (DE)

CA 2082580 4/2002
DE 69230365 T2 3/2000
EP 1376758 A1 1/2004
JP 2-150101 8/1990
JP 7-94934 7/1995
KR 1020040072974 8/2004
WO 0180352 A1 10/2001

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 334 days.

OTHER PUBLICATIONS

(21) Appl. No.: **11/453,253**

Robert E. Munson: "Conformal Microstrip Antennas and Microstrip Phased Arrays," IEEE Transactions on Antennas and Propagation, pp. 74-78 (Jan. 1974).
S.A. Long, M.D.: Walton "A Dual-Frequency Stacked Circular-Disc Antenna," IEEE Transaction on Antennas and Propagation, vol. AP-27, No. 2, pp. 270-273 (Mar. 1979).

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

(65) **Prior Publication Data**

US 2008/0122697 A1 May 29, 2008

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

(Continued)

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

Primary Examiner—Douglas W Owens

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

Assistant Examiner—Dieu Hien T Duong

(74) *Attorney, Agent, or Firm*—Nixon & Vanderhye PC

(56) **References Cited**

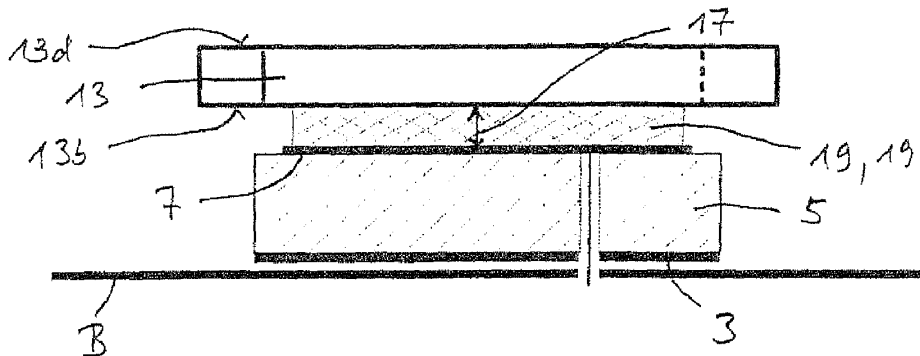
ABSTRACT

U.S. PATENT DOCUMENTS

5,307,075 A 4/1994 Huyah
5,315,753 A * 5/1994 Jensen et al. 29/600
5,745,079 A 4/1998 Wang et al.
5,880,694 A 3/1999 Wang et al.
6,359,589 B1 * 3/2002 Bae 343/700 MS
7,218,280 B2 * 5/2007 Annamaa et al. 343/700 MS
7,224,280 B2 * 5/2007 Ferguson et al. 340/572.7
2003/0011529 A1 * 1/2003 Gottl 343/795
2004/0061648 A1 * 4/2004 Pros et al. 343/700 MS
2004/0150561 A1 * 8/2004 Tillery et al. 343/700 MS
2004/0212536 A1 * 10/2004 Mori et al. 343/700 MS
2006/0001574 A1 * 1/2006 Petros 343/702

A multilayer antenna of planar construction comprises an electrically conductive ground face and a conductive radiation face which is arranged with lateral spacing from the ground face and extends substantially parallel thereto. A dielectric carrier is arranged between the ground face and the radiation face. Above the radiation face there is a carrying means. Above the carrying means there is provided an electrically conductive patch element. The carrying means has a thickness or height which is less than the thickness or height of the patch element.

23 Claims, 5 Drawing Sheets



Acrobat 文件



US007742001B2

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

(10) **Patent No.:** **US 7,742,001 B2**

(45) **Date of Patent:** **Jun. 22, 2010**

(54) **TWO-TIER WIDE BAND ANTENNA**

(75) Inventors: **Denver Humphrey**, Broughshane (GB);
Brian Kearns, Dublin (IE); **Bee Yen Toh**, Lisburn (GB)

(73) Assignee: **TDK 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 213 days.

(21) Appl. No.: **12/078,440**

(22) Filed: **Mar. 31, 2008**

(65) **Prior Publication Data**

US 2009/0243937 A1 Oct. 1, 2009

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

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

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

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,828,340 A 10/1998 Johnson
6,300,909 B1 * 10/2001 Tsubaki et al. 343/700 MS
6,693,594 B2 * 2/2004 Pankinaho et al. 343/700 MS
6,803,881 B2 * 10/2004 Ishihara et al. 343/700 MS
6,891,507 B2 5/2005 Kushihi et al.
7,019,698 B2 3/2006 Miyoshi et al.
7,081,859 B2 7/2006 Miyoshi et al.

7,136,020 B2 11/2006 Yamaki
7,196,663 B2 3/2007 Bolzer et al.
2004/0012530 A1 1/2004 Chen
2007/0222699 A1 9/2007 Modro
2009/0243940 A1 * 10/2009 Humphrey 343/700 MS

FOREIGN PATENT DOCUMENTS

EP 0 762 533 A2 3/1997
JP A-2005-203817 7/2005
WO WO 2006/022350 A1 3/2006

OTHER PUBLICATIONS

European Search Report issued in European Patent Application No. 09 00 4702 on Jul. 10, 2009.

* cited by examiner

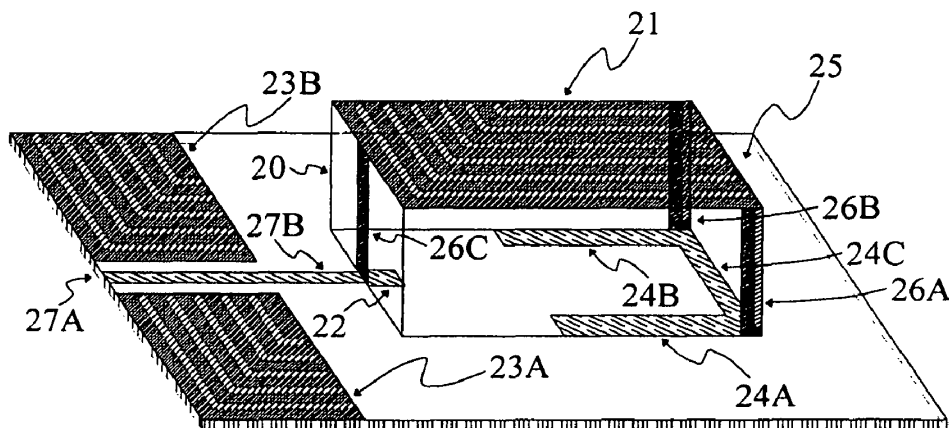
Primary Examiner—Tho G Phan

(74) *Attorney, Agent, or Firm*—Oliff & Berridge, PLC

(57) **ABSTRACT**

A two-tier wideband antenna comprising a chip of a dielectric material with an upper radiating structure and a lower radiating structure, the dielectric chip being mounted on an insulating carrier substrate which includes a feed-line to connect the antenna to a transceiver device. The lower radiating structure comprises two side elements which have a large aspect ratio so as to reduce the frequency of the lower band edge of the frequency response of the antenna when compared with the frequency response of a monopole patch antenna fabricated on a similar dielectric chip. The antenna of the present invention is suitable for operation over an ultra wideband, e.g. a frequency range extending from 3.1 to 10.6 GHz.

22 Claims, 6 Drawing Sheets



Acrobat 文件



US007742003B2

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

(10) **Patent No.:** **US 7,742,003 B2**
(45) **Date of Patent:** **Jun. 22, 2010**

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

(75) Inventors: **Kuan-Hsueh Tseng**, Taipei Hsien (TW);
Yi-Ling Chiu, Taipei Hsien (TW)

(73) Assignee: **Wistron Neweb Corp.**, 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 203 days.

(21) Appl. No.: **12/219,086**

(22) Filed: **Jul. 16, 2008**

(65) **Prior Publication Data**
US 2009/0046016 A1 Feb. 19, 2009

(30) **Foreign Application Priority Data**
Aug. 14, 2007 (TW) 96213418 U
Jun. 13, 2008 (TW) 97210544 U

(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, 846
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,100,850 A 8/2000 Utsumi

6,861,986 B2 3/2005 Fang et al.
7,170,464 B2 * 1/2007 Tang et al. 343/830
7,649,501 B2 * 1/2010 Wong et al. 343/702
2005/0128151 A1 6/2005 Kwak et al.

FOREIGN PATENT DOCUMENTS

EP 1 162 688 A1 12/2001
WO WO 02/29988 A1 4/2002

* cited by examiner

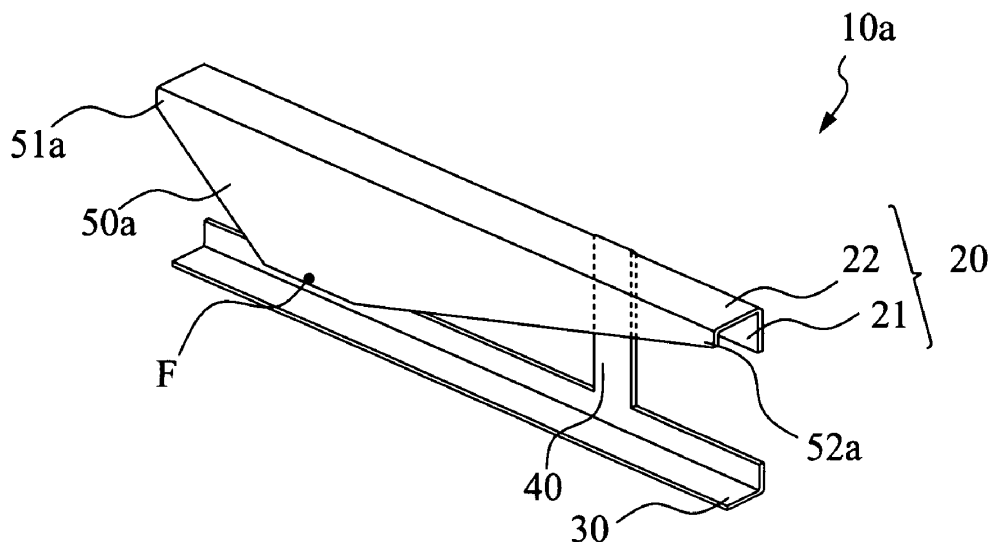
Primary Examiner—Hoang V Nguyen

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

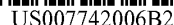
(57) **ABSTRACT**

A broadband antenna for wireless signal transmission of an electronic device is disclosed. The broadband antenna has a radiating element, a grounding element, a short-circuiting element and a feeding plane. The radiating element has a first radiation area and a second radiation area, the first radiation area and the second radiation area perpendicularly connected to each other substantially. The feeding plane perpendicularly connected to the second radiation area substantially, the feeding plane comprising a feeding point, a first end and a second end; wherein a distance between the feeding point and the first end is less than a distance between the feeding point and the second end. The short-circuiting element is used for connecting the first radiation area with the grounding element or connecting the feeding plane with the grounding element.

20 Claims, 27 Drawing Sheets



Acrobat 文件



(10) **Patent No.:** US 7,742,006 B2
(45) **Date of Patent:** Jun. 22, 2010

5,663,737	A	9/1997	Kakizawa
5,675,347	A	10/1997	Terashima et al.
5,825,335	A	10/1998	Arai et al.
5,926,141	A	7/1999	Lindenmeier et al.
6,054,961	A	4/2000	Gong et al.
6,097,345	A	8/2000	Walton
6,140,969	A	10/2000	Lindenmeier et al.
6,150,985	A	11/2000	Pritchard
6,172,651	B1	1/2001	Du
6,184,836	B1	2/2001	Ali
6,307,511	B1	10/2001	Ying et al.
6,362,784	B1	3/2002	Kane et al.
6,369,768	B1	4/2002	Fusinski
6,480,162	B2	11/2002	Sabet et al.
6,486,840	B1	11/2002	Buren

US 2008/0158075 A1 Jul. 3, 2008

(Continued)

FOREIGN PATENT DOCUMENTS

EP 1732160 A1 12/2006

Primary Examiner—Huedung Mancuso
(74) Attorney, Agent, or Firm—Howard & Howard Attorneys
PLLC

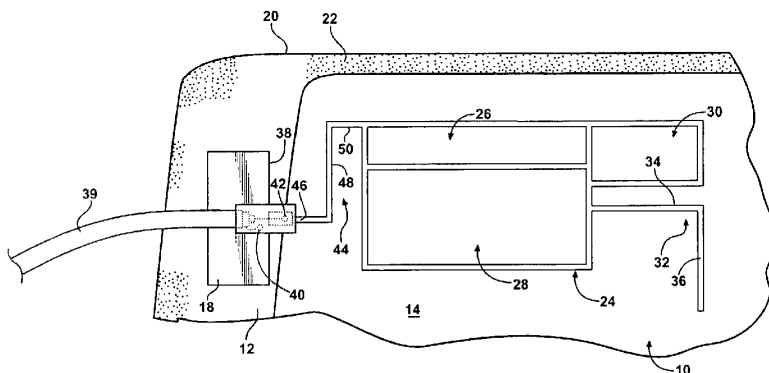
(57) **ABSTRACT**

U.S. PATENT DOCUMENTS

4,072,953	A	2/1978	Comastri et al.
4,072,954	A	2/1978	Comastri et al.
4,090,202	A	5/1978	Comastri et al.
4,527,164	A	7/1985	Cestaro et al.
4,823,142	A	4/1989	Ohe et al.
5,418,543	A	5/1995	Bolton
5,646,637	A	7/1997	Miller
5,650,791	A	7/1997	Talty
5,659,324	A	8/1997	Taniguchi et al.

An antenna includes a non-conductive pane, a ground plane disposed on the non-conductive pane, and a radiating strip disposed on the non-conductive pane for operating in a plurality of frequency bands. The radiating strip defines a plurality of loops. A portion of a periphery of one of the loops coincides with at least a portion of a periphery of another of the loops. The radiating strip also includes at least one branch extending away from the periphery of one of the loops to allow tuning and shifting of the resonant frequencies of the antenna.

19 Claims, 6 Drawing Sheets



Acrobat 文件



US007742009B2

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

(10) **Patent No.:** **US 7,742,009 B2**
(45) **Date of Patent:** **Jun. 22, 2010**

(54) **ANTENNA FOR THE PLUG-IN
DUAL-INTERFACE SMART CARD**

(75) Inventors: **Yong Li**, Beijing (CN); **Xuechao Jiang**,
Beijing (CN)

(73) Assignee: **Beijing Watch Data System Co., Ltd.**,
Beijing (CN)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 102 days.

(21) Appl. No.: **11/817,234**

(22) PCT Filed: **Jul. 25, 2006**

(86) PCT No.: **PCT/CN2006/001840**

§ 371 (c)(1),
(2), (4) Date: **Oct. 3, 2008**

(87) PCT Pub. No.: **WO2007/012271**

PCT Pub. Date: **Feb. 1, 2007**

(65) **Prior Publication Data**

US 2009/0102741 A1 Apr. 23, 2009

(30) **Foreign Application Priority Data**

Jul. 29, 2005 (CN) 2005 2 0103147 U

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

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

(58) **Field of Classification Search** 343/866,
343/742, 842, 702, 787; 340/572.1, 572
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,161,761	A *	12/2000	Ghaem et al.	235/492
7,280,076	B2 *	10/2007	Ninomiya et al.	343/702
7,546,671	B2 *	6/2009	Finn	29/592.1
2001/0002826	A1 *	6/2001	Tuttle et al.	343/872
2002/0044096	A1 *	4/2002	Chung	343/742

FOREIGN PATENT DOCUMENTS

CN	1332588	A	1/2002
CN	2696249	Y	4/2005
JP	2004171087		6/2004

* cited by examiner

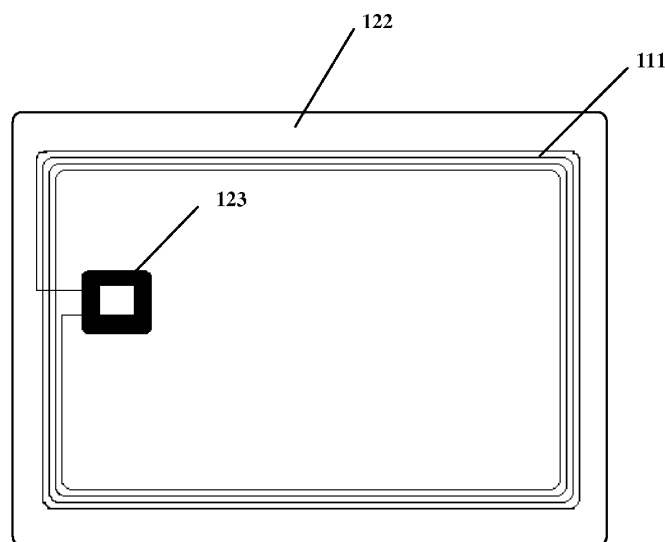
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—Gibb I.P. Law Firm, LLC

(57) **ABSTRACT**

An antenna for the non-contact interface of a plug-in dual-interface smart card, wherein the plug-in smart card includes a card module and chip base, the antenna includes a substrate, antenna loop fixed on the first surface of the substrate, and the first and second pins of the antenna, wherein the substrate comprises a structure to cooperate with the card module, the first and second contact points on the second surface, and the first and second vias. The first and second contact points and structure cooperating with the card module are arranged on the substrate on the position corresponding to the contact points of the plug-in smart card. The first and second antenna pins connect with the first and second contact points via the first and second vias.

11 Claims, 7 Drawing Sheets



Acrobat 文件



US007746276B2

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

(10) **Patent No.:** **US 7,746,276 B2**
(45) **Date of Patent:** **Jun. 29, 2010**

(54) **MICROSTRIP MULTI-BAND COMPOSITE ANTENNA**

(75) Inventors: **Emanoil Surducan**, Cluj-Napoca (RO);
Daniel Iancu, Pleasantville, NY (US);
John Glossner, Carmel, NY (US)

(73) Assignee: **Sandbridge Technologies, Inc.**, White Plains, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 514 days.

(21) Appl. No.: **11/719,246**

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

(86) PCT No.: **PCT/US2006/003564**

§ 371 (c)(1),
(2), (4) Date: **May 14, 2007**

(87) PCT Pub. No.: **WO2006/086194**

PCT Pub. Date: **Aug. 17, 2006**

(65) **Prior Publication Data**

US 2009/0079658 A1 Mar. 26, 2009

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

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

(58) **Field of Classification Search** 343/700 MS,
343/702; 333/132–133, 12
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,554,960 A * 9/1996 Ohnuki et al. 333/132
6,326,863 B1 * 12/2001 Kushitani et al. 333/128
6,608,534 B2 * 8/2003 Kushitani et al. 333/126
6,781,479 B2 * 8/2004 Ikada et al. 333/133
6,788,164 B2 * 9/2004 Maekawa et al. 333/26

7,026,887 B2 * 4/2006 Watanabe et al. 333/126
2001/0038325 A1 11/2001 Smith et al.
2002/0027482 A1 * 3/2002 Kushitani et al. 333/126
2003/0011439 A1 * 1/2003 Kawanami 333/24.2
2004/0041660 A1 * 3/2004 Kawahara et al. 333/133
2006/0055602 A1 3/2006 Huber et al.
2007/0085108 A1 * 4/2007 White et al. 257/173

FOREIGN PATENT DOCUMENTS

EP 0 871 238 A 10/1998
EP 1487051 A1 12/2004
GB 2 340 309 A 2/2000
WO 03/034545 A1 4/2003
WO WO 03/044897 A 5/2003
WO WO 2004/070875 A 8/2004
WO 2004/077610 A1 9/2004

OTHER PUBLICATIONS

Extended European search report; dated Oct. 9, 2008 for European Application No. 0672088.1.

Surducan E, et al.; "Modified Printed Dipole Antennas for Wireless Multi-Band Communication Devices" URSI 2004 Int'l Symposium on Electromagnetic Theory; vol. 2, May 23, 2004.

Anguera J, et al.; "Multifrequency Microstrip Patch Antenna Using Multiple Stacked Elements"; IEEE Microwave and Wireless Components Letters; vol. 13, No. 3, Mar. 1, 2003.

* cited by examiner

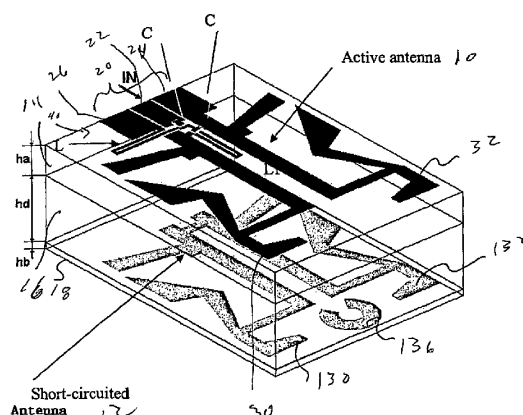
Primary Examiner—Huedung Mancuso

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

(57) **ABSTRACT**

The multi-band antenna structure includes a first antenna having a band width about a middle frequency and a second antenna spaced and electrically isolated from the antenna. Ends of the second antenna are shorted to each other and the antenna floats electrically. The first and second antennas are planar and superimposed in parallel planes. At least two layers of dielectric material of a thickness is between the two antennas. A third layer of dielectric material of a third thickness is between the two antennas.

20 Claims, 3 Drawing Sheets



Acrobat 文件



US007746277B2

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

(10) **Patent No.:** **US 7,746,277 B2**
(45) **Date of Patent:** **Jun. 29, 2010**

(54) **PLANE SUPER WIDE BAND COUPLING ANTENNA**

(75) Inventors: **Ching-Hsiung Huang**, Taipei County (TW); **Ming-Han Perng**, Taipei County (TW); **Chung-Ming Lin**, Taipei County (TW); **Chia-Cheng Lo**, Taipei County (TW); **Ming-Lai Chen**, Taipei County (TW)

(73) Assignee: **Joinsoon Electronic Mfg Co. Ltd.**, Xizhi, Taipei Country (TW)

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

(21) Appl. No.: **12/054,386**

(22) Filed: **Mar. 25, 2008**

(65) **Prior Publication Data**

US 2009/0243935 A1 Oct. 1, 2009

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

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

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

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,425,924 B2 * 9/2008 Chung et al. 343/702

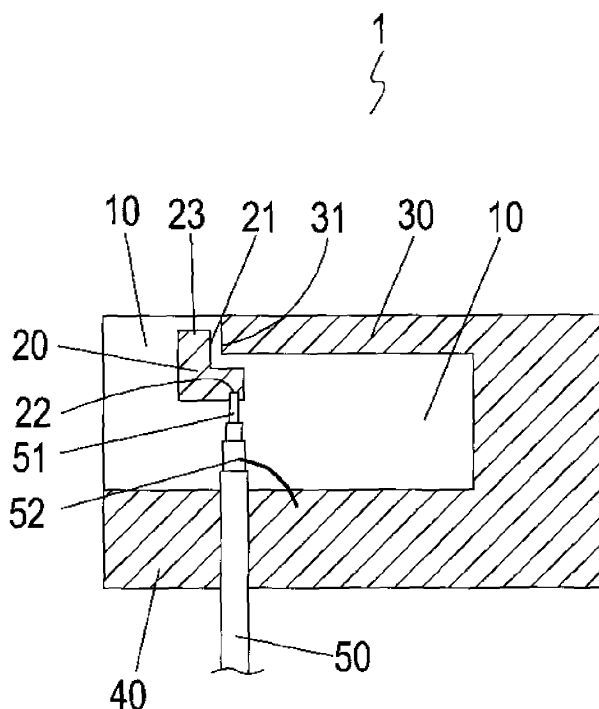
* cited by examiner

Primary Examiner—Hoang V Nguyen

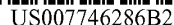
(57) **ABSTRACT**

A plane super wide band coupling antenna comprises an isolating substrate for installing with a metal thin film layer by printing; a first radiating portion being a metal thin film layer printed upon the isolating substrate; the first radiating portion having a coupling section and being extended with a feeding point; a second radiating portion being a metal thin film layer printed upon the isolating substrate; the second radiating portion extending from a ground portion on the isolating substrate and being a bended structure; the second radiating portion being formed with gaps with the first radiating portion; the ground portion being formed by a metal thin film layer; one end thereof being electrically connected to the second radiating portion; a signal feeding wire being a coaxial cable; and the main signal wire of the signal feeding wire being electrically connected to the feeding point of the first radiating portion.

5 Claims, 4 Drawing Sheets



Acrobat 文件





US007746287B2

(12) **United States Patent**
Noro

(10) **Patent No.:** **US 7,746,287 B2**
(45) **Date of Patent:** ***Jun. 29, 2010**

(54) **ANTENNA APPARATUS INCLUDING A SHIELD COVER WHICH COVERS AN AMPLIFICATION CIRCUIT, THE SHIELD COVER HAVING AN APERTURE POSITIONED TO ALLOW OBSERVATION OF AN INPUT UNIT OF THE AMPLIFICATION CIRCUIT FROM OUTSIDE OF THE SHIELD COVER**

(75) Inventor: **Junichi Noro, Akita (JP)**

(73) Assignee: **Mitsumi Electric Co., Ltd., Tama-shi (JP)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 358 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/895,099**

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

(65) **Prior Publication Data**

US 2008/0068278 A1 Mar. 20, 2008

(30) **Foreign Application Priority Data**

Sep. 19, 2006 (JP) 2006-252292

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

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

(58) **Field of Classification Search** 343/711,
343/712, 713, 841, 700 MS

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,585,806	A *	12/1996	Ogino et al.	343/700 MS
5,831,577	A	11/1998	Nichols et al.	
6,538,611	B2	3/2003	Noro	
6,674,013	B2	1/2004	Noro et al.	
6,879,294	B2	4/2005	Yuanzhu	
7,327,328	B2	2/2008	Yoneya et al.	
2008/0068279	A1	3/2008	Noro	

FOREIGN PATENT DOCUMENTS

JP	2004-72320	A	3/2004
JP	2004-228357	A	8/2004
JP	2005-110007	A	4/2005

* cited by examiner

Primary Examiner—Hoang V Nguyen

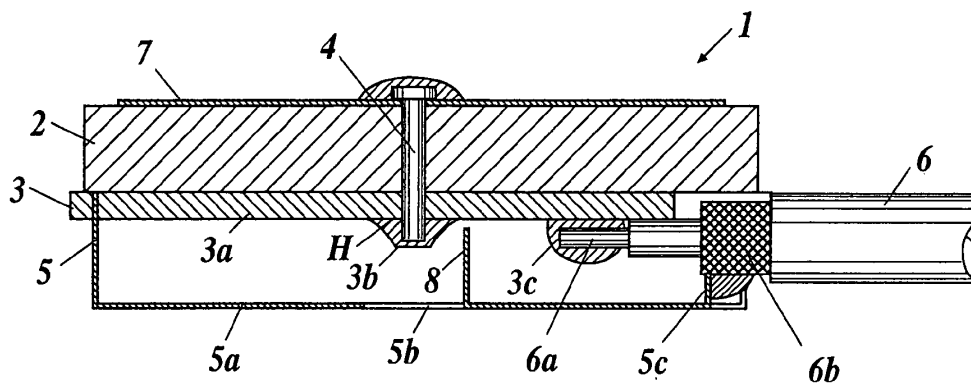
Assistant Examiner—Robert Karacsony

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

(57) **ABSTRACT**

Disclosed is an antenna apparatus that includes: an antenna element including a receiving unit to receive a radio wave; a circuit board on which an amplifier circuit to amplify an input signal sent from the antenna element is formed; an input pin to connect the receiving unit with the amplifier circuit; and a shield cover to cover the amplifier circuit on the circuit board, the shield cover shielding the amplifier circuit from a disturbing wave, wherein the input pin penetrates through the circuit board and is connected to the amplifier circuit by soldering, so as to structure an input unit of the circuit, and an ascertainment aperture is provided in the shield cover, the ascertainment aperture positioned such that the input unit can be observed from outside of the shield cover.

5 Claims, 4 Drawing Sheets



Acrobat 文件



US007746288B2

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

(10) **Patent No.:** **US 7,746,288 B2**
(45) **Date of Patent:** **Jun. 29, 2010**

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

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

(73) Assignee: **Yageo Corporation**, Kaohsiung (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1050 days.

(21) Appl. No.: **11/437,686**

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

(65) **Prior Publication Data**

US 2007/0200774 A1 Aug. 30, 2007

(30) **Foreign Application Priority Data**

Feb. 24, 2006 (TW) 95106360 A

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

(52) **U.S. Cl.** **343/846**; 343/702

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

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,339,400 B1 1/2002 Flint et al.
6,876,329 B2 * 4/2005 Milosavljevic 343/700 MS
6,982,675 B2 1/2006 Kwak et al.
2004/0014474 A1 1/2004 Kanada

FOREIGN PATENT DOCUMENTS

JP 59078707 5/1984

JP	2002-050924	2/2002
JP	2003-008342	2/2003
JP	2004023768 A	1/2004
JP	2004-064282	2/2004
JP	2004-228640	8/2004
TW	542416	7/2003
TW	227576 B1	2/2005
TW	257522	2/2005
TW	229473 B	3/2005

OTHER PUBLICATIONS

Apr. 1, 2008 Office Action for Corresponding Japanese Patent Application No. 2006-143018.

Feb. 24, 2009 Notice of Allowance for Corresponding Japanese Patent Application No. 2006-143018.

Dec. 17, 2008 Office Action for corresponding Taiwan, R.O.C. Patent Application No. 095106360.

* cited by examiner

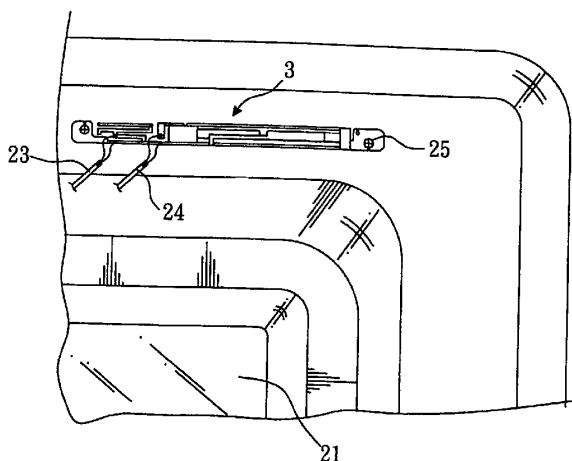
Primary Examiner—Michael C Wimer

(74) *Attorney, Agent, or Firm*—Volentine & Whitt, PLLC

(57) **ABSTRACT**

The present invention relates to an antenna for WWAN and an integrated antenna for WWAN, WLAN, and GPS. The integrated antenna comprises a ground metal plate, a coupled WWAN antenna, a WLAN antenna, an auxiliary grounding element, and at least one supporting element. The integrated antenna of the invention can be applied to a wireless electronic device with WWAN and WLAN by utilizing the coupled WWAN antenna to induce a WWAN frequency and the WLAN antenna to induce a WLAN frequency. In addition, the ground metal plate and the auxiliary grounding element are selectively connected or not connected to a ground end of the wireless electronic device, and can be separately used to provide grounding effect. Therefore, the integrated antenna can be mounted on any part of the wireless electronic device, and can have stable electrical characteristic.

35 Claims, 10 Drawing Sheets



Acrobat 文件