



US007369012B2

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

(10) **Patent No.:** **US 7,369,012 B2**
(45) **Date of Patent:** **May 6, 2008**

(54) **ANTENNA DUPLEXER**

(75) Inventors: **Masanori Hongo**, Osaka (JP); **Natsuyo Nagano**, Osaka (JP); **Takashi Ogura**, Kyoto (JP); **Hideki Ito**, Osaka (JP); **Toshio Tanuma**, Osaka (JP)

(73) Assignee: **Sanyo Electric Co., Ltd.**, Moriguchi-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.: **10/992,642**

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

(65) **Prior Publication Data**

US 2005/0116789 A1 Jun. 2, 2005

(30) **Foreign Application Priority Data**

Nov. 27, 2003 (JP) 2003-397970

(51) **Int. Cl.**
H01P 5/12 (2006.01)
H03H 9/00 (2006.01)

(52) **U.S. Cl.** **333/126; 333/133; 333/193**

(58) **Field of Classification Search** **333/126, 333/133, 193-196**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,339,365 B1 * 1/2002 Kawase et al. 333/193

6,466,103 B2 * 10/2002 Iwamoto et al. 333/133
6,489,860 B1 * 12/2002 Ohashi 333/133
6,566,981 B2 * 5/2003 Urabe et al. 333/193
6,759,924 B2 * 7/2004 Sakuragawa et al. 333/133
6,838,956 B2 * 1/2005 Bradley 333/189
6,943,645 B2 * 9/2005 Taniguchi 333/133
6,965,282 B2 * 11/2005 Kawachi et al. 333/193
7,030,716 B2 * 4/2006 Tsutsumi et al. 333/193

FOREIGN PATENT DOCUMENTS

JP 11-340781 12/1999
JP 2000-307383 11/2000
JP 2001352227 * 12/2001

* cited by examiner

Primary Examiner—Benny Lee

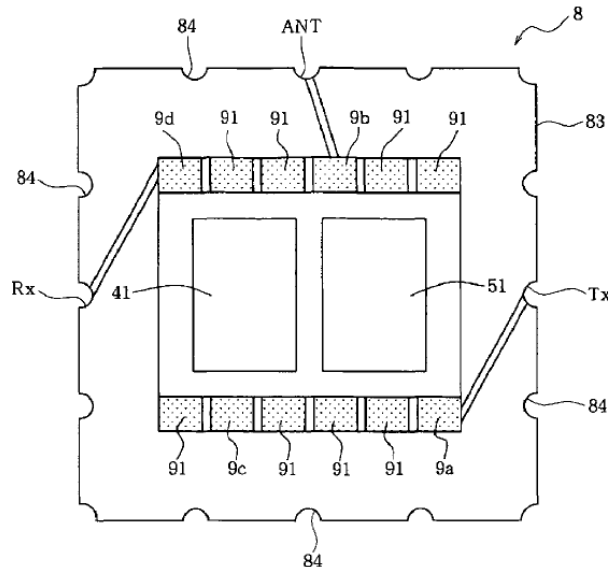
Assistant Examiner—Kimberly E Glenn

(74) *Attorney, Agent, or Firm*—Kratz, Quintos & Hanson, LLP

(57) **ABSTRACT**

The present invention provides an antenna duplexer comprising a transmitting filter and a receiving filter which are mounted on a package, a transmitting signal input pad and a transmitting signal output pad which are connected to input and output ends of the transmitting filter, a receiving signal input pad and a receiving signal output pad which are connected to input and output ends of the receiving filter, and at least one grounding pad. The pads are arranged, on a surface of the package, along at least two sides of four sides of a quadrangle. The transmitting signal input pad and the receiving signal output pad are disposed at diagonal positions of the quadrangle and are furthest away from one another.

4 Claims, 3 Drawing Sheets



Acrobat 文件



US007369086B2

(12) **United States Patent**
Luen

(10) **Patent No.:** **US 7,369,086 B2**
(45) **Date of Patent:** **May 6, 2008**

(54) **MINIATURE VERTICALLY POLARIZED
MULTIPLE FREQUENCY BAND ANTENNA
AND METHOD OF PROVIDING AN
ANTENNA FOR A WIRELESS DEVICE**

6,781,546 B2 * 8/2004 Wang et al. 343/700 MS
6,933,893 B2 * 8/2005 Rubinshteyn et al. 343/700 MS
2002/0057220 A1 * 5/2002 Sabet et al. 343/700 MS
2002/0109642 A1 * 8/2002 Gee et al. 343/876
2004/0113848 A1 * 6/2004 Gaucher et al. 343/702

(75) Inventor: **Kong S. Luen**, Germantown, MD (US)

(73) Assignee: **FreeScale 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 601 days.

(21) Appl. No.: **10/403,492**

(22) Filed: **Mar. 31, 2003**

(65) **Prior Publication Data**

US 2004/0192226 A1 Sep. 30, 2004

(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, 795, 820, 876
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,827,271 A * 5/1989 Berneking et al. ... 343/700 MS
5,105,175 A * 4/1992 Kaltenecker 333/219
5,507,012 A * 4/1996 Luxon et al. 455/89
5,532,708 A * 7/1996 Krenz et al. 343/795
5,990,838 A * 11/1999 Burns et al. 343/702
6,362,792 B1 * 3/2002 Sawamura et al. 343/702

OTHER PUBLICATIONS

"Analysis of a Coaxially-fed Patch Antenna", published Jul. 9, 1998, and found at the web site <http://lc.cray.com/apps/pat/>.*

* cited by examiner

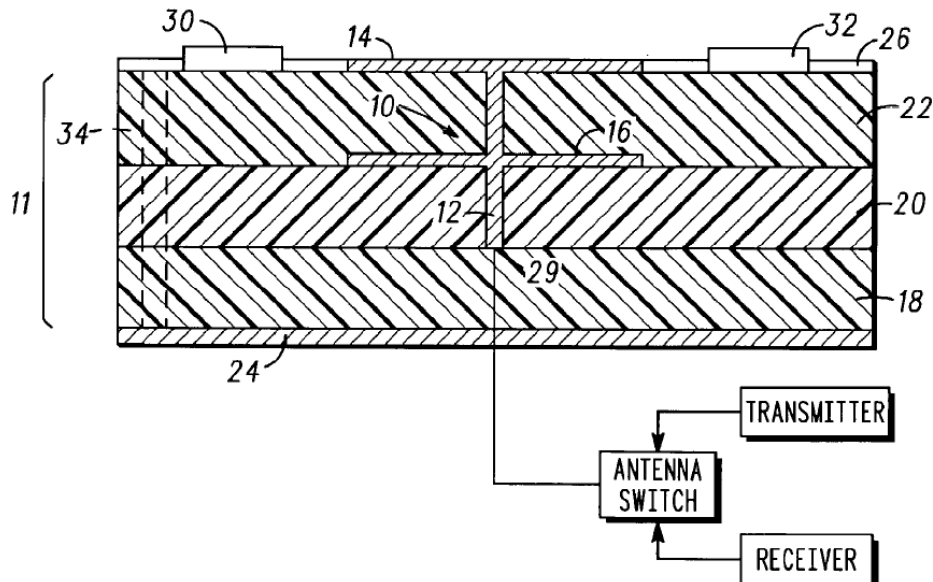
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—Charles W. Bethards

(57) **ABSTRACT**

A miniature vertically polarized multi-frequency antenna 10 is embedded in a substrate 11 and suitable for use within a wireless device. The antenna 10 includes a first lateral member 14 and a second lateral member 16, which is spaced from and parallel to the first lateral member 14. The antenna 10 has a wide tuning range due to multiple resonances provided by the lateral members 14, 16. The antenna 10 is shortened by reactive loading and by embedding the antenna in material having a high dielectric constant. Tuning circuits 30, 32 are coupled to respective ends of one of the lateral members 14, 16. The tuning circuits are located on a common plane with the lateral member to which they are connected. The tuning circuits 30, 32 electronically add reactance to the antenna to alter the frequency at which it resonates. A method of providing the antenna 10 includes forming flat metal strips 14, 16 on layers of a laminated substrate 11 and forming the second lateral member 16 between adjacent layers 20, 22 of the substrate 11.

20 Claims, 2 Drawing Sheets



Acrobat 文件



US007369089B2

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

(10) **Patent No.:** **US 7,369,089 B2**

(45) **Date of Patent:** **May 6, 2008**

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

FOREIGN PATENT DOCUMENTS

DE 101 37 946 A1 4/2003

(75) Inventors: **Geyi Wen**, Waterloo (CA); **Krystyna Bandurska**, Waterloo (CA); **Perry Jarmuszewski**, Waterloo (CA)

(Continued)

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

OTHER PUBLICATIONS

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

Microwave Journal, May 1984, p. 242, advertisement of Solitron/Microwave, XP002032716 various RF connectors with posts see left hand column.

(Continued)

(21) Appl. No.: **11/777,448**

Primary Examiner—Shih-Chao Chen

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

(74) Attorney, Agent, or Firm—Jones Day; Krishna K. Pathiyal; Robert C. Liang

(65) **Prior Publication Data**

(57) **ABSTRACT**

US 2007/0257846 A1 Nov. 8, 2007

Related U.S. Application Data

(63) Continuation of application No. 11/344,753, filed on Feb. 1, 2006, now Pat. No. 7,256,741, which is a continuation of application No. 10/844,685, filed on May 13, 2004, now Pat. No. 7,023,387.

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 1/24 (2006.01)
H01Q 13/10 (2006.01)

(52) **U.S. Cl.** **343/700 MS; 343/702; 343/770**

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

(56) **References Cited**

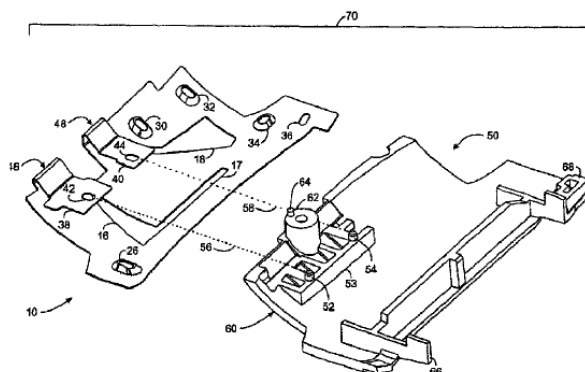
U.S. PATENT DOCUMENTS

3,521,284 A 7/1970 Shelton, Jr. et al. 343/702

A multiple-band antenna having a plurality of operating frequency bands is provided. The antenna includes a plurality of structures configured for operation in respective ones of the plurality of operating frequency bands, and a plurality of structures configured for operation in more than one of the plurality of operating frequency bands. In one embodiment, a multiple-band antenna has first, second, and third operating frequency bands, and comprises a first patch structure associated with the first operating frequency band, a second patch structure connected to the first patch structure and associated with the second operating frequency band and the third operating frequency band, a first slot structure disposed between a first portion of the first patch structure and the second patch structure and associated with the first operating frequency band and the second operating frequency band, a second slot structure disposed between a second portion of the first patch structure and the second patch structure and associated with the second operating frequency band, and a third slot structure disposed between a third portion of the first patch structure and the second patch structure and associated with the first operating frequency band and the third operating frequency band.

(Continued)

20 Claims, 7 Drawing Sheets



Acrobat 文件



US007369091B2

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

(10) **Patent No.:** **US 7,369,091 B2**
(45) **Date of Patent:** **May 6, 2008**

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE HAVING DUAL ANTENNA SYSTEM
FOR CELLULAR AND WIFI**

(75) Inventors: **Ying Tong Man**, Waterloo (CA);
Yihong Qi, St. Agatha (CA)

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

(*) 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.: **11/468,803**

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

(65) **Prior Publication Data**
US 2008/0055163 A1 Mar. 6, 2008

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

(52) **U.S. Cl.** **343/702; 343/725**

(58) **Field of Classification Search** **343/702,**
343/725, 700 MS, 893
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,448,933 B1 * 9/2002 Hill et al. 343/702
6,670,923 B1 12/2003 Kadambi et al. 343/700
6,885,880 B1 4/2005 Ali 455/575.7
6,922,172 B2 7/2005 Oshiyama et al. 343/700
6,930,641 B2 8/2005 Ohara et al. 343/702
6,980,154 B2 12/2005 Vance et al. 343/700

7,015,863 B2 3/2006 Sadler et al. 343/702
7,043,285 B2 5/2006 Boyle 455/575.7
7,053,844 B2 5/2006 Gaucher et al. 343/702
2005/0041624 A1 2/2005 Hui et al. 370/335
2005/0057407 A1 3/2005 Imaizumi et al. 343/702
2005/0225484 A1 * 10/2005 Kuramoto 343/700 MS
2005/0237251 A1 10/2005 Boyle et al. 343/770
2006/0181468 A1 8/2006 Iguchi et al. 343/702
2006/0214857 A1 * 9/2006 Ollikainen 343/702
2006/0250307 A1 * 11/2006 Liu et al. 343/700 MS

FOREIGN PATENT DOCUMENTS

EP 1 291 968 3/2003
EP 1 503 450 2/2005
WO 02/05381 1/2002
WO 2005/067635 7/2005

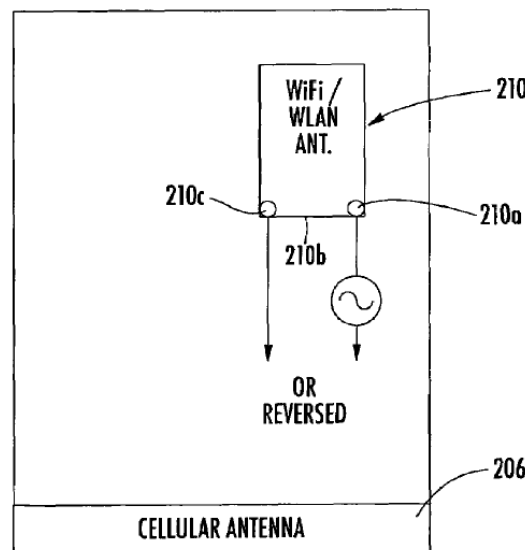
* cited by examiner

Primary Examiner—Hoang V Nguyen
(74) *Attorney, Agent, or Firm*—Allen, Dyer, Doppelt,
Milbrath & Gilchrist, P.A.

(57) **ABSTRACT**

A mobile wireless communications device includes a housing and circuit board carried by the housing. Radio Frequency (RF) circuitry is mounted on the circuit board. A first antenna is supported by the circuit board within the housing and operatively connected to the RF circuitry and configured for cellular phone communications. A second antenna is supported by the circuit board within the housing and operatively connected to the RF circuitry and configured for WiFi communications. The second antenna comprises an inverted-F or monopole antenna having an opening gap that is pointed away from the first antenna.

22 Claims, 5 Drawing Sheets



Acrobat 文件



US007369094B2

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

(10) **Patent No.:** **US 7,369,094 B2**
(45) **Date of Patent:** **May 6, 2008**

(54) **DUAL-FREQUENCY HIGH-GAIN ANTENNA**

(75) Inventors: **Jia-Jiu Song**, Jhonghe (TW); **Wei-Tong Cheng**, Hsinchu (TW)

(73) Assignee: **Smartant Telecom Co., Ltd.**, Hsinchu County (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.: **11/526,663**

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

(65) **Prior Publication Data**

US 2008/0074340 A1 Mar. 27, 2008

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

(52) **U.S. Cl.** **343/816**; 343/820; 343/810

(58) **Field of Classification Search** 343/700 MS, 343/793, 810, 816, 820
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,102,586 B2 * 9/2006 Liang et al. 343/795

7,215,285 B2 * 5/2007 Song et al. 343/700 MS
2005/0073465 A1 * 4/2005 Olson 343/795
2007/0063913 A1 * 3/2007 Wu et al. 343/824

* cited by examiner

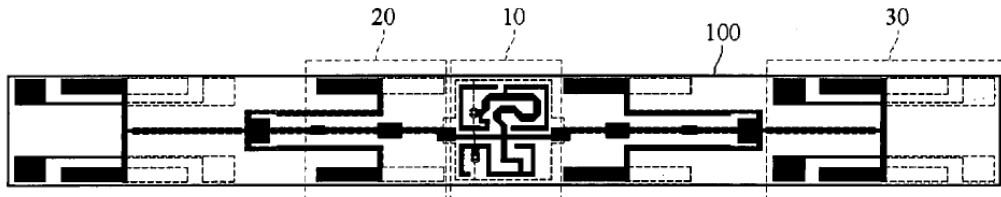
Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—Rabin & Berdo, P.C.

(57) **ABSTRACT**

A dual-frequency high-gain antenna is provided, which includes: a diplexer loop portion disposed at the center of the antenna substrate for receiving a feed signal; two single-frequency radiation units, symmetrically connected to two sides of the diplexer loop portion for radiating a radio-frequency signal corresponding to a first frequency value of the feed signal; and two dual-frequency radiation units, respectively connected to each single-frequency radiation portion for radiating radio-frequency signals corresponding to the first frequency value and a second frequency value of the feed signal.

12 Claims, 11 Drawing Sheets



Acrobat 文件



US007372373B2

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

(10) **Patent No.:** **US 7,372,373 B2**

(45) **Date of Patent:** **May 13, 2008**

(54) **EMBEDDED ANTENNA AND FILTER
APPARATUS AND METHODOLOGY**

(75) Inventors: **Vladimir Borisov**, Seneca, SC (US);
Philippe Chiumminto, Seneca, SC
(US); **Semyon Lapushin**, Tucker, GA
(US); **Sudhir Thumaty**, Clemson, SC
(US)

(73) Assignee: **Itron, Inc.**, Liberty Lake, WA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 442 days.

(21) Appl. No.: **11/211,153**

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

(65) **Prior Publication Data**

US 2006/0055610 A1 Mar. 16, 2006

Related U.S. Application Data

(60) Provisional application No. 60/604,973, filed on Aug.
27, 2004.

(51) **Int. Cl.**
G08B 23/00 (2006.01)

(52) **U.S. Cl.** **340/870.02**; 343/782; 301/659;
301/748; 301/761; 301/765; 333/12; 333/202;
324/84

(58) **Field of Classification Search** 340/870.02;
343/782; 301/659, 748, 761, 765; 333/12,
333/202; 716/15; 324/84
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,963,843 A * 10/1990 Peckham 333/203
5,801,597 A * 9/1998 Carter et al. 333/12

5,801,605 A * 9/1998 Filakovsky 333/203
6,023,608 A * 2/2000 Yrjola et al. 455/78
6,078,785 A 6/2000 Bush
6,104,821 A * 8/2000 Husung 381/312
6,175,727 B1 * 1/2001 Mostov 455/307
6,636,406 B1 * 10/2003 Anthony 361/118
6,737,985 B1 5/2004 Garrard et al.
6,781,486 B2 * 8/2004 Killen et al. 333/204
6,801,101 B2 * 10/2004 Hiroshima et al. 333/134
6,876,056 B2 * 4/2005 Tilmans et al. 257/528
7,111,271 B2 * 9/2006 Li et al. 716/15

OTHER PUBLICATIONS

"Current Affairs—Advance in AMR Technology" Metering Inter-
national, Issue 2, 2000.

* cited by examiner

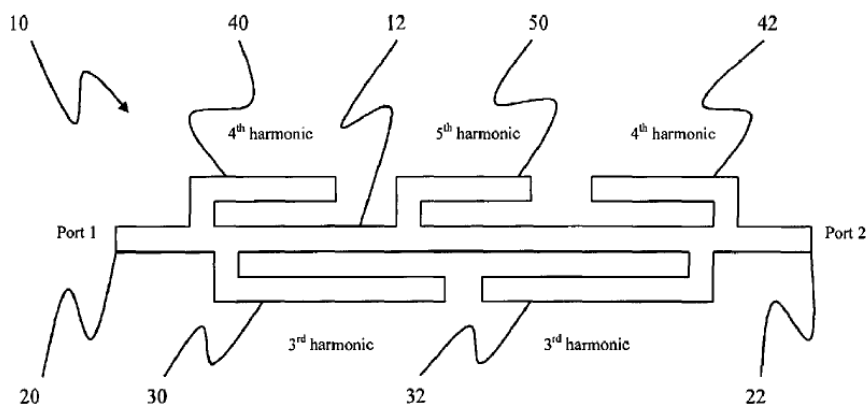
Primary Examiner—Albert K. Wong

(74) *Attorney, Agent, or Firm*—Dority & Manning, P.A.

(57) **ABSTRACT**

Apparatus and methodology are disclosed for providing effective transmission of data to and/or from an electricity meter by providing embedded radio frequency components. An antenna and stripline or microline filter arrangement are provided as embedded components in association with a transmitter or transceiver portion of the electricity meter's metrology circuitry so as to provide control of out of band harmonic radiation and to provide enhanced signal transmission to and/or from the electricity meter, to accomplish automated meter reading communications or similar. The antenna element is configured and mounted such that, once the electricity meter is fully assembled, the meter case itself can be used as part of a radiating element. An overall resulting integrated design can achieve greater economy utilizing printed circuit board approaches with no additional parts, and with less uncontrolled surface radiation because of the otherwise buried or embedded structure.

18 Claims, 3 Drawing Sheets



Acrobat 文件



US007372406B2

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

(10) **Patent No.:** **US 7,372,406 B2**
(45) **Date of Patent:** **May 13, 2008**

(54) **ANTENNA APPARATUS INCLUDING
INVERTED-F ANTENNA HAVING VARIABLE
RESONANCE FREQUENCY**

(75) Inventors: **Shinichi Shiotsu**, Kawasaki (JP);
Isamu Yamada, Kawasaki (JP);
Youichi Kondo, Kawasaki (JP)

(73) Assignee: **Fujitsu Limited**, Kawasaki (JP)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 551 days.

(21) Appl. No.: **10/639,490**

(22) Filed: **Aug. 13, 2003**

(65) **Prior Publication Data**

US 2004/0041734 A1 Mar. 4, 2004

(30) **Foreign Application Priority Data**

Aug. 30, 2002 (JP) 2002-253729

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

(52) **U.S. Cl.** **343/700 MS; 343/850**

(58) **Field of Classification Search** 343/700 MS,
343/702, 745, 795, 846, 850, 860
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,508,272 A * 4/1970 Khan et al. 343/745
5,379,007 A 1/1995 Nakahara 343/702
5,734,305 A 3/1998 Ervasti 343/700 MS
5,969,681 A * 10/1999 O'Neill, Jr. 343/700 MS
6,034,636 A * 3/2000 Saitoh 343/700 MS
6,034,640 A * 3/2000 Oida et al. 343/722

6,204,819 B1 * 3/2001 Hayes et al. 343/702
6,211,830 B1 * 4/2001 Monma et al. 343/702
6,255,994 B1 * 7/2001 Saito 343/700 MS
6,701,167 B2 3/2004 Odachi et al. 343/702
6,734,828 B2 * 5/2004 Shor 343/795
6,864,848 B2 * 3/2005 Sievenpiper 343/767
7,164,387 B2 * 1/2007 Sievenpiper 343/702

FOREIGN PATENT DOCUMENTS

JP 59-44103 3/1984
JP 4-183102 6/1992
JP 6-97725 4/1994
JP 6-338702 12/1994
JP 7-7321 1/1995
JP 8-186420 7/1996
JP 8-307106 11/1996
JP 10-190344 7/1998
JP 10-284919 10/1998
JP 11-136025 5/1999
JP 11-251825 9/1999
JP 2001-189615 7/2001
JP 2001-223507 8/2001

OTHER PUBLICATIONS

Japanese Office Action transmitted on Mar. 14, 2006 for corre-
sponding Japanese Application.

Japanese Office Action transmitted on Jun. 6, 2006 for correspond-
ing Japanese Application.

* cited by examiner

Primary Examiner—Tan Ho

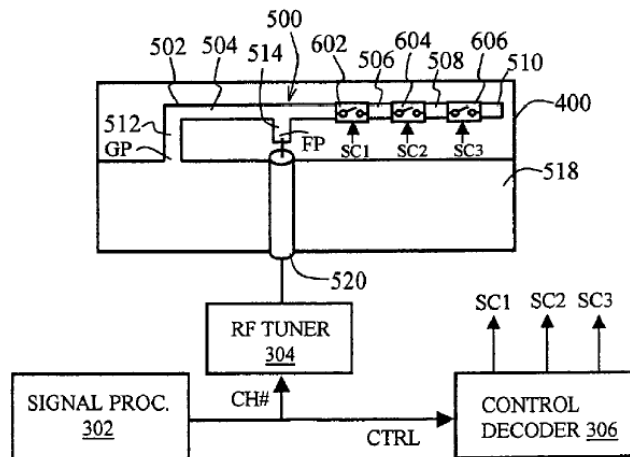
Assistant Examiner—Jimmy T Vu

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

(57) **ABSTRACT**

An inverted-F antenna has at least two antenna conductive
elements coupled in series via at least one switch. An
antenna apparatus includes control means for controlling the
at least one switch.

2 Claims, 8 Drawing Sheets



Acrobat 文件



US007372409B2

(12) **United States Patent**
Morton

(10) **Patent No.:** **US 7,372,409 B2**
(45) **Date of Patent:** **May 13, 2008**

(54) **SLIT LOADED TAPERED SLOT PATCH ANTENNA**

2004/0066345 A1* 4/2004 Schadler 343/767
2007/0046554 A1* 3/2007 Fukuchi 343/767
2007/0080878 A1* 4/2007 McLean 343/725

(75) Inventor: **Jacob Morton**, Melbourne, FL (US)

OTHER PUBLICATIONS

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

Chen, Zhi Ning, "Center-Fed Microstrip Patch Antenna", IEEE Transactions on Antennas and Propagation, vol. 51, No. 3, Mar. 2003.

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 244 days.

* cited by examiner

Primary Examiner—Hoanganh Le

(21) Appl. No.: **11/358,146**

(74) Attorney, Agent, or Firm—Darby & Darby; Robert J. Sacco

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

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2007/0194999 A1 Aug. 23, 2007

Patch antenna (100) for a wireless communications device has a reduced size. The patch antenna is operable on a fundamental frequency f_0 and a first harmonic f_1 of the fundamental frequency, with substantially co-located peak gain directions on both frequencies. The patch antenna (100) is formed from a conductive ground plane (102) of generally rectangular shape. A first aperture (108) provided in the conductive ground plane member (102) defines a bow-tie shape. Additional elongated apertures (118, 120) are provided for reactive loading. The elongated apertures (118, 120) disrupt the phasing of surface currents within the conductive ground plane member (102) around the periphery of the first aperture (108).

(51) **Int. Cl.**

H01Q 1/38 (2006.01)

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

(58) **Field of Classification Search** 343/700 MS, 343/767, 770, 846, 848, 795

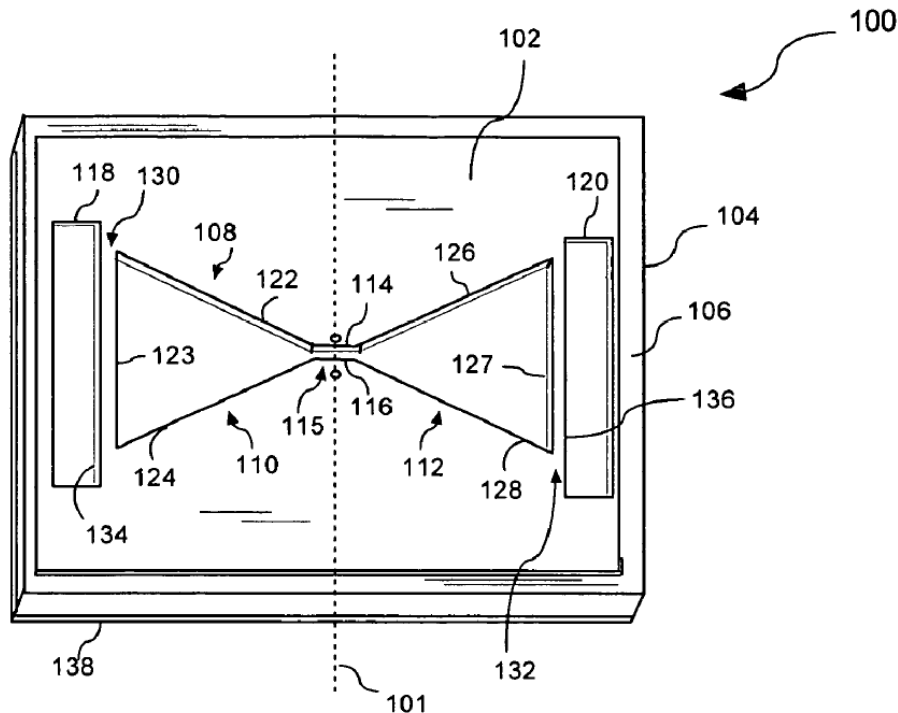
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,424,309 B1* 7/2002 Johnston et al. 343/767
6,429,819 B1 8/2002 Bishop et al.

20 Claims, 7 Drawing Sheets



Acrobat 文件



US007372417B2

(12) **United States Patent**
Fukuchi

(10) **Patent No.:** **US 7,372,417 B2**
(45) **Date of Patent:** **May 13, 2008**

(54) **WIDEBAND ANTENNA**

2006/0055619 A1* 3/2006 Sarabandi et al. 343/866

(75) Inventor: **Keisuke Fukuchi**, Hitachi (JP)

FOREIGN PATENT DOCUMENTS

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

JP 2004-343424 A 12/2004

JP 2005-094437 A 4/2005

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

JP 2005-094499 A 4/2005

OTHER PUBLICATIONS

(21) Appl. No.: **11/444,538**

Chang et al., *Microwave and Optical Technology Letters*, vol. 25, No. 3, May 5, 2000, pp. 206-211.

(22) Filed: **Jun. 1, 2006**

* cited by examiner

(65) **Prior Publication Data**

US 2007/0046554 A1 Mar. 1, 2007

Primary Examiner—Hoanganh Le

(74) Attorney, Agent, or Firm—Foley & Lardner LLP

(30) **Foreign Application Priority Data**

Aug. 31, 2005 (JP) 2005-252142

(57) **ABSTRACT**

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

(52) U.S. Cl. **343/767**; 343/795; 343/700 MS

(58) Field of Classification Search 343/767, 343/768, 700 MS, 795

See application file for complete search history.

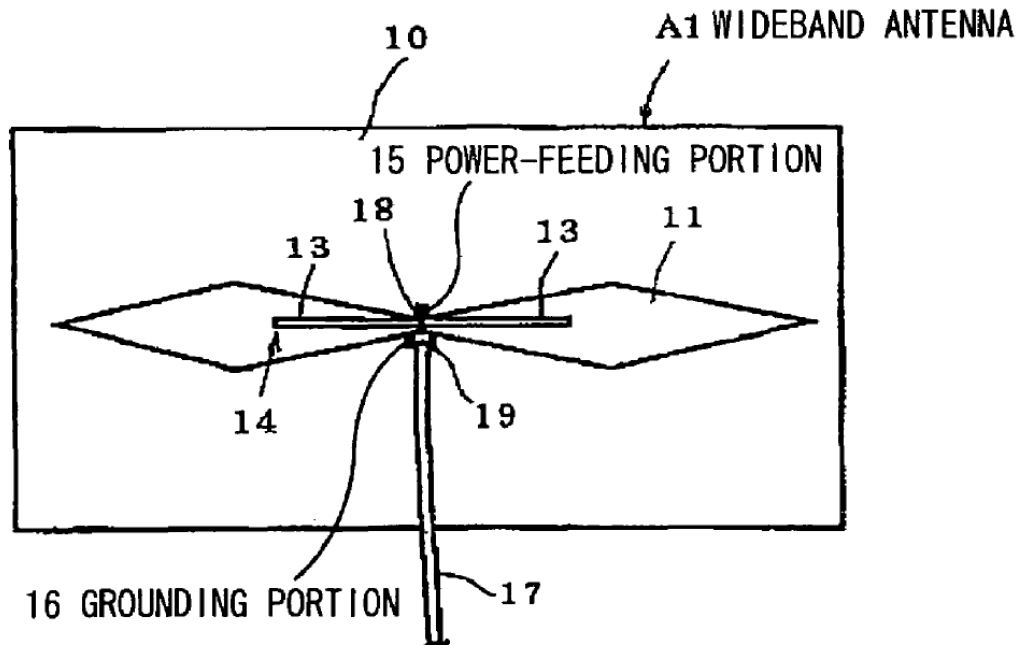
A wideband antenna has: a rectangular conductor sheet; a bow-tie-shaped slit formed in the rectangular conductor sheet, the rectangular conductor sheet having two apex portions defined by the bow-tie-shaped slit, the two apex portions being opposite to each other in the middle of the bow-tie-shaped slit; an auxiliary antenna element formed to extend along the bow-tie-shaped slit on both sides of one of the two apex portions; a power-feeding portion formed at the one of the two apex portions; and a grounding portion formed at an other of the two apex portions.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,762,729 B2* 7/2004 Egashira 343/767

6 Claims, 5 Drawing Sheets



Acrobat 文件



(10) **Patent No.:** US 7,372,427 B2
(45) **Date of Patent:** May 13, 2008

- | | | | |
|-----------|---|---------|---------|
| 5,854,608 | A | 12/1998 | Leisten |
| 5,859,621 | A | 1/1999 | Leisten |
| 5,945,963 | A | 8/1999 | Leisten |

(Continued)

FOREIGN PATENT DOCUMENTS

EP	649181	4/1995
----	--------	--------

(Continued)

OTHER PUBLICATIONS

Search Report Under Section 17(5), Patents Act of 1977, British Patent Office, issued in connection with Application No. GB 0505771.6 issued on Dec. 7, 2005.

(Continued)

Primary Examiner—Douglas W. Owens

Assistant Examiner—Minh Dieu A.

(74) *Attorney, Agent, or Firm*—John Bruckner PC

(57) **ABSTRACT**

In a dielectrically-loaded quadrifilar antenna for operation with circularly polarised signals, four coextensive composite helical elements are plated on the outer surface of a cylindrical dielectric core, each composite element comprising two mutually adjacent conductive tracks defining between them an elongate channel or slit. The track edges bounding each channel are longer than the opposite edges of the respective tracks in that they follow parallel meandered paths, with the result that each channel deviates from a mean helical path and is longer than the corresponding portion of the mean helical path. At a frequency within the operating band of the antenna, the channels have respective electrical lengths equivalent to a half wavelength. The bandwidth of the antenna is greater than the bandwidth of a correspondingly dimensioned antenna having single-track helical elements.

41 Claims, 7 Drawing Sheets



Acrobat 文件

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

(10) **Patent No.:** **US 7,375,684 B2**
(45) **Date of Patent:** **May 20, 2008**

(54) **MULTIBAND PLANAR ANTENNA**

2004/0090379 A1* 5/2004 Fourdeux et al. 343/700 MS

(75) Inventors: **Franck Thudor**, Rennes (FR);
François Baron, Cesson Sevigne (FR);
Françoise Le Bolzer, Rennes (FR)

FOREIGN PATENT DOCUMENTS

WO WO 01/20718 A 3/2001

OTHER PUBLICATIONS

(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.

Search Report, 2001.

Guangping Zhou "Shorting-pin loaded annular ring microstrip
antenna" Antennas and Propagation Society International Sympo-
sium, 1998 IEEE Atlanta, GA Jun. 21-16, 1998 New York, NY
IEEE, US.

Ishii N et al. "Analysis On the Mechanism 1-10 of a Tuning Stub
for Circular-Polarized Annular Microstrip Antenna" Electronics &
Communications, Scripta Technica New York, US vol. 78, No. 11
pp. 43-501 Nov. 1995.

Tanaka M et al. "Suppressing Undesired Modes in a Higher-Order
Mode Microstrip Ring Patch Antenna" Electronics & Communica-
tions in Japan, Part 1—Communications, Scripta Technica New
York, US vol. 85, No. 3, Part 1 Mar. 2002 vol. 85, No. 3, Part 1 pp.
9-18.

(21) Appl. No.: **11/064,350**

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

(65) **Prior Publication Data**

US 2005/0190112 A1 Sep. 1, 2005

(30) **Foreign Application Priority Data**

Mar. 1, 2004 (FR) 04 50400

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

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

(58) **Field of Classification Search** **343/700 MS,**
343/767, 768, 769, 770, 846
See application file for complete search history.

* cited by examiner

Primary Examiner—Huedung Mancuso

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

(57) **ABSTRACT**

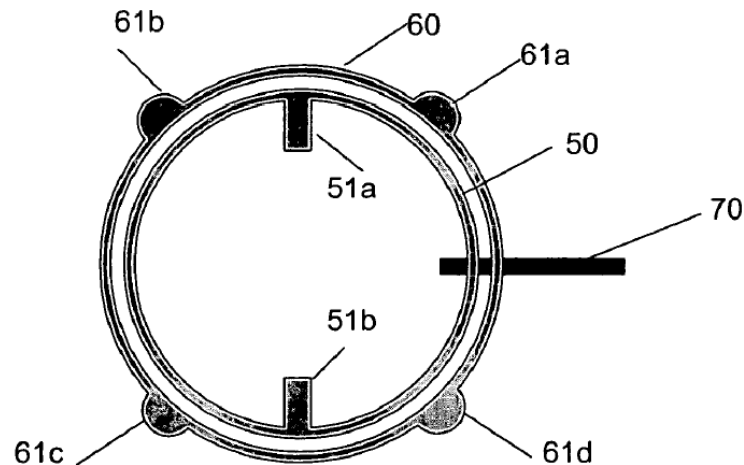
The present invention relates to a multiband planar antenna
consisting of at least one resonator formed of an element
having a closed shape made on a substrate and dimensioned
so as to operate in its fundamental mode at the resonant
frequency of the lowest band. The resonator is fed by a feed
line in such a way as to operate in all the higher modes. The
resonator comprises means for modifying the resonant fre-
quencies of the various modes in such a way as to cover the
bands concerned.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,509,209 A * 4/1985 Itoh et al. 455/327
5,005,019 A * 4/1991 Zaghloul et al. 343/700 MS
5,181,042 A * 1/1993 Kaise et al. 343/700 MS
6,828,942 B2 * 12/2004 Louzir et al. 343/769
6,999,038 B2 * 2/2006 Louzir et al. 343/770
2004/0090376 A1 * 5/2004 Dai et al. 343/700 MS

9 Claims, 7 Drawing Sheets



Acrobat 文件



US007375685B1

(12) **United States Patent**
Nalbandian

(10) **Patent No.:** **US 7,375,685 B1**
(45) **Date of Patent:** **May 20, 2008**

(54) **DUAL BAND ELECTRICALLY SMALL MICROSTRIP ANTENNA**

(75) Inventor: **Vahakn Nalbandian**, Schwenksville, PA (US)

(73) Assignee: **The United States of America as represented by the Secretary of the Army**, 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 268 days.

(21) Appl. No.: **11/416,511**

(22) Filed: **Apr. 18, 2006**

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

(52) **U.S. Cl.** **343/700 MS; 343/803; 343/846; 343/829**

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

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,561,435 A * 10/1996 Nalbandian et al. . 343/700 MS
6,362,785 B1 * 3/2002 Nalbandian et al. . 343/700 MS
6,870,506 B2 * 3/2005 Chen et al. 343/700 MS
6,958,730 B2 * 10/2005 Nagumo et al. 343/702
7,042,403 B2 * 5/2006 Colburn et al. 343/702
7,265,718 B2 * 9/2007 Tsai 343/700 MS
2004/0012528 A1 * 1/2004 Dai et al. 343/702

2004/0196187 A1 * 10/2004 Yeh 343/700 MS
2006/0279464 A1 * 12/2006 Mei 343/700 MS

* cited by examiner

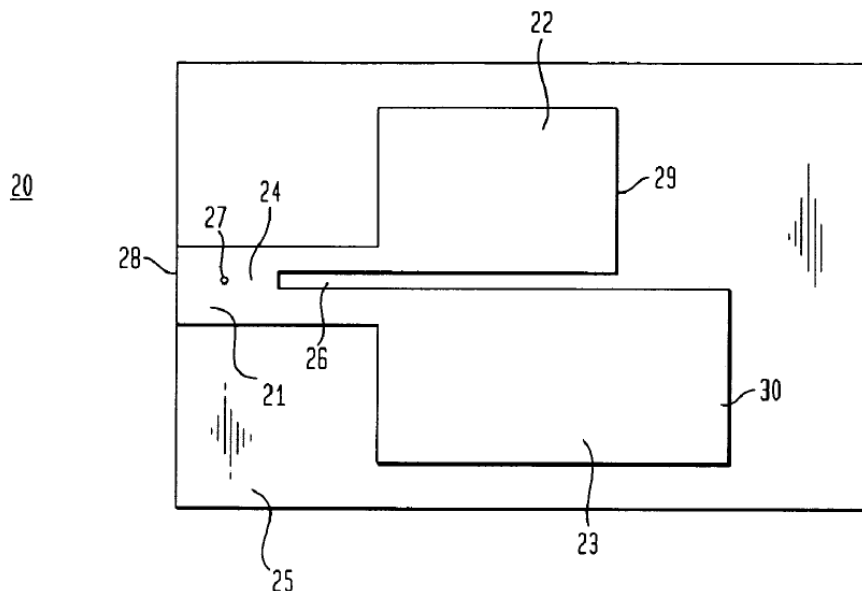
Primary Examiner—Trinh V Dinh

(74) *Attorney, Agent, or Firm*—Michael Zelenka; George B. Tereschuck

(57) **ABSTRACT**

A multiple band electrically small compact planar microstrip antenna at VHF and UHF frequencies is provided that permits both a considerably abbreviated antenna length and significantly high efficiency antenna performance. The multiple band electrically small compact planar microstrip antenna advantageously positions a narrow radiating strip and a group of unequally dimensioned radiating members on a microstrip dielectric substrate that is stacked on a ground plane. The unequally dimensioned, or unlike, radiating members are separated by at least one gap and cause the antenna to resonate at a number of different frequencies instead of a single frequency as the prior art microstrip antenna. The multiple band electrically small compact planar microstrip antenna also innovatively filters unwanted signals at other frequencies because of the narrowband nature of each band. The preferred embodiment is a dual band electrically small compact planar microstrip antenna with two unlike radiating members separated by a single gap. This invention also encompasses methods for providing substantial reduction in antenna size at the VHF and UHF frequencies with multiple band electrically small planar microstrip antennas.

20 Claims, 4 Drawing Sheets



Acrobat 文件



US007375686B2

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

(10) **Patent No.:** **US 7,375,686 B2**
(45) **Date of Patent:** **May 20, 2008**

(54) **PLANAR INVERTED F ANTENNA AND METHOD OF MAKING THE SAME**

(75) Inventors: **Po-Kang Ku**, Tu-Cheng (TW);
Lung-Sheng Tai, Tu-Cheng (TW);
Chen-Ta Hung, Tu-Cheng (TW);
Yun-Long Ke, Tu-Cheng (TW);
Yao-Shien Huang, 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 0 days.

(21) Appl. No.: **11/491,602**

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

(65) **Prior Publication Data**
US 2007/0018892 A1 Jan. 25, 2007

(30) **Foreign Application Priority Data**
Jul. 22, 2005 (CN) 2005 1 0041153

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

(52) **U.S. Cl.** **343/700 MS; 343/725; 343/830**

(58) **Field of Classification Search** 343/700 MS,
343/702, 829, 830, 846, 725
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,600,448 B2	7/2003	Ikegaya	
6,844,853 B2 *	1/2005	Tai et al.	343/700 MS
6,847,329 B2	1/2005	Ikegaya	
6,891,504 B2	5/2005	Cheng	
6,897,810 B2 *	5/2005	Dai et al.	343/700 MS
2004/0178957 A1 *	9/2004	Chang et al.	343/700 MS

* cited by examiner

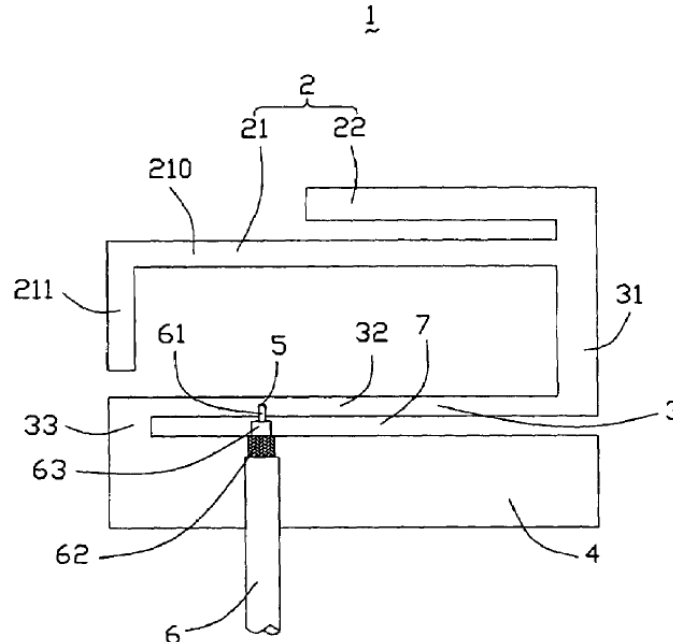
Primary Examiner—Shih-Chao Chen

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

(57) **ABSTRACT**

A multi-band antenna (1) used in wireless communications includes a radiating portion (2), a grounding portion (4), and a connecting portion (3). The radiating portion (2) includes a first radiating element (21) operating at 900 MHz frequency band and a second radiating element (22) operating at 1800 MHz frequency band. The connecting portion (3) connects the radiating portion (2) and the grounding portion (4). The grounding portion (4), the radiating portion (2), and the connecting portion (3) locate in the same plane.

20 Claims, 6 Drawing Sheets



Acrobat 文件



US007375687B2

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

(10) **Patent No.:** **US 7,375,687 B2**
(45) **Date of Patent:** **May 20, 2008**

(54) **MONOPOLE ANTENNA**

(75) Inventors: **Yun-Long Ke**, Tu-Cheng (TW);
Lung-Sheng Tai, Tu-Cheng (TW);
Yao-Shien Huang, 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 0 days.

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

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

(65) **Prior Publication Data**
US 2007/0120743 A1 May 31, 2007

(30) **Foreign Application Priority Data**
Nov. 28, 2005 (TW) 94141660 A

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

(52) **U.S. Cl.** **343/700 MS; 343/767;**
343/846

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

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,603,429 B1 *	8/2003	Bancroft et al.	343/700 MS
6,864,842 B2 *	3/2005	Hung et al.	343/700 MS
7,042,401 B2 *	5/2006	Park et al.	343/700 MS
2005/0280580 A1 *	12/2005	Lin	343/700 MS

FOREIGN PATENT DOCUMENTS

TW 239677 9/2005

* cited by examiner

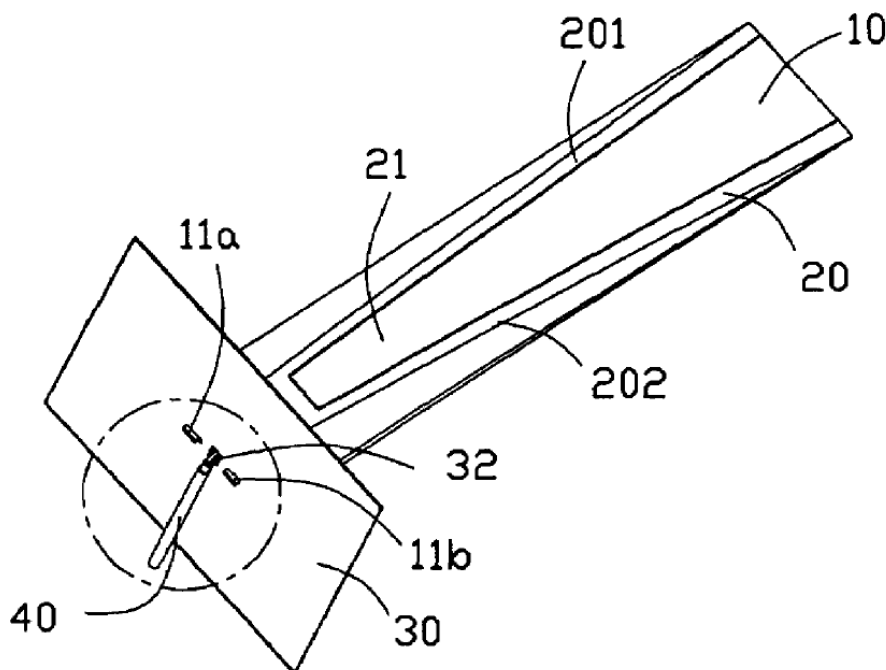
Primary Examiner—Hoang V Nguyen

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

(57) **ABSTRACT**

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

15 Claims, 6 Drawing Sheets



Acrobat 文件



US007375689B2

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

(10) **Patent No.:** **US 7,375,689 B2**
(45) **Date of Patent:** **May 20, 2008**

(54) **MULTI-BAND ANTENNA OF COMPACT SIZE**

(75) Inventors: **Yun-Ta Chen**, Tao-Yuan (TW);
Chien-Pang Chou, Tao-Yuan (TW);
Chang-Hao Hsieh, Tao-Yuan (TW)

(73) Assignee: **High Tech Computer Corp.**, Taoyuan,
Taoyuan County (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.: **11/560,812**

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

(65) **Prior Publication Data**

US 2007/0200777 A1 Aug. 30, 2007

(30) **Foreign Application Priority Data**

Feb. 27, 2006 (TW) 95106679 A

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

(52) **U.S. Cl.** **343/702; 343/702; 343/803;**
343/764; 343/765

(58) **Field of Classification Search** 343/803,
343/764, 765
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,044,303 A * 8/1977 Reindel 324/95
6,317,099 B1 * 11/2001 Zimmerman et al. 343/803
6,496,382 B1 * 12/2002 Ferguson et al. 361/767
6,697,025 B2 * 2/2004 Koyanagi et al. 343/741

6,820,314 B2 * 11/2004 Ferguson et al. 29/25,42
6,930,640 B2 8/2005 Chung et al.
7,170,448 B2 * 1/2007 Jecko et al. 343/700 MS
2004/0084296 A1 * 5/2004 Hori et al. 204/157.15
2005/0184917 A1 * 8/2005 Cuthbert 343/742
2006/0097930 A1 * 5/2006 Rosenberg et al. 343/702
2006/0181466 A1 8/2006 Krupa
2007/0035447 A1 * 2/2007 Chen et al. 343/700 MS

FOREIGN PATENT DOCUMENTS

DE 100 03 082 A1 7/2001
TW 200419843 10/2004
WO WO 98/44587 A1 10/1998
WO WO 00/65684 A2 11/2000
WO WO 02/29926 A1 4/2002

* cited by examiner

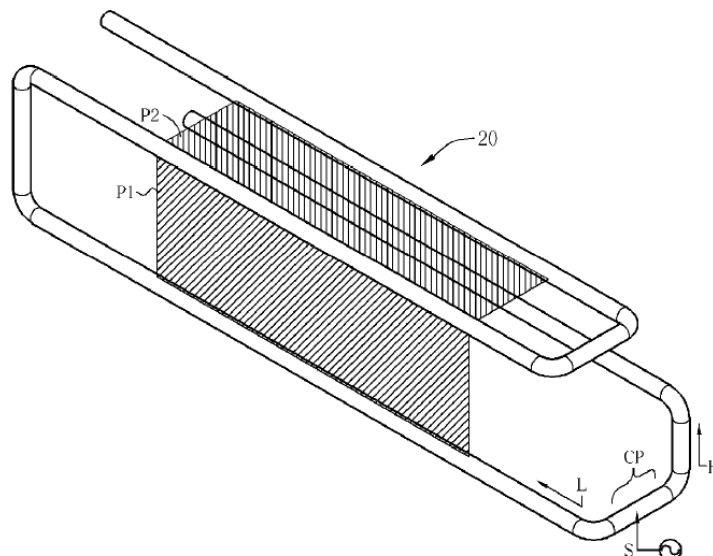
Primary Examiner—Trinh V Dinh

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

(57) **ABSTRACT**

A multi-band antenna of compact size includes a conductor of uniform cross-section folded to form the antenna with a connection portion, a low-frequency first radiation portion, and a high-frequency second radiation portion. The connection portion has a feeding point for signal feeding. The first and second radiation portions connect to two ends of the connection portion. The first radiation portion is folded along two different planes to form three main sections. The second radiation portion is folded along a plane to form two sections. A terminal section of the first radiation portion and a terminal section of the second radiation portion are parallel, such that radiation of these two sections is coupled to enhance radiation characteristics of the antenna. Also, the folded structure helps to achieve compact size of the antenna.

17 Claims, 26 Drawing Sheets



Acrobat 文件



US007375690B2

(12) **United States Patent**
Chen

(10) **Patent No.:** **US 7,375,690 B2**
(45) **Date of Patent:** **May 20, 2008**

(54) **ANTENNA RING FOR ELECTRONIC
DEVICE**

(76) Inventor: **Franklin F K Chen**, 6007 Johnston
Dr., Oakland, CA (US) 94611

(*) 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.: **11/626,377**

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

(65) **Prior Publication Data**

US 2007/0115190 A1 May 24, 2007

Related U.S. Application Data

(63) Continuation of application No. 11/162,051, filed on
Aug. 26, 2005, now Pat. No. 7,196,670.

(60) Provisional application No. 60/686,623, filed on Jun.
3, 2005.

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

(52) **U.S. Cl.** **343/702; 343/271**

(58) **Field of Classification Search** 343/702,
343/718, 741, 866; 224/197, 269, 271, 183
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,964,361 B2 * 11/2005 Kathrein 224/183
7,148,852 B2 * 12/2006 Pathak et al. 343/702
7,196,670 B2 * 3/2007 Chen 343/702

* cited by examiner

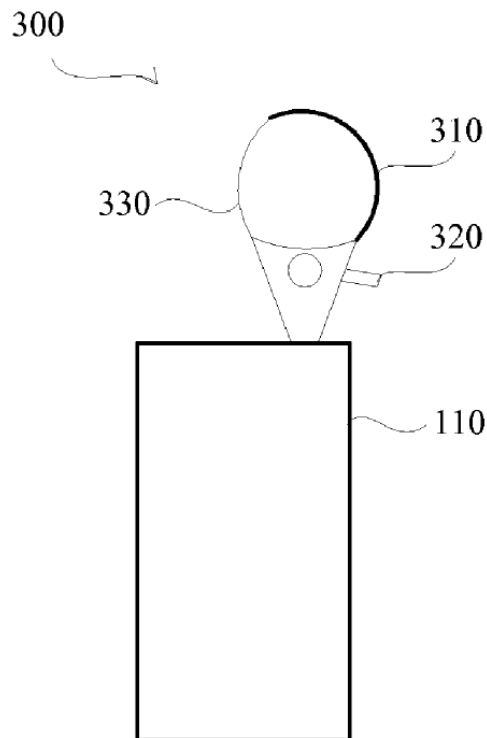
Primary Examiner—Tan Ho

(74) *Attorney, Agent, or Firm*—Thelen Reid Brown
Raysman & Steiner; Aaron Wininger

(57) **ABSTRACT**

An accessory for an electronic device, such as a mobile
phone, includes a mounting portion and a coupling portion.
The mounting portion is adapted for mounting to an antenna
region of the electronic device. The coupling portion is
coupled to the mounting portion and adapted for detachable
coupling to an object to thereby couple the electronic device
to the object.

29 Claims, 2 Drawing Sheets



Acrobat 文件



US007375694B2

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

(10) **Patent No.:** **US 7,375,694 B2**
(45) **Date of Patent:** **May 20, 2008**

(54) **ANTENNA CAPABLE OF MICRO-TUNING
AND MACRO TUNING FOR WIRELESS
TERMINAL**

(75) Inventors: **Chang-won Jung**, Yongin-sin (KR);
Yong-jin Kim, Yongin-si (KR);
Yong-eil Kim, Yongin-si (KR); **Se-hyun
Park**, Yongin-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.: **11/606,146**

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

(65) **Prior Publication Data**

US 2008/0001823 A1 Jan. 3, 2008

(30) **Foreign Application Priority Data**

Jul. 3, 2006 (KR) 10-2006-0062027

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

(52) **U.S. Cl.** **343/745; 343/700 MS;**
343/702

(58) **Field of Classification Search** **343/745,**
343/749, 750, 700 MS, 702
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,071,887 B2 * 7/2006 Shigihara et al. 343/744

7,129,894 B1 * 10/2006 Winter 343/700 MS
7,260,424 B2 * 8/2007 Schmidt 455/575.7
7,307,598 B2 * 12/2007 Shigihara 343/788
7,315,287 B2 * 1/2008 Shigihara 343/744
2006/0262015 A1 * 11/2006 Thornell-Pers et al. 343/702

FOREIGN PATENT DOCUMENTS

KR 1998-087437 A 12/1998
KR 20-0393219 Y1 8/2005
KR 2006-0012621 A 2/2006
WO 2004102737 A1 11/2004

* cited by examiner

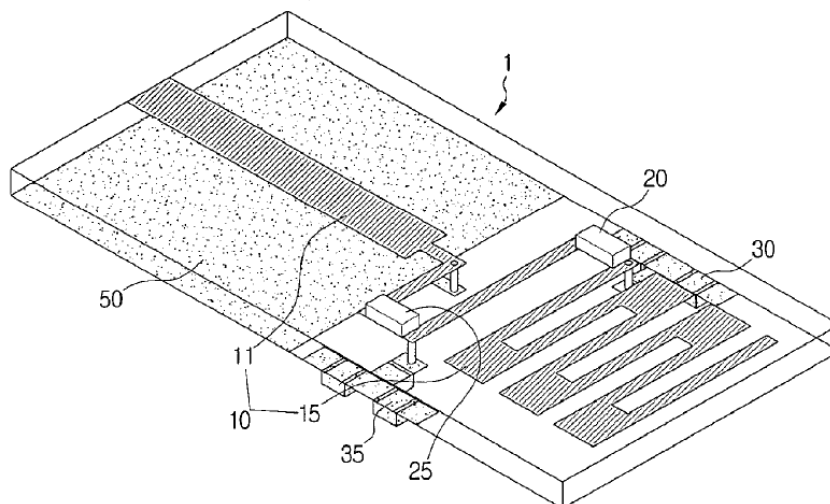
Primary Examiner—Hoang V Nguyen

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

(57) **ABSTRACT**

Disclosed is an antenna capable of micro-tuning and macro-tuning for a wireless terminal, comprising: a radiator radiating electromagnetic waves; a ground connected to the radiator; at least one switching element positioned at a lengthwise region of the radiator, for shorting or opening the region of the radiator; and a voltage controlling element positioned at the radiator between the switching element and the ground, for controlling the extent of a voltage potential applied across the radiator. In accordance with the present invention, the antenna is capable of the macro-tuning between the service bands and micro-tuning for channel control within the service bands. Furthermore, the size of the antenna is significantly reduced and the antenna is installed on a circuit board in a patch type, thereby simplifying a work process.

11 Claims, 6 Drawing Sheets



Acrobat 文件



US007375695B2

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

(10) **Patent No.:** **US 7,375,695 B2**

(45) **Date of Patent:** **May 20, 2008**

(54) **ANTENNA AND WIRELESS
COMMUNICATION DEVICE**

(75) Inventors: **Kenichi Ishizuka**, Sagamihara (JP);
Kazunari Kawahata, Machida (JP)

(73) Assignee: **Murata Manufacturing Co., Ltd.**,
Kyoto (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.: **11/829,653**

(22) Filed: **Jul. 27, 2007**

(65) **Prior Publication Data**

US 2007/0268191 A1 Nov. 22, 2007

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2005/
022342, filed on Dec. 6, 2005.

(30) **Foreign Application Priority Data**

Jan. 27, 2005 (JP) 2005-020199
Aug. 23, 2005 (JP) 2005-241890

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

(52) **U.S. Cl.** **343/745**

(58) **Field of Classification Search**
343/702, 700 MS, 744, 750; 340/572.7,
340/572.8

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,492,953 B2 * 12/2002 Apostolos 343/744
6,606,069 B2 8/2003 Kitamura et al.
6,670,925 B2 12/2003 Iwai et al.
6,765,536 B2 * 7/2004 Phillips et al. 343/702
7,034,760 B2 * 4/2006 Nakamura 343/745

7,129,907 B2 * 10/2006 Lin et al. 343/876
7,202,790 B2 * 4/2007 Copeland et al. 340/572.7
2002/0044092 A1 4/2002 Kushihi

(Continued)

FOREIGN PATENT DOCUMENTS

JP 2002-076750 A 3/2002

(Continued)

OTHER PUBLICATIONS

Official communication issued in the counterpart International
Application No. PCT/JP2005/022342, mailed on Mar. 14, 2006.

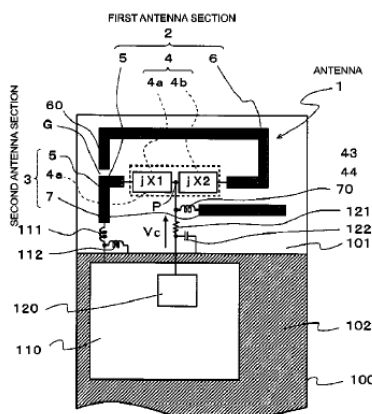
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—Keating & Bennett, LLP

(57) **ABSTRACT**

An antenna and a wireless communication device are adapted to have a plurality of resonant frequencies changed simultaneously by a desired range at a low voltage. The antenna includes a first antenna section and a second antenna section. The first antenna section includes a feeding electrode, a frequency-changing circuit, and a radiating electrode, and the second antenna section includes the feeding electrode, a first reactance circuit, and an additional radiating electrode. The frequency-changing circuit has a circuit configuration in which the first reactance circuit and the second reactance circuit are connected. When a control voltage V_c is applied to a node P, the reactances of the first and second reactance circuits change in accordance with the magnitude of the control voltage V_c , so that a resonant frequency f_1 of the first antenna section and a resonant frequency f_2 of the second antenna section change simultaneously.

17 Claims, 18 Drawing Sheets



Acrobat 文件



US007375697B2

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

(10) **Patent No.:** **US 7,375,697 B2**

(45) **Date of Patent:** **May 20, 2008**

(54) **MEANDERED SLIT ANTENNA**

(75) Inventors: **Young Soon Lee**, Gyeongsangbuk-do (KR); **Ui Jung Kim**, Gyeongsangbuk-do (KR); **Han Chil Cha**, Gyeongsangbuk-do (KR)

(73) Assignee: **Ohsung Electrics Co., Ltd.**, Gyeongsangbuk-Do (KR)

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

6,392,609 B2 *	5/2002	Nieminen	343/767
6,618,020 B2 *	9/2003	Wang et al.	343/767
6,677,909 B2 *	1/2004	Sun et al.	343/767
6,750,821 B2 *	6/2004	Fang et al.	343/700 MS
6,995,714 B2 *	2/2006	Sim et al.	343/702
2005/0012674 A1 *	1/2005	Takei	343/767

FOREIGN PATENT DOCUMENTS

KR 1020020071011 5/2004

(21) Appl. No.: **11/229,733**

(22) Filed: **Sep. 19, 2005**

(65) **Prior Publication Data**

US 2006/0284777 A1 Dec. 21, 2006

(30) **Foreign Application Priority Data**

Jun. 20, 2005 (KR) 10-2005-0053225

(51) **Int. Cl.**

H01Q 13/10 (2006.01)

(52) **U.S. Cl.** 343/767; 343/895

(58) **Field of Classification Search** 343/767, 343/770, 700 MS, 702, 829, 846, 895
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,914,693 A * 6/1999 Takei et al. 343/767

* cited by examiner

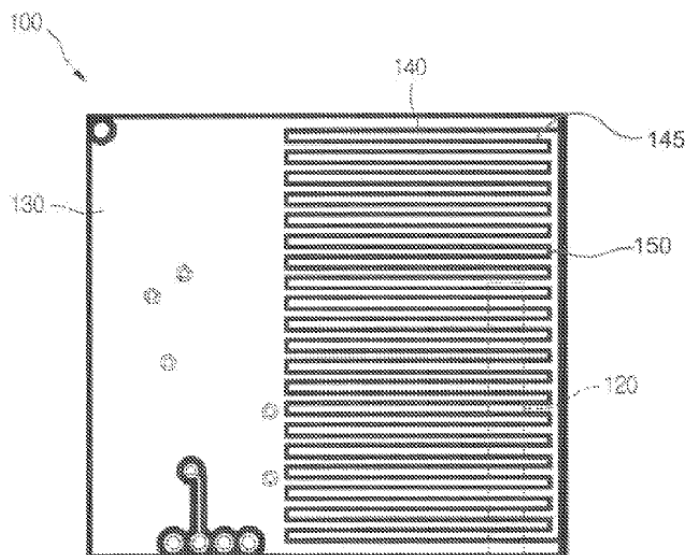
Primary Examiner—Tho Phan

(74) *Attorney, Agent, or Firm*—Apex Juris, PLLC; Tracy M Heims

(57) **ABSTRACT**

A meandered slit antenna is provided. The meandered slit antenna includes: a printed circuit board; an RF module mounted on the printed circuit board to generate a predetermined electric signal; a microstrip feed line connected with the RF module to transmit the predetermined electric signal; and a slot part for radiating an electromagnetic wave induced by the electric signal that is transmitted through the microstrip feed line, the slot part being formed in a meandered shape.

14 Claims, 12 Drawing Sheets



Acrobat 文件



US007375699B2

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

(10) **Patent No.:** **US 7,375,699 B2**

(45) **Date of Patent:** ***May 20, 2008**

(54) **WAVE ANTENNA WIRELESS
COMMUNICATION DEVICE AND METHOD**

3,508,274 A 4/1970 Kesler et al.

(Continued)

(75) Inventors: **Ian James Forster**, Essex (GB); **Peter Robert George Horrell**, Essex (GB);
Patrick F. King, Glen Ellyn, IL (US)

FOREIGN PATENT DOCUMENTS

DE 37 36 803 A1 11/1989

(73) Assignee: **Mineral Lassen LLC**, Las Vegas, NV
(US)

(Continued)

OTHER PUBLICATIONS

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

International Search Report, dated Apr. 11, 2003, for PCT/IB02/05095, filed Oct. 29, 2002.

(Continued)

This patent is subject to a terminal disclaimer.

Primary Examiner—Tho Phan

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

(21) Appl. No.: **10/637,326**

(22) Filed: **Aug. 8, 2003**

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2004/0041739 A1 Mar. 4, 2004

Related U.S. Application Data

(63) Continuation of application No. 10/012,206, filed on Oct. 29, 2001, now Pat. No. 6,630,910.

(51) **Int. Cl.**

H01Q 1/36 (2006.01)

(52) **U.S. Cl.** **343/806; 343/795; 343/895; 340/572.7**

(58) **Field of Classification Search** 343/713, 343/742, 795, 806, 828, 843, 867, 895, 741, 343/866; 340/572.1, 572.7, 572.8

See application file for complete search history.

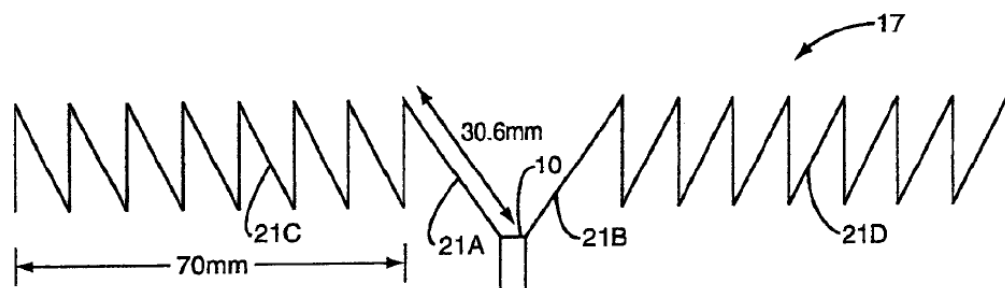
(56) **References Cited**

U.S. PATENT DOCUMENTS

3,202,985 A 8/1965 Perkins et al.

A wireless communication device coupled to a wave antenna that provides greater increased durability and impedance matching. The wave antenna is a conductor that is bent in alternating sections to form peaks and valleys. The wireless communication device is coupled to the wave antenna to provide wireless communication with other communication devices, such as an interrogation reader. The wireless communication device and wave antenna may be placed on objects, goods, or other articles of manufacture that are subject to forces such that the wave antenna may be stretched or compressed during the manufacture and/or use of such object, good or article of manufacture. The wave antenna, because of its bent structure, is capable of stretching and compressing more easily than other structures, reducing the wireless communication device's susceptibility to damage or breaks that might render the wireless communication device coupled to the wave antenna unable to properly communicate information wirelessly.

29 Claims, 11 Drawing Sheets



Acrobat 文件



US007375700B2

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

(10) **Patent No.:** **US 7,375,700 B2**
(45) **Date of Patent:** **May 20, 2008**

(54) **WIDEBAND MONOPOLE ANTENNA**

(75) Inventors: **Seong-Taek Hwang**, Pyeongtaek-si (KR); **Jae-Hoon Lee**, Seoul (KR); **Young-Sik Kim**, Seoul (KR); **Ji-Chai Jeong**, Seoul (KR); **Jung-Woo Baek**, Seoul (KR); **Young-Je Sung**, Seoul (KR)

(73) Assignee: **Samsung Electronics Co., Ltd.**, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do (KR)

(*) 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.: **11/230,971**

(22) Filed: **Sep. 20, 2005**

(65) **Prior Publication Data**

US 2006/0181463 A1 Aug. 17, 2006

(30) **Foreign Application Priority Data**

Feb. 17, 2005 (KR) 10-2005-0013133

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

(52) **U.S. Cl.** 343/906; 343/702

(58) **Field of Classification Search** 343/702, 343/872, 906

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,157,344 A * 12/2000 Bateman et al. 343/700 MS

6,774,853 B2 * 8/2004 Wong et al. 343/700 MS

* cited by examiner

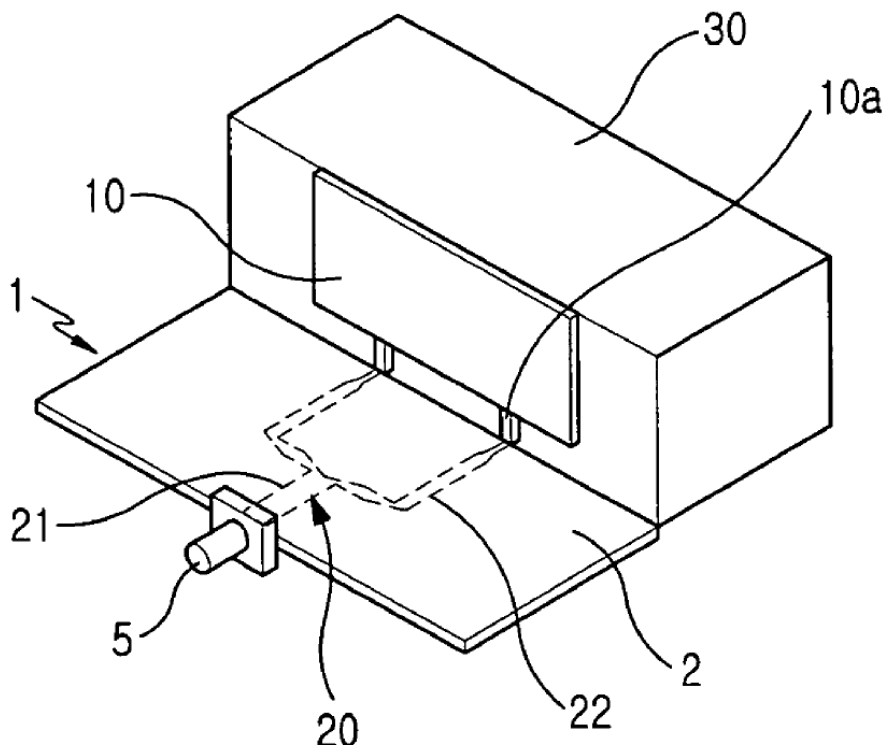
Primary Examiner—Shih-Chao Chen

(74) *Attorney, Agent, or Firm*—Cha & Reiter, LLC

(57) **ABSTRACT**

A wideband monopole antenna assembly includes a substrate having an antenna connector, a wideband monopole antenna positioned on the substrate, and a feeder unit positioned on the rear surface of the substrate for supporting the antenna with a part thereof bent at a predetermined angle. The wideband monopole antenna has a feeder portion shorter than conventional antennas for compactness of the antenna.

19 Claims, 8 Drawing Sheets



Acrobat 文件



US007379024B2

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

(10) **Patent No.:** **US 7,379,024 B2**

(45) **Date of Patent:** **May 27, 2008**

(54) **RFID TAG USING A SURFACE INSENSITIVE ANTENNA STRUCTURE**

(75) Inventors: **Ian J. Forster**, Chelmsford (GB);
Adrian N. Farr, Dunmow (GB);
Norman A. Howard, Ilford (GB);
Andrew W. Holman, West Hills, CA (US)

(73) Assignee: **Avery Dennison Corporation**,
Pasadena, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 39 days.

(21) Appl. No.: **11/636,091**

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

(65) **Prior Publication Data**
US 2007/0080233 A1 Apr. 12, 2007

Related U.S. Application Data

(60) Division of application No. 11/245,152, filed on Oct. 6, 2005, which is a continuation of application No. PCT/US2004/011218, filed on Apr. 12, 2004.

(60) Provisional application No. 60/517,156, filed on Nov. 4, 2003.

(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, 895; 340/572.1-572
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,706,050 A 11/1987 Andrews

4,786,907 A	11/1988	Koelle
4,816,839 A	3/1989	Landt
5,153,983 A	10/1992	Oyama
5,430,441 A	7/1995	Bickley et al.
5,491,483 A	2/1996	D'Hont
5,545,291 A	8/1996	Smith et al.
5,557,279 A	9/1996	D'Hont
5,563,616 A	10/1996	Dempsey et al.
5,564,888 A	10/1996	Doan
5,621,199 A	4/1997	Calari et al.
5,783,856 A	7/1998	Smith et al.
5,793,305 A	8/1998	Turner et al.

(Continued)

FOREIGN PATENT DOCUMENTS

DE 197 03 864 6/1998

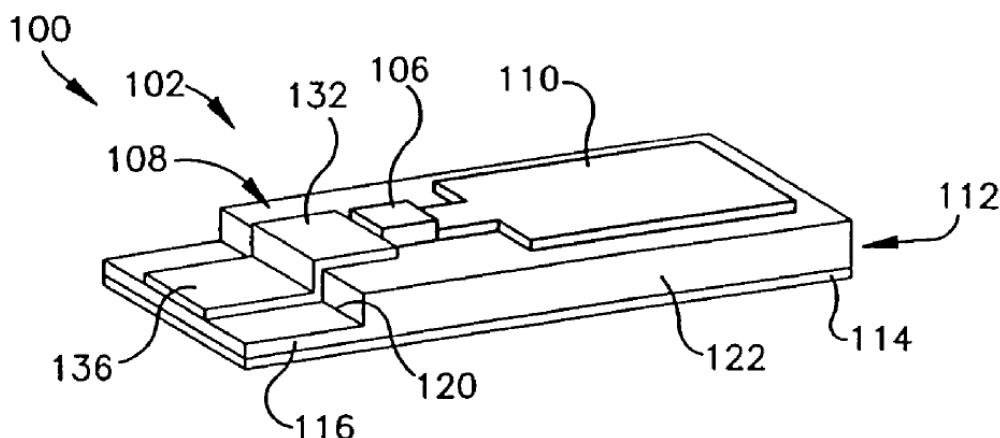
(Continued)

Primary Examiner—Hucdung Mancuso
(74) *Attorney, Agent, or Firm*—Renner, Otto, Boisselle & Sklar, LLP

(57) **ABSTRACT**

An RFID device includes conductive tabs, and a conductive structure, with a dielectric layer between the conductive tabs and the conductive structure. The conductive structure overlaps the conductive tabs and acts as a shield, allowing the device to be at least somewhat insensitive to the surface upon which it is mounted, or to the presence of nearby objects, such as goods in a carton or other container that includes the device. The dielectric layer may be a portion of the container, such as an overlapped portion of the container. Alternatively, the dielectric layer may be a separate layer, which may vary in thickness, allowing one of the conductive tabs to be capacitively coupled to the conductive structure. As another alternative, the dielectric layer may be an expandable substrate that may be expanded after fabrication operations, such as printing.

8 Claims, 5 Drawing Sheets



Acrobat 文件



US007379025B2

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

(10) **Patent No.:** **US 7,379,025 B2**

(45) **Date of Patent:** **May 27, 2008**

(54) **MOBILE ANTENNA UNIT AND
ACCOMPANYING COMMUNICATION
APPARATUS**

2004/0080457 A1* 4/2004 Guo et al. 343/700 MS
2004/0113848 A1* 6/2004 Gaucher et al. 343/702
2004/0198293 A1* 10/2004 Sadler et al. 455/280

(75) Inventors: **Takeshi Asano**, Atsugi (JP); **Shohhei
Fujio**, Machida (JP)

FOREIGN PATENT DOCUMENTS

JP	03-005087	1/1991
JP	06-066577	8/1994
JP	06-069718	11/1994
JP	11-041026	12/1999
JP	3026171	1/2000
JP	2001-160710	6/2001
JP	2001-168634	6/2001
JP	2002-158522	5/2002
JP	3326762	7/2002
JP	2002-271118	9/2002
JP	2002-135040	10/2002
JP	2002-330025	11/2002
JP	2003-008325	1/2003
JP	2003-051705	2/2003

(73) Assignee: **Lenovo (Singapore) PTE Ltd.**,
Singapore (SG)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 55 days.

(21) Appl. No.: **10/788,056**

(22) Filed: **Feb. 26, 2004**

(65) **Prior Publication Data**

US 2004/0222929 A1 Nov. 11, 2004

(30) **Foreign Application Priority Data**

Feb. 27, 2003 (JP) 2003-050328

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

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

(58) **Field of Classification Search** **343/702**,
343/700 MS, **725**, **729**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,370,657 A *	1/1983	Kaloi		343/700 MS
4,401,988 A *	8/1983	Kaloi		343/700 MS
5,008,681 A *	4/1991	Cavallaro et al.		343/700 MS
5,898,404 A *	4/1999	Jou		343/700 MS
6,326,921 B1 *	12/2001	Egorov et al.		343/700 MS
6,509,882 B2 *	1/2003	McKivergan		343/818

* cited by examiner

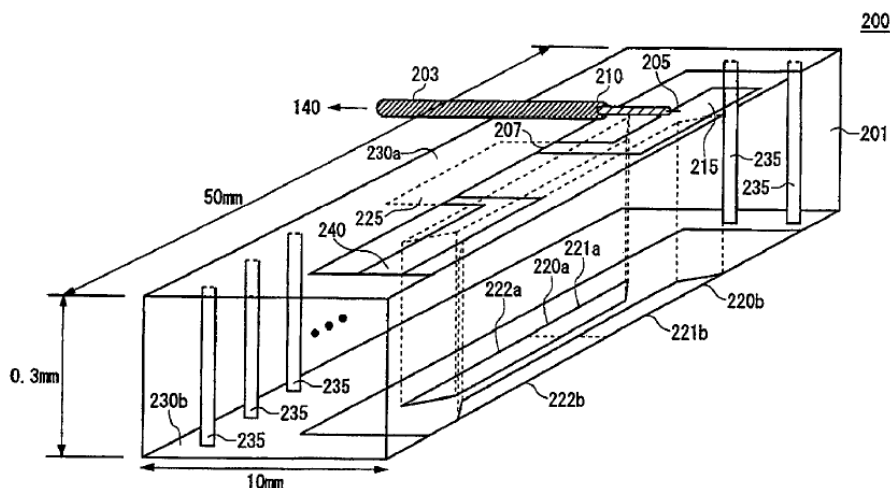
Primary Examiner—Huedung Mancuso

(74) *Attorney, Agent, or Firm*—Keusey, Tutunjian & Bitetto,
P.C.

(57) **ABSTRACT**

An antenna unit is provided with an inverted F-type antenna element provided with a feeding point and a ground connection point, and a non-feed antenna element configured so as to resonate with the inverted F-type antenna element through electrical coupling. In addition, the antenna unit may also be provided with a ground part which is grounded to the earth and connected to the ground connection point provided on one edge of the inverted F-type antenna element, and a resonance element, one edge of which is connected to the ground part, resonated by the non-feed antenna element through electrical coupling.

11 Claims, 4 Drawing Sheets



Acrobat 文件



US007379027B2

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

(10) **Patent No.:** **US 7,379,027 B2**
(45) **Date of Patent:** **May 27, 2008**

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE WITH HUMAN INTERFACE
DIVERSITY ANTENNA AND RELATED
METHODS**

(75) Inventors: **Vytas Kezys**, Ancaster (CA); **Yihong Qi**, Waterloo (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 0 days.

(21) Appl. No.: **11/616,405**

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

(65) **Prior Publication Data**

US 2007/0132647 A1 Jun. 14, 2007

Related U.S. Application Data

(63) Continuation of application No. 11/067,935, filed on Feb. 28, 2005, now Pat. No. 7,187,332.

(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** **343/702, 343/700 MS, 867; 455/575.1, 101, 90**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,584,709 A 4/1986 Kneisel et al. 455/78
5,451,965 A 9/1995 Matsumoto 343/702
5,557,293 A 9/1996 McCoy et al. 343/867
5,905,467 A 5/1999 Narayanaswamy et al. . 343/702

6,147,649 A 11/2000 Ivrisimtzis et al. 343/700
6,271,796 B1 8/2001 Itoh et al. 343/702
6,295,030 B1 9/2001 Kozakai et al. 343/700 MS
6,307,511 B1 10/2001 Ying et al. 343/702
6,388,626 B1 5/2002 Gamalielsson et al. 343/702
6,452,556 B1 9/2002 Ha et al. 343/702
6,459,413 B1 10/2002 Tseng et al. 343/702
6,476,769 B1 11/2002 Lehtola 343/702
6,483,463 B2 11/2002 Kadambi et al. 343/700 MS
6,628,236 B2 9/2003 Kim et al. 343/702
6,664,930 B2 12/2003 Wen et al. 343/702
6,806,835 B2 10/2004 Iwai et al. 343/702
6,995,719 B2 2/2006 Ide 343/702
7,109,923 B2* 9/2006 Ollikainen et al. .. 343/700 MS
2004/0053582 A1 3/2004 Nakanishi et al. 455/101
2004/0183729 A1 9/2004 Otake et al. 343/700 MS
2004/0198473 A1 10/2004 Tran 455/575.1
2005/0184914 A1 8/2005 Ollikainen et al. 343/702

FOREIGN PATENT DOCUMENTS

EP 0 752 735 1/1997
WO 02/078123 10/2002

* cited by examiner

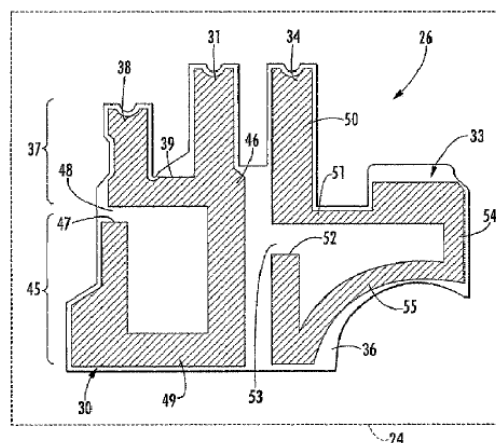
Primary Examiner—Hoang V Nguyen

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

(57) **ABSTRACT**

A mobile wireless communications device may include a portable handheld housing, and a wireless transceiver carried by the housing. A pair of antennas are positioned in side-by-side relation preferably in the upper portion of the portable handheld housing. A human interface diversity controller is connected to the wireless transceiver to preferentially operate with the plurality of antennas based upon a relative position of the portable handheld housing with respect to a hand of a human user. The device can select or weight the antennas based upon the position of the device when being held by a user.

25 Claims, 4 Drawing Sheets



Acrobat 文件