



US007446708B1

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

(10) **Patent No.:** **US 7,446,708 B1**
(45) **Date of Patent:** **Nov. 4, 2008**

(54) **MULTIBAND MONOPOLE ANTENNA WITH
INDEPENDENT RADIATING ELEMENTS**

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(US); **Jatupum Jenwatanavet**, San
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San Diego, CA (US)

(73) Assignee: **Kyocera Wireless Corp.**, San Diego,
CA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 369 days.

(21) Appl. No.: **11/260,588**

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

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/818,063,
filed on Apr. 5, 2004, now Pat. No. 7,019,696, which is
a continuation of application No. 10/228,693, filed on
Aug. 26, 2002, now Pat. No. 6,741,213.

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

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

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

(56) **References Cited**

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2007/0069954 A1 * 3/2007 Kenoun et al. 343/700 MS
2007/0152887 A1 * 7/2007 Castany et al. 343/702

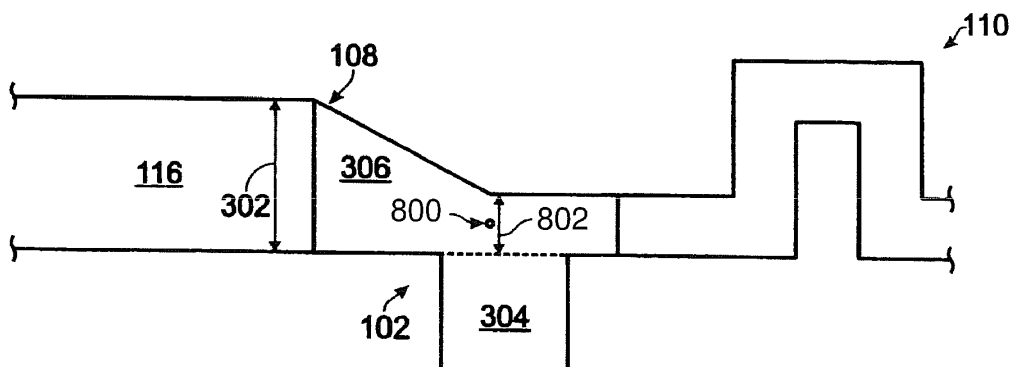
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Primary Examiner—HoangAnh T Le

(57) **ABSTRACT**

A single-feedpoint multiband monopole antenna is provided with independent radiator elements. The antenna comprises a microstrip counterpoise coupler having a single-feedpoint interface, a first radiator interface, and a second radiator interface. A first microstrip radiator, i.e. a meander line microstrip, has an end connected to the counterpoise coupler first radiator interface, and an unterminated end. A second microstrip radiator, i.e. a straight-line microstrip, has an end connected to the counterpoise coupler second radiator interface, and an unterminated end. The two radiators are capable of resonating at non-harmonically related frequencies. As with the two microstrip radiators, the microstrip counterpoise coupler is a conductive trace formed overlying a sheet of dielectric material. The counterpoise coupler can come in a variety of shapes, so that the overall antenna may take on a number of form factors.

16 Claims, 7 Drawing Sheets



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US007446710B2

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

(10) **Patent No.:** **US 7,446,710 B2**

(45) **Date of Patent:** **Nov. 4, 2008**

(54) **INTEGRATED LTCC MM-WAVE PLANAR
ARRAY ANTENNA WITH LOW LOSS
FEEDING NETWORK**

5,708,444 A * 1/1998 Pouwels et al. 343/700 MS
5,880,694 A * 3/1999 Wang et al. 343/700 MS
6,809,688 B2 * 10/2004 Yamada 343/700 MS
7,058,362 B1 * 6/2006 Khorrami et al. 455/66.1

(75) Inventors: **Ke-Li Wu**, Hong Kong SAR (CN); **Yong Huang**, Hong Kong SAR (CN)

(73) Assignee: **The Chinese University of Hong Kong**,
Hong Kong Sar (CN)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 306 days.

(21) Appl. No.: **11/384,179**

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

(65) **Prior Publication Data**

US 2006/0256016 A1 Nov. 16, 2006

Related U.S. Application Data

(60) Provisional application No. 60/663,139, filed on Mar.
17, 2005.

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

(52) **U.S. Cl.** **343/700 MS; 343/853**

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

See application file for complete search history.

(56) **References Cited**

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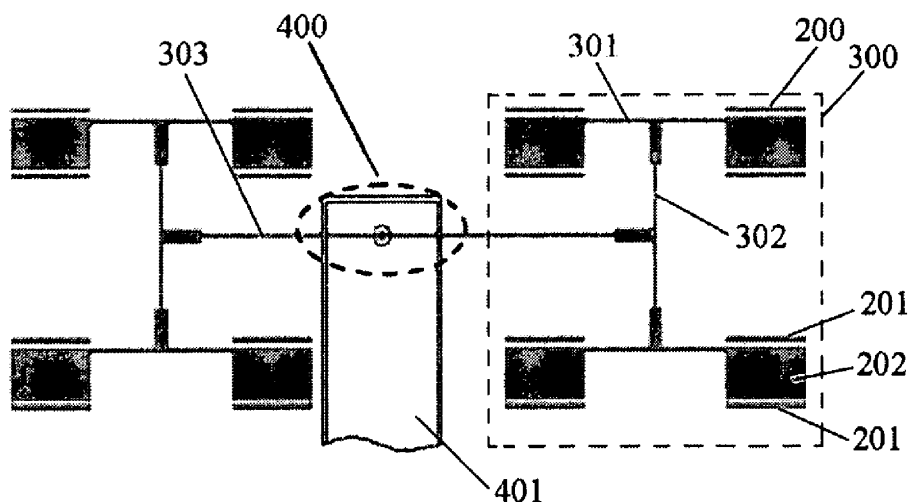
Primary Examiner—Tho G Phan

(74) *Attorney, Agent, or Firm*—Knobbe Martens Olson &
Bear LLP

(57) **ABSTRACT**

An array antenna comprises a first substrate comprising a first plurality of ceramic layers; a second substrate comprising a second plurality of ceramic layers; a bottom ground plane stacked on the bottom of the second ceramic substrate; a plurality of quasi-cavity-backed patch antennas mounted on a top surface the first substrate, each of the patch antennas including a radiating element and two grounded grid-like conductor walls; and a mixed feeding network coupled to each of the patch antennas. The array antenna working at mm-wave frequency band can provide high radiation efficiency and low loss from feeding network by using quasi-cavity-backed patch elements and a mixed feeding network configuration.

17 Claims, 5 Drawing Sheets



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US007446717B2

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

(10) **Patent No.:** **US 7,446,717 B2**

(45) **Date of Patent:** **Nov. 4, 2008**

(54) **MULTI-BAND ANTENNA**

(56) **References Cited**

(75) Inventors: **Chen-Ta Hung**, Tu-Cheng (TW);
Po-Kang Ku, Tu-Cheng (TW);
Yao-Shien Huang, Tu-Cheng (TW)

(73) Assignee: **Hon Hai Precision Inc. 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.: **11/638,597**

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

(65) **Prior Publication Data**

US 2007/0132646 A1 Jun. 14, 2007

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

(52) **U.S. Cl.** **343/702**; 343/700 MS;
343/846

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

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Primary Examiner—Hoang V Nguyen

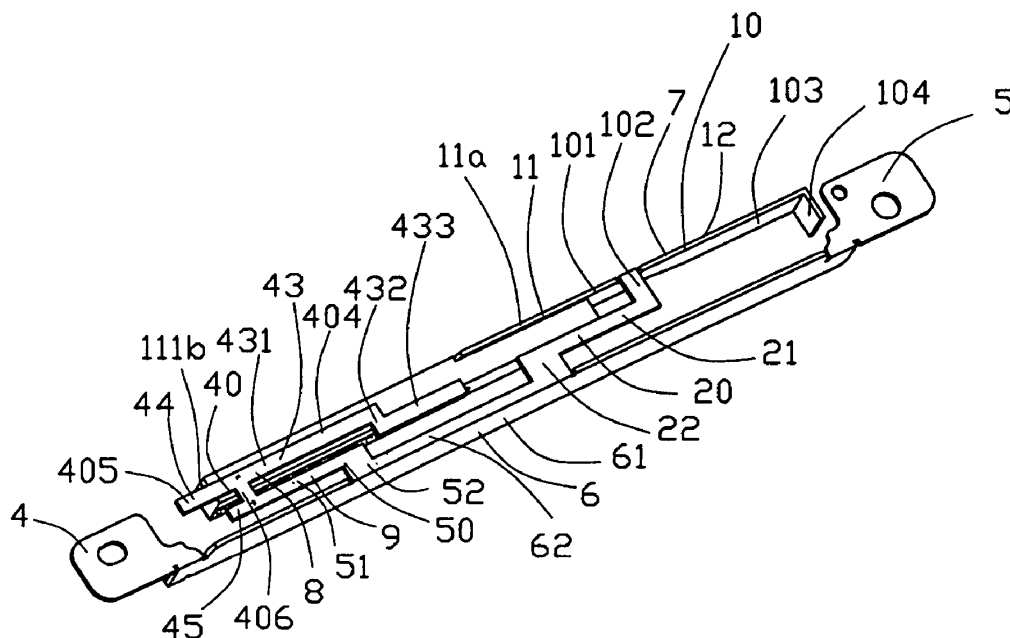
(74) *Attorney, Agent, or Firm*—Wei Te Chung

(57) **ABSTRACT**

A multi-band antenna includes a first antenna operating at wireless wide area network and having a first radiating arm, a second antenna operating at wireless local area network and a grounding portion employed by the first antenna and the second antenna. Wherein the first radiating arm of the first antenna further includes a metallic sheet, an insulative member affixed to the metallic sheet and a metal foil affixed to the insulative member.

20 Claims, 6 Drawing Sheets

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US007446719B2

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

(10) **Patent No.:** **US 7,446,719 B2**
(45) **Date of Patent:** **Nov. 4, 2008**

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

4,602,260 A 7/1986 Lindenmeier et al.
6,028,557 A * 2/2000 Oka 343/713
6,198,447 B1 3/2001 Sauer

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

(Continued)

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(73) Assignees: **Denso Corporation**, Kariya (JP); **Nippon Soken, Inc.**, Nishio (JP)

EP 0 124 055 B2 7/1997

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

(Continued)

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

Notification of Reasons for Rejection dated Oct. 16, 2007 in corresponding Japanese patent application No. 2005-150949 (and English translation).

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

(65) **Prior Publication Data**

US 2007/0097001 A1 May 3, 2007

(Continued)

Related U.S. Application Data

Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—Posz Law Group, PLC

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

(57) **ABSTRACT**

(30) **Foreign Application Priority Data**

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

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

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

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

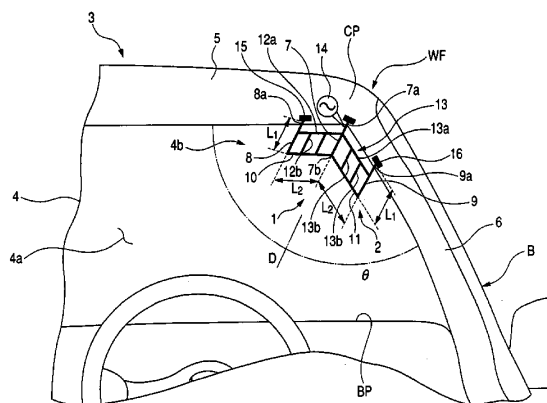
(58) **Field of Classification Search** 343/713, 343/711, 867, 742
See application file for complete search history.

(56) **References Cited**

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30 Claims, 26 Drawing Sheets



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US007450070B2

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

(10) **Patent No.:** **US 7,450,070 B2**

(45) **Date of Patent:** **Nov. 11, 2008**

(54) **ANTENNAS**

(75) Inventors: **Yuan-Li Chang**, Taipei (TW);
Chih-Ming Wang, Taipei (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 50 days.

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

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

(65) **Prior Publication Data**

US 2007/0096998 A1 May 3, 2007

Related U.S. Application Data

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

(30) **Foreign Application Priority Data**

Oct. 28, 2004 (TW) 93132684 A

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

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

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

(56) **References Cited**

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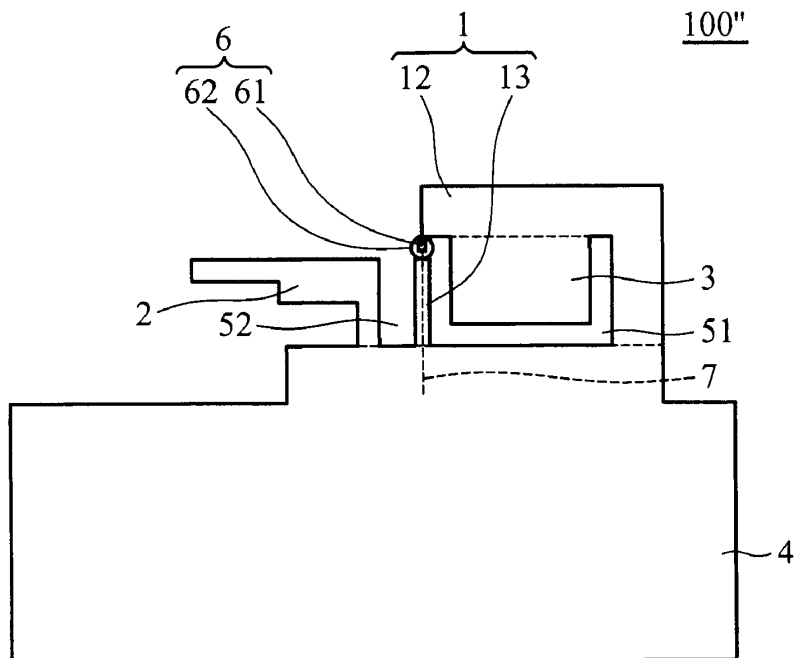
Primary Examiner—Trinh V Dinh

(74) *Attorney, Agent, or Firm*—Quintero Law Office

(57) **ABSTRACT**

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

6 Claims, 6 Drawing Sheets



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US007450072B2

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

(10) **Patent No.:** **US 7,450,072 B2**

(45) **Date of Patent:** **Nov. 11, 2008**

(54) **MODIFIED INVERTED-F ANTENNA FOR WIRELESS COMMUNICATION**

(75) Inventors: **Je Woo Kim**, San Jose, CA (US); **Kyung Sup Han**, San Ramon, CA (US); **Volodymyr Rakytyanskyy**, Santa Clara, CA (US); **Oleksandr Sulima**, Toronto (CA)

(73) Assignee: **QUALCOMM Incorporated**, San Diego, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 34 days.

(21) Appl. No.: **11/729,126**

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

(65) **Prior Publication Data**

US 2007/0229366 A1 Oct. 4, 2007

Related U.S. Application Data

(60) Provisional application No. 60/786,896, filed on Mar. 28, 2006.

(51) **Int. Cl.**

H01Q 1/38 (2006.01)

H01Q 1/48 (2006.01)

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

(58) **Field of Classification Search** 343/700 MS, 343/846, 876, 893

See application file for complete search history.

(56) **References Cited**

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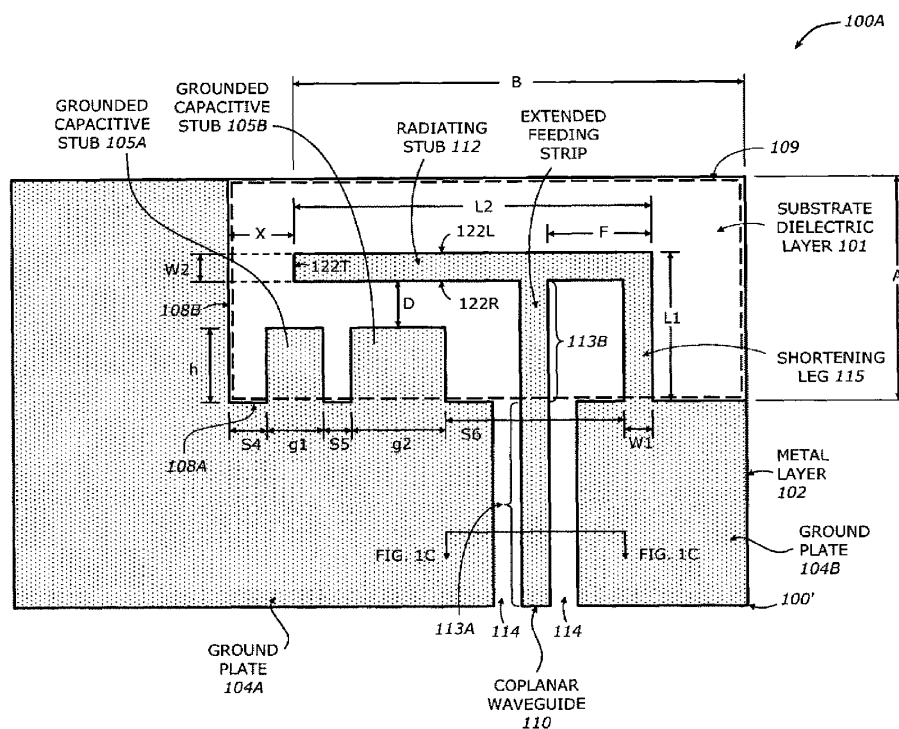
Primary Examiner—Shih-Chao Chen

(74) *Attorney, Agent, or Firm*—Thomas Rouse; Ross L. Franks; Kenneth K. Vu

(57) **ABSTRACT**

An embodiment of the present invention is a modified inverted-F antenna for wireless communication. The antenna circuit includes a dielectric substrate having a first surface, a radiating stub on the first surface of the dielectric substrate, and a first ground plate on the first surface of the dielectric substrate to couple to ground. The first ground plate includes one or more grounded capacitive stubs spaced apart from the radiating stub. The one or more grounded capacitive stubs tune performance parameters for the antenna circuit.

30 Claims, 18 Drawing Sheets



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US007450075B2

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

(10) **Patent No.:** **US 7,450,075 B2**

(45) **Date of Patent:** **Nov. 11, 2008**

(54) **BROADCASTING RECEIVING ANTENNA
SYSTEM MOUNTED IN A WIRELESS
TERMINAL**

(58) **Field of Classification Search** 343/702,
343/725, 846, 900
See application file for complete search history.

(75) Inventors: **Yong-jin Kim**, Seongnam-si (KR);
Young-eil Kim, Suwon-si (KR); **Ick-jae**
Yoon, Seoul (KR)

(56) **References Cited**

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(73) Assignees: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR); **Samsung**
Electro-Mechanics Co., Ltd., Suwon-si
(KR)

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

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(21) Appl. No.: **11/637,031**

Primary Examiner—Hoang V Nguyen

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

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

(65) **Prior Publication Data**

US 2007/0273591 A1 Nov. 29, 2007

(30) **Foreign Application Priority Data**

May 24, 2006 (KR) 2006-46365

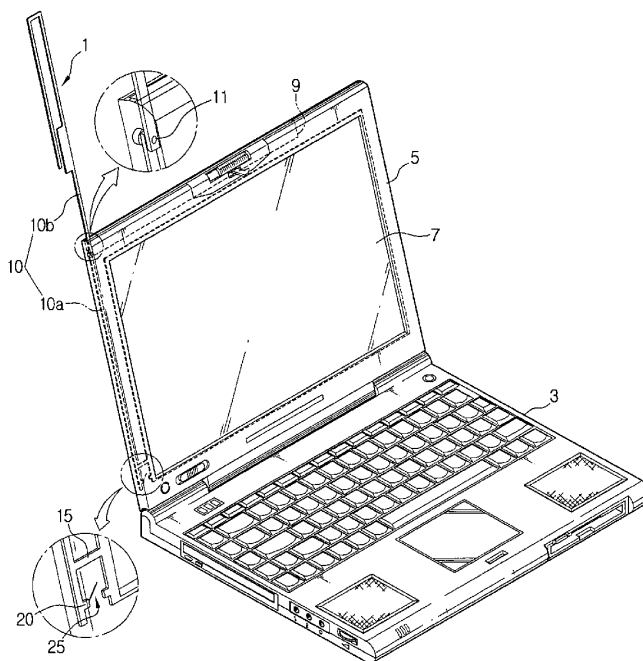
(57) **ABSTRACT**

A broadcast receiving antenna system mounted in a wireless
terminal. The antenna is bendable, and functions as a PIFA
antenna or a monopole whip antenna according to whether it
is bent or not. Accordingly, since the length and the type of the
antenna are adjustable according to the magnitude of the
DMB or DVB-H signal, optimum broadcasting services can
be provided and the length of the antenna can be shortened.
Ultimately, Intenna-type antenna can be mounted.

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

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

16 Claims, 5 Drawing Sheets



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US007450076B1

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

(10) **Patent No.:** **US 7,450,076 B1**

(45) **Date of Patent:** **Nov. 11, 2008**

(54) **INTEGRATED MULTI-BAND ANTENNA**

(75) Inventors: **Ching-Chi Lin**, Taipei Hsien (TW); **Kai Shih**, Taipei Hsien (TW); **Yu-Yuan Wu**, Taipei Hsien (TW); **Jia-Hung Su**, 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 1 day.

(21) Appl. No.: **11/770,650**

(22) Filed: **Jun. 28, 2007**

(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, 829, 846**

See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Tho G Phan

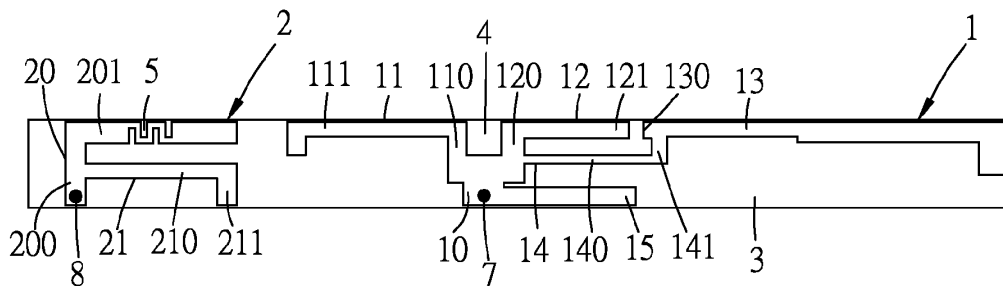
(74) *Attorney, Agent, or Firm*—WPAT, P.C.; Anthony King

(57) **ABSTRACT**

An integrated multi-band antenna has a first radiating element and a second radiating element. The first radiating element has a first radiating conductor defining opposite sides connected to a second radiating conductor and a third radiating conductor respectively. A fourth radiating conductor defines a first end facing the free end of the third radiating conductor. A fifth radiating conductor connects the third radiating conductor and vicinity of the first end of the fourth radiating conductor. A sixth radiating conductor connects the first radiating conductor and close to a ground portion. The second radiating element has a seventh radiating conductor staggered opened plurality of slots at opposite sides thereon. An eighth radiating conductor connects the seventh radiating conductor and the ground portion. The integrated multi-band antenna operates at wireless telecommunication frequency through the first radiating element and operates at wireless local area network frequency through the second radiating element.

23 Claims, 4 Drawing Sheets

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US00D580417S

(12) **United States Design Patent**
Miyoshi

(10) **Patent No.:** **US D580,417 S**

(45) **Date of Patent:** **** Nov. 11, 2008**

(54) **ANTENNA**

(75) Inventor: **Akira Miyoshi**, Tokyo (JP)

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

(**) Term: **14 Years**

(21) Appl. No.: **29/299,116**

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

(30) **Foreign Application Priority Data**

Aug. 7, 2007 (JP) 2007-021481

(51) **LOC (8) Cl.** **14-03**

(52) **U.S. Cl.** **D14/230**

(58) **Field of Classification Search** D14/138,

D14/230-238, 299, 358; D12/42, 43; 343/700 MS,
343/700 R-705, 711-713, 741, 748, 767,
343/795, 819, 840, 846, 866, 871-908; 455/90.2,
455/90.3, 91, 128, 269, 344, 347, 562.1

See application file for complete search history.

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Primary Examiner—Robert M. Spear

Assistant Examiner—John Windmuller

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

(57) **CLAIM**

The ornamental design for an antenna, as shown.

DESCRIPTION

FIG. 1 is a perspective view of the top, front and right side of an antenna showing my new design;

FIG. 2 is a perspective view of the bottom, rear and left side thereof;

FIG. 3 is a front elevational view thereof;

FIG. 4 is a rear elevational view thereof;

FIG. 5 is a right side elevational view thereof;

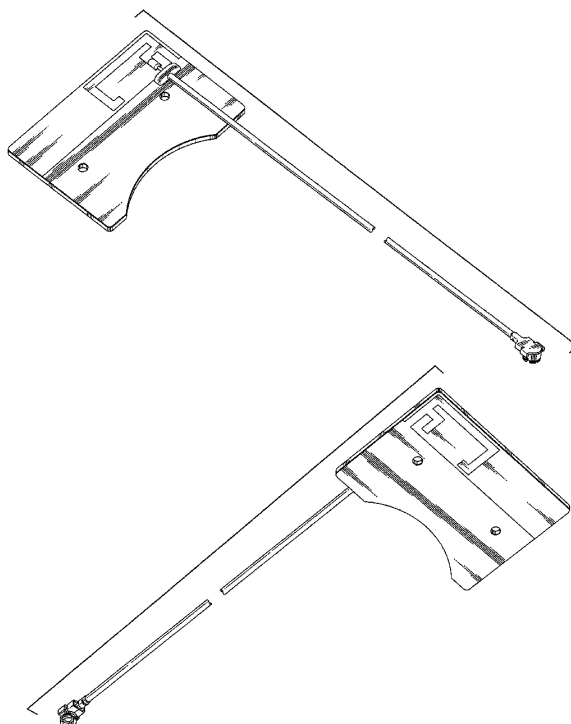
FIG. 6 is a left side elevational view thereof;

FIG. 7 is a top plan view thereof; and,

FIG. 8 is a bottom plan view thereof.

The antenna is shown broken away in the middle to indicate it has no specific length.

1 Claim, 5 Drawing Sheets



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US00D580418S

(12) **United States Design Patent**
Yang et al.

(10) **Patent No.:** **US D580,418 S**

(45) **Date of Patent:** **** Nov. 11, 2008**

(54) **ANTENNA**

(75) Inventors: **Wen Chieh Yang**, Tu-Cheng (TW); **Yu Yuan Wu**, Tu-Cheng (TW); **Kai Shih**, Tu-Cheng (TW); **Hsin Tsung Wu**, Tu-Cheng (TW)

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

(**) Term: **14 Years**

(21) Appl. No.: **29/300,347**

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

(51) **LOC (8) Cl.** **14-03**

(52) **U.S. Cl.** **D14/230; D14/358**

(58) **Field of Classification Search** D14/230-238,
D14/299, 358; 343/700 R, 840, 841, 908;
455/3.02, FOR. 215, 575.2

See application file for complete search history.

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D534,903 S * 1/2007 Hung et al. D14/230
D554,111 S * 10/2007 Su et al. D14/230
D555,154 S * 11/2007 Lin et al. D14/230
D555,155 S * 11/2007 Su et al. D14/230
2008/0030407 A1 * 2/2008 Hung et al. 343/700 MS
* cited by examiner

Primary Examiner—Robert M. Spear

Assistant Examiner—John Windmuller

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

(57) **CLAIM**

The ornamental design for an antenna, as shown and described.

DESCRIPTION

FIG. 1 is a perspective view of an antenna showing our new design;

FIG. 2 is a front elevational view thereof;

FIG. 3 is a rear elevational view thereof;

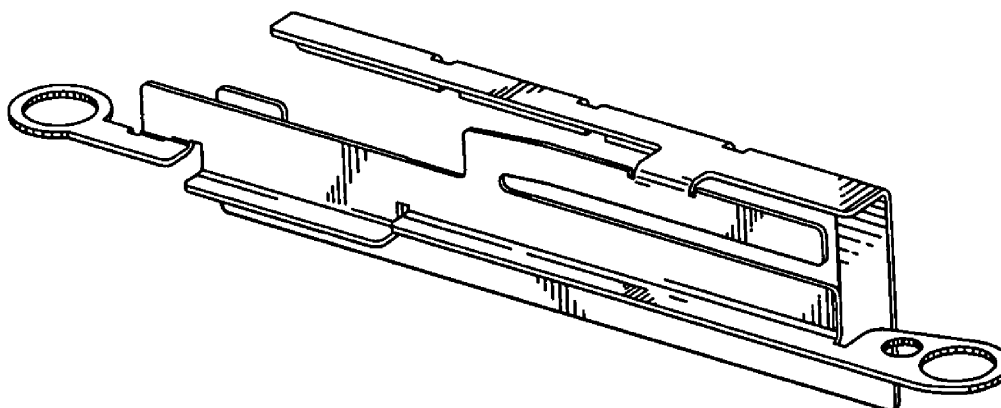
FIG. 4 is a left side elevational view thereof;

FIG. 5 is a right side elevational view thereof;

FIG. 6 is a top plan view thereof; and,

FIG. 7 is a bottom plan view thereof.

1 Claim, 7 Drawing Sheets



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US007453401B2

(12) **United States Patent**
Jow

(10) **Patent No.:** **US 7,453,401 B2**
(45) **Date of Patent:** **Nov. 18, 2008**

(54) **VERTICAL COMPLEMENTARY FRACTAL ANTENNA**

(75) Inventor: **Uei-Ming Jow**, Hsinchu (TW)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 169 days.

(21) Appl. No.: **11/261,568**

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

(65) **Prior Publication Data**

US 2006/0267842 A1 Nov. 30, 2006

(30) **Foreign Application Priority Data**

May 27, 2005 (TW) 94117602 A

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

(52) **U.S. Cl.** **343/700 MS; 343/792.5; 343/846**

(58) **Field of Classification Search** **343/700 MS, 343/702, 792.5, 846, 895**

See application file for complete search history.

(56) **References Cited**

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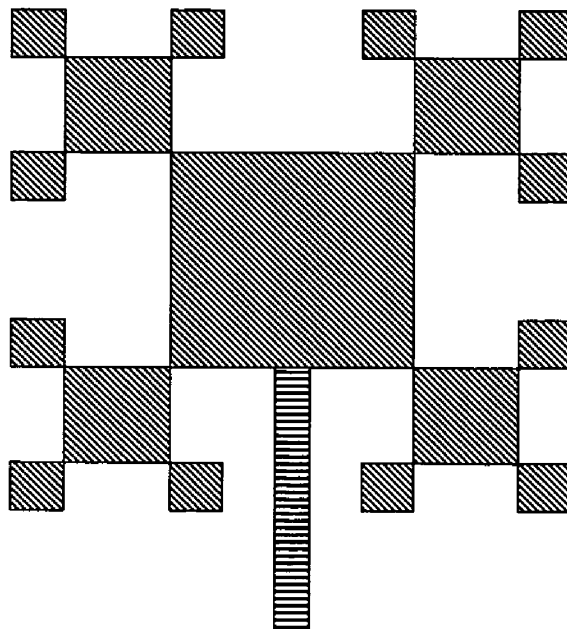
Primary Examiner—Tho G Phan

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

(57) **ABSTRACT**

A vertical complementary fractal antenna is provided, which includes a first fractal structure and a second fractal structure. The first fractal structure is defined as a superposition over at least one iteration of a motif, while the second fractal structure has a pattern complementary to that of the first fractal structure. Thus, the antenna may effectively increase bandwidth.

25 Claims, 7 Drawing Sheets



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US007453402B2

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

(10) **Patent No.:** **US 7,453,402 B2**
(45) **Date of Patent:** **Nov. 18, 2008**

(54) **MINIATURE BALANCED ANTENNA WITH DIFFERENTIAL FEED**

(75) Inventors: **Corbett Rowell**, Shatin (HK); **Chi Lun Mak**, Shatin (HK)

(73) Assignee: **Hong Kong Applied Science and Research Institute Co., Ltd.**, Hong Kong (CN)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 26 days.

(21) Appl. No.: **11/455,526**

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

(65) **Prior Publication Data**

US 2007/0290927 A1 Dec. 20, 2007

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

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

(58) **Field of Classification Search** **343/833, 343/834, 793, 815, 700 MS, 702, 817, 795**
See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Trinh V Dinh

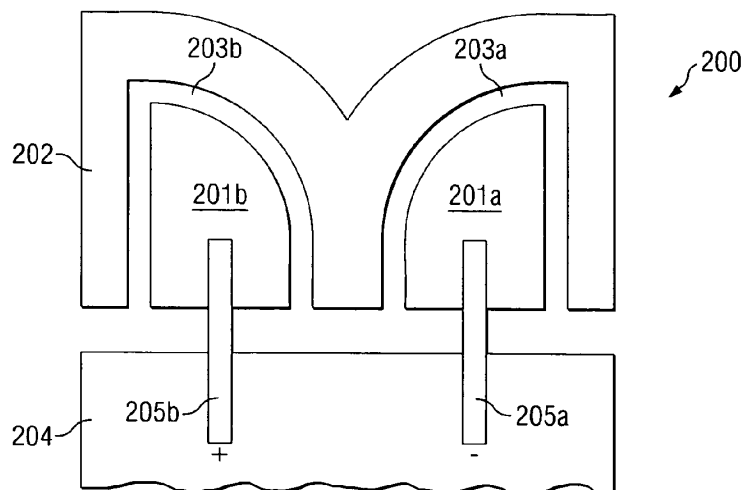
Assistant Examiner—Dieu Hien T Duong

(74) *Attorney, Agent, or Firm*—Fulbright & Jaworski L.L.P.

(57) **ABSTRACT**

An example antenna system includes a parasitic element and a symmetrical element fed by a balanced RF signal source. The fed element is operable to couple with the parasitic element, thereby causing the parasitic element to resonate at a first frequency band. Thus, the fed element is operable to act as a balanced capacitive feed for the parasitic element. Also, the parasitic element is symmetrical with respect to a polarity of the fed element.

15 Claims, 4 Drawing Sheets



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US007453404B2

(12) **United States Patent**
Ying

(10) **Patent No.:** **US 7,453,404 B2**

(45) **Date of Patent:** **Nov. 18, 2008**

(54) **ANTENNA DEVICE FOR COMMUNICATION EQUIPMENT**

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

(73) Assignee: **Sony Ericsson Mobile Communications AB**, Lund (SE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 42 days.

(21) Appl. No.: **10/554,016**

(22) PCT Filed: **Mar. 4, 2004**

(86) PCT No.: **PCT/EP2004/002188**

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

(87) PCT Pub. No.: **WO2004/097977**

PCT Pub. Date: **Nov. 11, 2004**

(65) **Prior Publication Data**

US 2007/0080871 A1 Apr. 12, 2007

Related U.S. Application Data

(60) Provisional application No. 60/466,309, filed on Apr. 29, 2003.

(30) **Foreign Application Priority Data**

Apr. 26, 2003 (EP) 03009488

(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, 906
See application file for complete search history.

(56) **References Cited**

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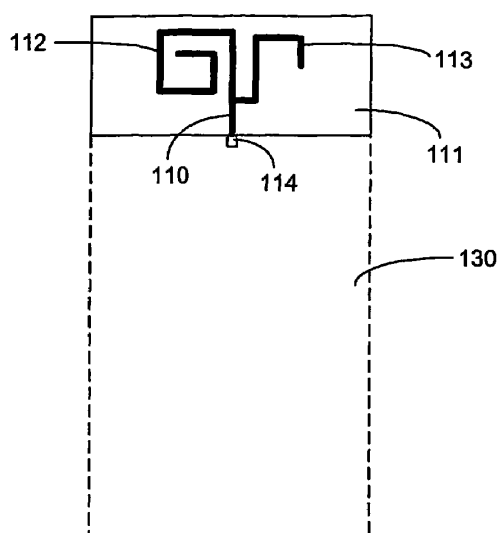
Primary Examiner—Tan Ho

(74) *Attorney, Agent, or Firm*—Myers Bigel Sibley & Sajovec

(57) **ABSTRACT**

An antenna device for a computer card device, such as a PCMCIA type card, includes at least a first antenna including a trace on a support element, antenna output means, and a protruding member extending from a housing of the card. The support element, which may include a flexible dielectric film, has a geometric shape that is conformed to the geometric shape of the protruding member.

17 Claims, 3 Drawing Sheets



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US007453406B2

(12) **United States Patent**
Chenoweth

(10) **Patent No.:** **US 7,453,406 B2**
(45) **Date of Patent:** **Nov. 18, 2008**

(54) **LOW INTERFERENCE INTERNAL ANTENNA SYSTEM FOR WIRELESS DEVICES**

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

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

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

(21) Appl. No.: **11/618,126**

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

(65) **Prior Publication Data**

US 2008/0158070 A1 Jul. 3, 2008

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

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

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

See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Trinh Vo Dinh

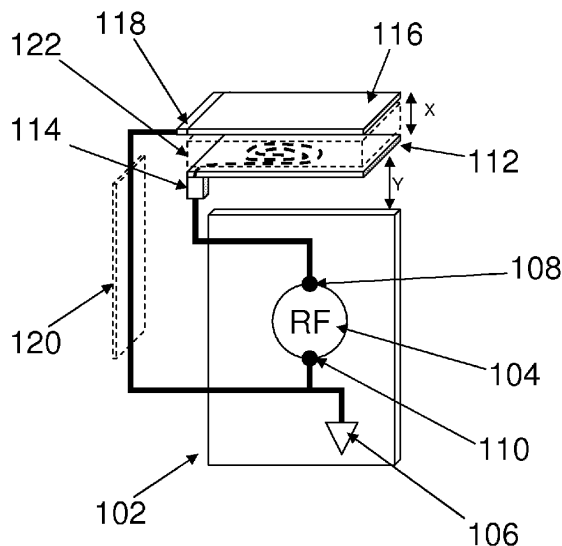
Assistant Examiner—Dieu Hien T Duong

(74) *Attorney, Agent, or Firm*—Pablo Meles; Akerman Senterfitt

(57) **ABSTRACT**

A wireless communications antenna system (100) includes a main circuit element (102) having a feed device (104) with an active port (108) and a grounding port (110), where the grounding port is coupled to a grounding device (106) of the main circuit element, a generally planar antenna element (112) having a feeding portion (114) coupled to the active port of the feed device, where the antenna element is electrically ungrounded, and a generally planar secondary circuit element (116) having a grounding portion (118) coupled to the grounding device. The secondary circuit element is positioned in proximity to the antenna element and the antenna element and the secondary circuit element are generally parallel and separated by a gap (X). Further, at least a portion of the secondary circuit element at least partially overlaps the antenna element.

20 Claims, 4 Drawing Sheets



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US007453407B2

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

(10) **Patent No.:** **US 7,453,407 B2**
(45) **Date of Patent:** **Nov. 18, 2008**

(54) **ANTENNA CONSTRUCTIONS FOR
ELECTRONIC DEVICES AND METHODS
FOR MANUFACTURING SUCH ANTENNA
CONSTRUCTIONS**

(75) Inventors: **Brian Matthew Logan**, Akron, OH
(US); **Robert Leon Benedict**,
Tallmadge, OH (US)

(73) Assignee: **The Goodyear Tire & Rubber
Company**, Akron, OH (US)

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

(21) Appl. No.: **11/618,744**

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

(65) **Prior Publication Data**

US 2008/0158072 A1 Jul. 3, 2008

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

(52) **U.S. Cl.** **343/711; 343/717; 343/897**

(58) **Field of Classification Search** **343/711,**
343/717, 897, 700 MS

See application file for complete search history.

(56) **References Cited**

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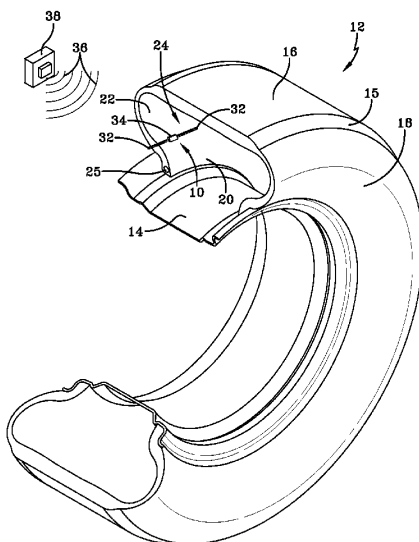
Primary Examiner—Hoang V Nguyen

(74) Attorney, Agent, or Firm—Wood, Herron & Evans LLP

(57) **ABSTRACT**

Antenna constructions for electronic devices and methods of
manufacturing such antenna constructions. The electronic
device comprises a transponder and an antenna electrically
coupled with the transponder. The antenna has a core of a first
material and a coating of a second material on the core. The
second material has a higher electrical conductivity than the
first material and/or a lower permeability than the first ma-
terial. The coating on the core also has a predetermined thick-
ness. The electronic devices may be used in tires.

17 Claims, 2 Drawing Sheets



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US007453408B2

(12) **United States Patent**
Martin

(10) **Patent No.:** **US 7,453,408 B2**

(45) **Date of Patent:** **Nov. 18, 2008**

(54) **DETECTION OR IDENTIFICATION
ANTENNA INSENSITIVE TO THE
ENVIRONMENT THEREOF**

(58) **Field of Classification Search** 343/742,
343/867, 895; 340/572, 1, 572.1; 235/492
See application file for complete search history.

(75) Inventor: **Jean-Marc Martin**, Saint Leu la Foret
(FR)

(56) **References Cited**

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(73) Assignee: **Pygmalyon** (FR)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 44 days.

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Primary Examiner—Shih-Chao Chen

(74) *Attorney, Agent, or Firm*—Cantor Colburn LLP

(21) Appl. No.: **10/522,202**

(22) PCT Filed: **Jul. 17, 2003**

(86) PCT No.: **PCT/FR03/02267**

§ 371 (c)(1),

(2), (4) Date: **Jan. 27, 2006**

(87) PCT Pub. No.: **WO2005/010811**

PCT Pub. Date: **Feb. 3, 2005**

(57) **ABSTRACT**

A resonant detection or identification antenna having at least one turn the antenna includes at least one electrically conducting wire and is connected to an electronic transponder chip, the operating frequency of the antenna being greater than or equal to 10 MHz and the area defined by the at least one turn being substantially less than or equal to 0.30 m². The total capacitance of the antenna is substantially greater than or equal to 140 pF and the Q-factor of the at least one turn is substantially greater than or equal to 30.

(65) **Prior Publication Data**

US 2006/0139232 A1 Jun. 29, 2006

(30) **Foreign Application Priority Data**

Jul. 17, 2002 (FR) 02 09052

(51) **Int. Cl.**

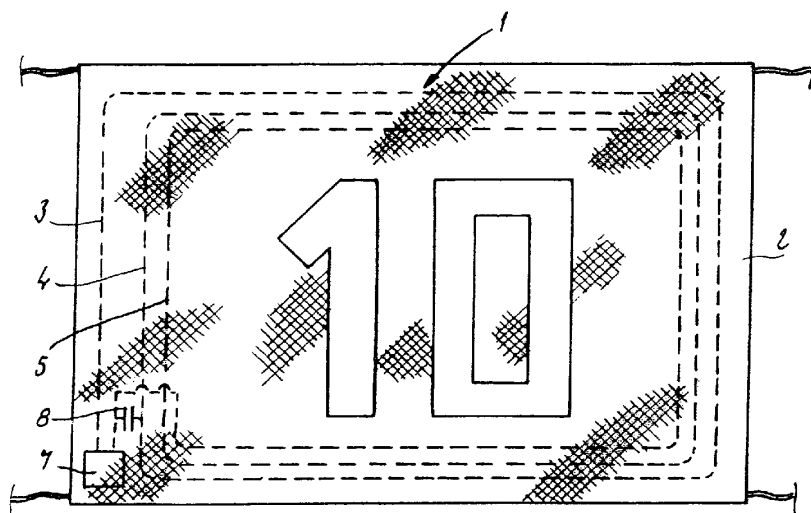
H01Q 11/12 (2006.01)

H01Q 21/00 (2006.01)

G06K 19/06 (2006.01)

(52) **U.S. Cl.** 343/742; 343/867; 235/492

10 Claims, 2 Drawing Sheets



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US007453410B2

(12) **United States Patent**
Chang

(10) **Patent No.:** **US 7,453,410 B2**
(45) **Date of Patent:** **Nov. 18, 2008**

(54) **WAVEGUIDE ANTENNA USING A
CONTINUOUS LOOP WAVEGUIDE FEED
AND METHOD OF PROPAGATING
ELECTROMAGNETIC WAVES**

(75) Inventor: **Yu-Wen Chang**, Rancho Palos Verdes,
CA (US)

(73) Assignee: **Chang Indusatry, Inc.**, La Verne, CA
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 193 days.

(21) Appl. No.: **11/401,513**

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

(65) **Prior Publication Data**
US 2007/0236402 A1 Oct. 11, 2007

(51) **Int. Cl.**
H01Q 13/06 (2006.01)
H01P 5/22 (2006.01)

(52) **U.S. Cl.** **343/776**; 333/120; 333/137

(58) **Field of Classification Search** 333/120,
333/125, 137; 343/776, 852
See application file for complete search history.

(56) **References Cited**

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Mauricio Sanchez Barbetty; *Design and Implementation of a Transceiver and a Microstrip Corporate Feed for Solid State X-Band Radar*; 2005; 58 pages (29 condensed pages).

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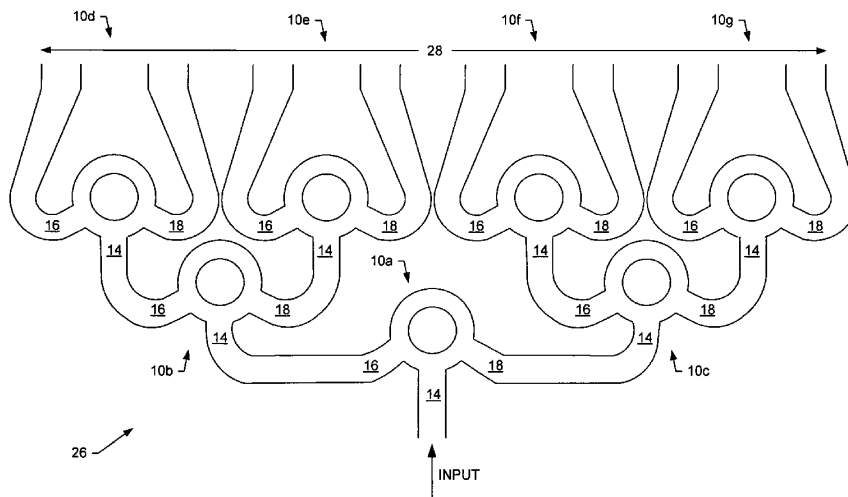
Primary Examiner—Benny Lee

(74) Attorney, Agent, or Firm—Alston & Bird LLP

(57) **ABSTRACT**

An antenna includes first, second and third waveguides in direct communication with a base waveguide at first, second and third positions, respectively, the base waveguide forming a continuous loop. The second position, at which the second waveguide is in direct communication with the base waveguide, is spaced apart from the first position by about one-sixth the circumference of the loop. The third position, at which the third waveguide is in direct communication with the base waveguide, is spaced apart from the first position by about one-sixth the circumference of the loop, and is uninterruptedly spaced apart from the second position, without extending through the first position, by about two-thirds the circumference of the loop. The first, second and third waveguides comprise closed-channel waveguides, and the second and third waveguides have an open end and are configured to radiate electromagnetic waves and/or focus radiating electromagnetic waves.

18 Claims, 6 Drawing Sheets



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US007453411B2

(12) **United States Patent**
Nagai

(10) **Patent No.:** **US 7,453,411 B2**
(45) **Date of Patent:** **Nov. 18, 2008**

(54) **ANTENNA DEVICE AND RADAR APPARATUS INCLUDING THE SAME**

7,091,922 B2 * 8/2006 Parsons et al. 343/781 P

FOREIGN PATENT DOCUMENTS

(75) Inventor: **Tomohiro Nagai**, Nagaokakyo (JP)
(73) Assignee: **Murata Manufacturing Co., Ltd** (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.

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(21) Appl. No.: **11/583,024**

Written Opinion dated May 31, 2005 (with English translation).
International Search Report dated May 31, 2005.

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

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(65) **Prior Publication Data**

US 2007/0035461 A1 Feb. 15, 2007

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2005/006238, filed on Mar. 31, 2005.

Primary Examiner—Trinh V Dinh
Assistant Examiner—Dieu Hien T Duong
(74) *Attorney, Agent, or Firm*—Dickstein, Shapiro, LLP.

(57) **ABSTRACT**

(30) **Foreign Application Priority Data**

May 21, 2004 (JP) 2004-151597

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

(52) **U.S. Cl.** **343/781 P**; 343/781 R

(58) **Field of Classification Search** 343/757,
343/761, 763, 772, 781 R, 781 P
See application file for complete search history.

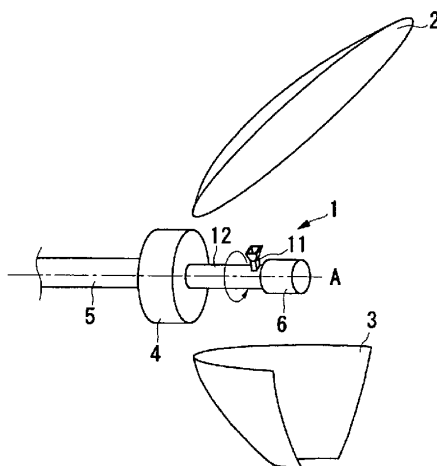
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6,396,448	B1 *	5/2002	Zimmerman et al.		343/753
6,870,512	B2 *	3/2005	Yoneda et al.		343/781 CA

An antenna device having a primary radiator that includes a transmitting section formed of a cylindrical waveguide extending parallel to a direction in which the front of the antenna device faces (front direction), and a rectangular horn-shaped radiant section extending perpendicular to the front direction. A waveguide whose central axis in the extending direction corresponds to that of the transmitting section of the primary radiator is connected to an end of the transmitting section via a rotary joint so as to be rotatable. A first reflector is of an offset parabolic type, and is disposed above the primary radiator in a predetermined position with respect to the primary radiator such that a predetermined directivity is obtained. A second reflector is parabolic in the vertical direction, and is toric in the horizontal direction. The second reflector is disposed below the primary radiator in a predetermined position with respect to the primary radiator such that a predetermined directivity is obtained.

10 Claims, 11 Drawing Sheets



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US007453414B2

(12) **United States Patent**
Parsche

(10) **Patent No.:** **US 7,453,414 B2**
(45) **Date of Patent:** **Nov. 18, 2008**

(54) **BROADBAND OMNIDIRECTIONAL LOOP
ANTENNA AND ASSOCIATED METHODS**

(75) Inventor: **Francis Eugene Parsche**, Palm Bay, FL
(US)

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

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 429 days.

(21) Appl. No.: **11/330,642**

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

(65) **Prior Publication Data**

US 2007/0159408 A1 Jul. 12, 2007

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

(52) **U.S. Cl.** **343/866; 343/773; 343/867;**
343/807

(58) **Field of Classification Search** 343/773,
343/774, 866, 867, 741, 742, 807, 795
See application file for complete search history.

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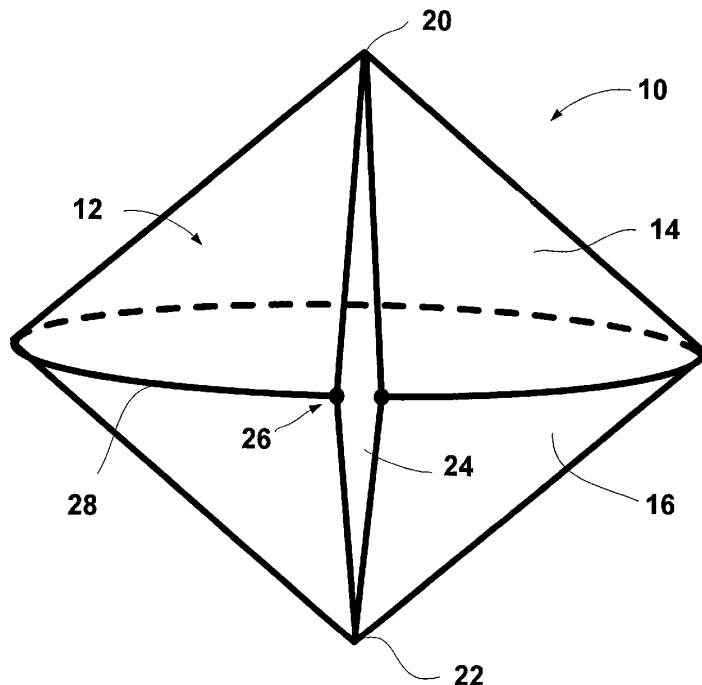
Primary Examiner—HoangAnh T Le

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

(57) **ABSTRACT**

The biconical loop antenna is the dual and compliment to the biconical dipole antenna, and has broadband omnidirectional horizontally polarized radiation. The antenna includes a conductive antenna body having first and second opposing ends with a medial portion therebetween. The antenna body has a slot extending from at least adjacent the first end to at least adjacent the second end, and the medial portion of the antenna body is wider than the opposing ends. First and second body portions may be conical antenna elements connected together at their respective bases. Antenna feed points are at the medial and chine portion of the antenna body adjacent the slot.

20 Claims, 8 Drawing Sheets



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US007453415B2

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

(10) **Patent No.:** **US 7,453,415 B2**
(45) **Date of Patent:** **Nov. 18, 2008**

(54) **ANTENNA APPARATUS FOR TRANSPONDER**

(75) Inventors: **Makoto Shigihara**, Fukushima-ken (JP);
Yasuhiro Konno, Fukushima-ken (JP)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 2 days.

(21) Appl. No.: **11/809,051**

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

(65) **Prior Publication Data**

US 2008/0001842 A1 Jan. 3, 2008

(30) **Foreign Application Priority Data**

Jun. 30, 2006 (JP) 2006-181930

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

(52) **U.S. Cl.** **343/872; 343/717; 343/755;**
343/793; 343/795; 343/866

(58) **Field of Classification Search** **343/717;**
343/755, 793, 795, 872, 866, 873
See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Douglas W. Owens

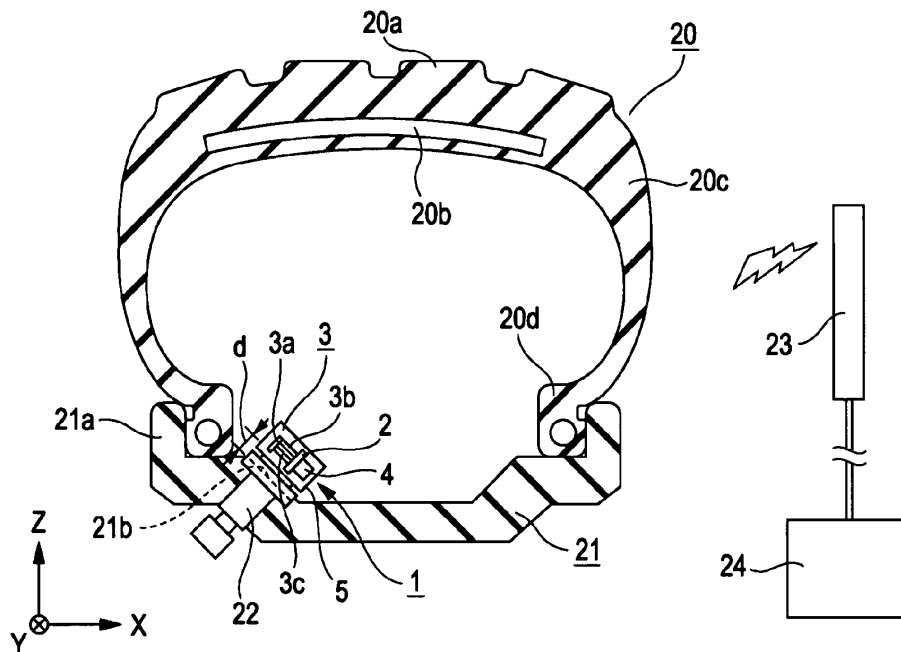
Assistant Examiner—Chuc Tran

(74) *Attorney, Agent, or Firm*—Beyer Law Group LLP

(57) **ABSTRACT**

An antenna apparatus is mounted at a wheel rim as a transponder of a system for monitoring a tire pressure or the like, and attached at an end portion of an air valve. The apparatus includes a circuit board having an electronic circuit portion and a grounding conductor layer, a sheet-metal inverse-F type antenna element, a sheet-metal shield case conducting to the grounding conductor layer to cover the electronic circuit portion, and a resin case for accommodating these components. One side surface extending in a longitudinal direction of a space defined between the circuit board and the radiating conductor of the antenna element faces one of sidewalls of a tire, and the other side surface thereof faces a wall surface of the wheel rim with a distance interposed therebetween, the distance being about one-fourth of a wavelength of a radio wave to be used.

5 Claims, 3 Drawing Sheets



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US00D580917S

(12) **United States Design Patent**
Hu et al.

(10) **Patent No.:** **US D580,917 S**

(45) **Date of Patent:** **** Nov. 18, 2008**

(54) **ANTENNA APPARATUS**

(75) Inventors: **Shih-Hao Hu**, Tu-Cheng (TW); **Pei-Fen Wu**, Tu-Cheng (TW); **Hung-Jen Chen**, Tu-Cheng (TW); **Yu-Yuan Wu**, Tu-Cheng (TW)

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

(**) Term: **14 Years**

(21) Appl. No.: **29/300,078**

(22) Filed: **Feb. 20, 2008**

(51) **LOC (8) Cl.** **14-03**

(52) **U.S. Cl.** **D14/230; D14/358**

(58) **Field of Classification Search** D14/230-238,
D14/299, 358; 343/700 R, 840, 841, 908;
455/3.02, FOR. 215, 575.2

See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Robert M. Spear

Assistant Examiner—John Windmuller

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

(57) **CLAIM**

The ornamental design for an antenna apparatus, as shown and described.

DESCRIPTION

FIG. 1 is a perspective view of an antenna apparatus showing our new design;

FIG. 2 is a front elevational view thereof;

FIG. 3 is a rear elevational view thereof;

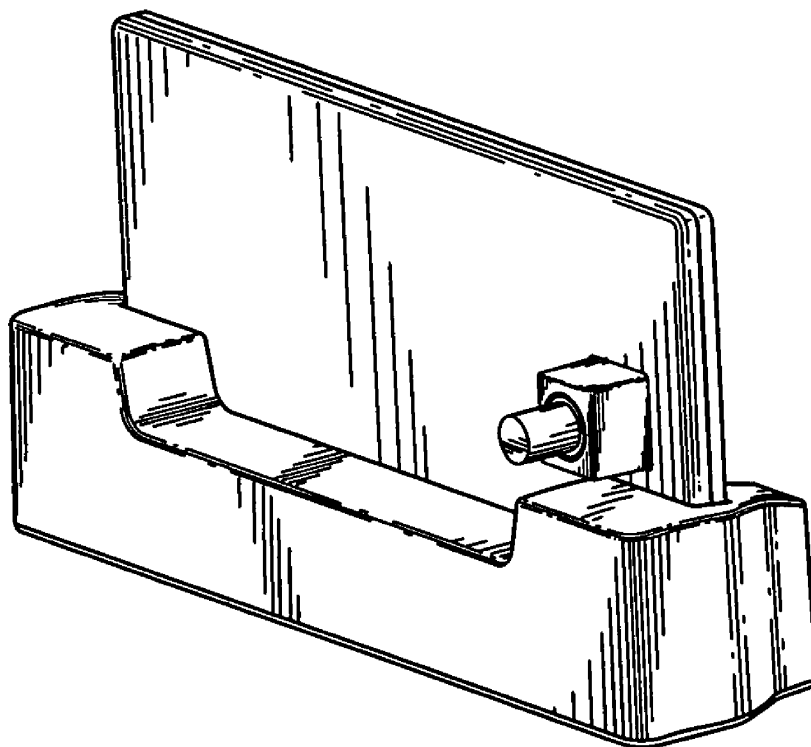
FIG. 4 is a left side elevational view thereof;

FIG. 5 is a right side elevational view thereof;

FIG. 6 is a top plan view thereof; and,

FIG. 7 is a bottom plan view thereof.

1 Claim, 7 Drawing Sheets



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US007456748B2

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

(10) **Patent No.:** **US 7,456,748 B2**
(45) **Date of Patent:** **Nov. 25, 2008**

(54) **RFID ANTENNA WITH PRE-APPLIED ADHESIVES**

(75) Inventors: **Chih-Min Cheng**, Westford, MA (US);
Vito Buffa, Hopkinton, MA (US)

(73) Assignee: **National Starch and Chemical Investment Holding Corporation**, New Castle, DE (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 148 days.

(21) Appl. No.: **11/255,117**

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

(65) **Prior Publication Data**

US 2007/0089286 A1 Apr. 26, 2007

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

(52) **U.S. Cl.** **340/572.7**; 340/572.1; 156/60;
343/873; 343/895; 29/825; 29/846

(58) **Field of Classification Search** 340/572.7,
340/572.1; 343/873, 895, 853; 156/264,
156/299, 60, 269; 29/825, 846, 847

See application file for complete search history.

(56) **References Cited**

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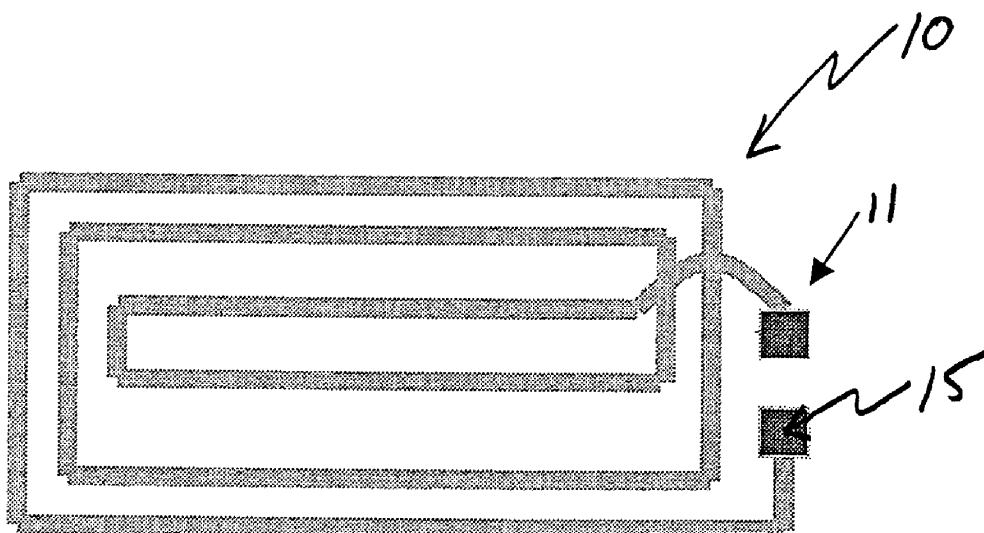
Primary Examiner—Davetta W Goins

(74) *Attorney, Agent, or Firm*—Sun Hee Lehmann

(57) **ABSTRACT**

A radio frequency identification (“RFID”) system antenna having adhesive pre-applied to one or more of its contact pads to allow for high speed attachment of the antenna to the RFID die or die strap. Also disclosed is a method for attaching an RFID antenna having pre-applied adhesive to a die or die strap.

9 Claims, 1 Drawing Sheet



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US007456790B2

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

(10) **Patent No.:** **US 7,456,790 B2**
(45) **Date of Patent:** **Nov. 25, 2008**

(54) **HIGH FREQUENCY ANTENNA DEVICE AND METHOD OF MANUFACTURING THE SAME, HF ANTENNA PRINTED CIRCUIT BOARD FOR HF ANTENNA DEVICE, AND TRANSMITTING AND RECEIVING DEVICE USING HF ANTENNA DEVICE**

(75) Inventors: **Tadashi Isono**, Mito (JP); **Kazuo Matsuura**, Hitachinaka (JP)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 317 days.

(21) Appl. No.: **11/206,819**

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

(65) **Prior Publication Data**
US 2006/0097912 A1 May 11, 2006

(30) **Foreign Application Priority Data**
Nov. 5, 2004 (JP) 2004-321690

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

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

(58) **Field of Classification Search** **343/700 MS, 343/713, 711, 872, 712; 342/175, 70**
See application file for complete search history.

(56) **References Cited**

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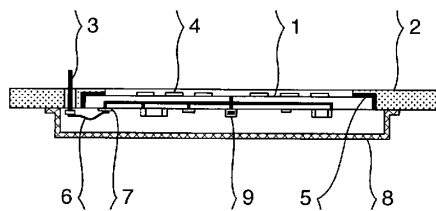
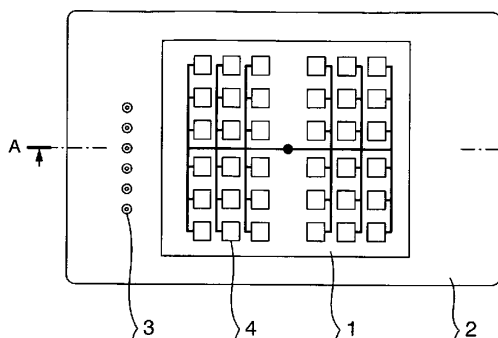
Primary Examiner—HoangAnh T Le

(74) *Attorney, Agent, or Firm*—Crowell & Moring LLP

(57) **ABSTRACT**

A high frequency antenna device is provided which includes: a high frequency antenna wiring board having a film antenna formed on one surface of a dielectric substrate made up of multiple, laminated ceramic layers and a high frequency circuit formed on the other surface of the dielectric substrate to generate a high frequency signal; a plate-like metal base having a square opening cut therethrough; and a cover to package a surface of the high frequency circuit on the high frequency antenna wiring board after the high frequency antenna wiring board has been fitted in the opening of the metal base; wherein a periphery of the high frequency antenna wiring board is airtightly sealed and joined to the metal base with glass or brazing metal.

7 Claims, 5 Drawing Sheets



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US007456796B2

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

(10) **Patent No.:** **US 7,456,796 B2**
(45) **Date of Patent:** **Nov. 25, 2008**

(54) **GLASS ANTENNA FOR VEHICLE**

(75) Inventors: **Yoji Nagayama**, Matsusaka (JP); **Yasuo Takaki**, Matsusaka (JP)

(73) Assignee: **Central Glass Company, Limited**,
Ube-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.: **11/667,734**

(22) PCT Filed: **Mar. 17, 2006**

(86) PCT No.: **PCT/JP2006/005371**

§ 371 (c)(1),
(2), (4) Date: **May 15, 2007**

(87) PCT Pub. No.: **WO2006/103956**

PCT Pub. Date: **Oct. 5, 2006**

(65) **Prior Publication Data**
US 2008/0106480 A1 May 8, 2008

(30) **Foreign Application Priority Data**
Mar. 29, 2005 (JP) 2005-096361
Feb. 9, 2006 (JP) 2006-032946

(51) **Int. Cl.**
H01Q 1/32 (2006.01)
(52) **U.S. Cl.** **343/713; 343/704**
(58) **Field of Classification Search** **343/713,**
343/704, 711, 712
See application file for complete search history.

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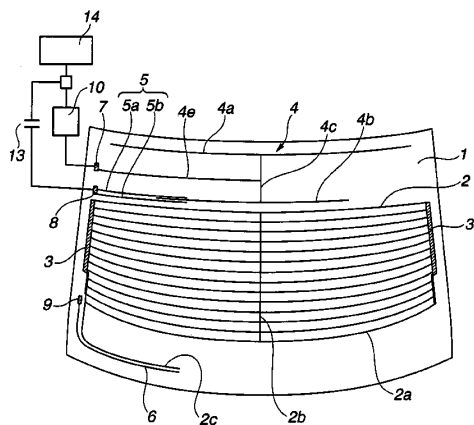
Primary Examiner—Tho G Phan

(74) Attorney, Agent, or Firm—Crowell & Moring LLP

(57) **ABSTRACT**

There is provided an antenna formed on at least upper blank space of defogging heating strips of a rear window glass of a vehicle. The antenna is a vehicular glass antenna including an AM broadcast wave receiving antenna which has at least two horizontal strips formed to have a space therebetween, and a vertical strip connecting the two horizontal strips in the vicinity of a midpoint of each horizontal strip, and in which an extension line extends in a horizontal direction from the vicinity of a midpoint of the vertical strip to the vicinity of a vertical edge of a flange and connects to a first feed point; and an FM broadcast wave receiving antenna having at least one horizontal strip extending from a second feed point formed in the vicinity of the first feed point, and characterized in that at least one horizontal strip of the FM broadcast wave receiving antenna is adjacent to one end of either horizontal strip of the two horizontal strips of the AM broadcast wave receiving antenna to achieve a capacitive coupling.

7 Claims, 7 Drawing Sheets



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US007456798B2

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

(10) **Patent No.:** **US 7,456,798 B2**
(45) **Date of Patent:** **Nov. 25, 2008**

(54) **STACKED LOOP ANTENNA**

(75) Inventors: **Hang Wong**, Kowloon (HK); **Kwai Man Luk**, West Kowloon (HK); **Chi Hou Chan**, Kowloon (HK); **Quan Xue**, Kowloon (HK)

(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 226 days.

(21) Appl. No.: **11/476,387**

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

(65) **Prior Publication Data**

US 2008/0001840 A1 Jan. 3, 2008

(51) **Int. Cl.**

H01Q 7/00 (2006.01)

H01Q 21/28 (2006.01)

(52) **U.S. Cl.** **343/742; 343/867**

(58) **Field of Classification Search** **343/806, 343/853, 895, 742, 867**

See application file for complete search history.

(56) **References Cited**

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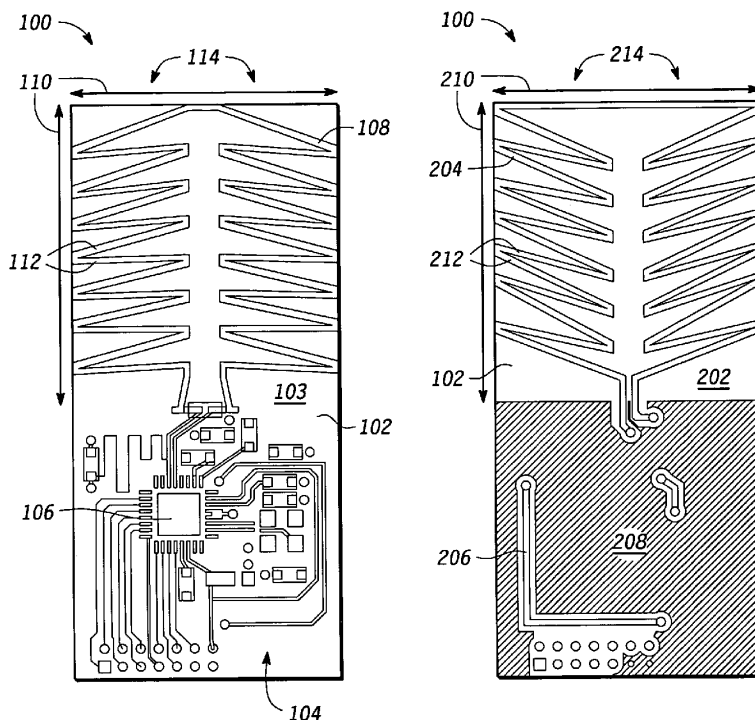
Primary Examiner—Michael C Wimer

(74) *Attorney, Agent, or Firm*—Charles Bergere

(57) **ABSTRACT**

A small transceiver device and antenna system has an insulating layer with first and second surfaces. A transmit loop element having transmit loop segments is formed on the first surface. The transmit loop segments are disposed in a transmit zigzag configuration. A receive loop element having receive loop segments is formed on the second surface. The receive loop segments are disposed in a receive zigzag configuration. Each receive loop segment in the receive zigzag configuration is skewed with respect to a closest transmit loop segment disposed in the transmit zigzag configuration. The transmit loop segments can be grouped in two or more transmit zigzag configurations, and the receive loop segments can be grouped in two or more receive zigzag configurations.

17 Claims, 4 Drawing Sheets



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US007456799B1

(12) **United States Patent**
Cohen

(10) **Patent No.:** **US 7,456,799 B1**
(45) **Date of Patent:** **Nov. 25, 2008**

(54) **WIDEBAND VEHICULAR ANTENNAS**

(75) Inventor: **Nathan Cohen**, Belmont, MA (US)

(73) Assignee: **Fractal Antenna Systems, Inc.**,
Waltham, MA (US)

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

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(21) Appl. No.: **11/805,472**

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

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Related U.S. Application Data

(63) Continuation-in-part of application No. 11/716,909,
filed on Mar. 12, 2007, which is a continuation of
application No. 10/812,276, filed on Mar. 29, 2004,
now Pat. No. 7,190,318.

Primary Examiner—Tho G Phan

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

(60) Provisional application No. 60/458,333, filed on Mar.
29, 2003, provisional application No. 60/802,498,
filed on May 22, 2006.

(57) ABSTRACT

Antennas suitable for wideband transmission and reception are disclosed that are useful in environments susceptible to vibration and impact motion such as for example vehicles of various types, e.g., automobiles, trains, etc. The apparatus can include a bicone antenna including two cone-shaped elements. The physical shape of at least one of the two cone-shaped elements may be at least partially defined by one or more pleats (e.g., a series) that extend about a portion of the cone. An antenna can further include a mast for supporting the bicone as well as a second antenna section including a fractalized dipole. The fractalized dipole can be configured as a conformal circuit board conforming to the shape of the mast and can include self-similar portions or extensions. The antenna may also include a counterpoise to balance the electrically conductive conformal portion. The counterpoise may be defined substantially by a repetitive tooth-like pattern.

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

(52) **U.S. Cl.** **343/773; 343/846**

(58) **Field of Classification Search** **343/773,**
343/772, 846

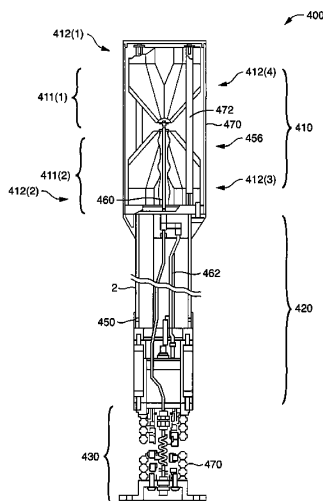
See application file for complete search history.

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14 Claims, 7 Drawing Sheets



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US007456800B2

(12) **United States Patent**
Steghafner

(10) **Patent No.:** **US 7,456,800 B2**
(45) **Date of Patent:** **Nov. 25, 2008**

(54) **RECEIVING ANTENNA SYSTEM
COMPRISING SEVERAL ACTIVE
ANTENNAE**

(75) Inventor: **Herbert Steghafner**, Tiefenbach (DE)

(73) Assignee: **Rohde & Schwarz GmbH & Co. KG**,
Munich (DE)

(*) 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.: **10/577,411**

(22) PCT Filed: **Jul. 12, 2005**

(86) PCT No.: **PCT/EP2005/007554**

§ 371 (c)(1),
(2), (4) Date: **Jun. 20, 2007**

(87) PCT Pub. No.: **WO2006/018079**

PCT Pub. Date: **Feb. 23, 2006**

(65) **Prior Publication Data**

US 2007/0268196 A1 Nov. 22, 2007

(30) **Foreign Application Priority Data**

Aug. 13, 2004 (DE) 10 2004 039 439

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

(52) **U.S. Cl.** **343/844**; 343/850; 343/900;
343/901; 343/711

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

(56) **References Cited**

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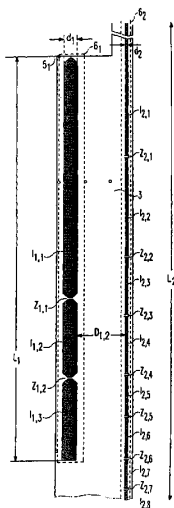
Primary Examiner—Trinh V Dinh

(74) *Attorney, Agent, or Firm*—Marshall, Gerstein & Borun
LLP

(57) **ABSTRACT**

A receiver antenna system of broad bandwidth including a plurality of active, vertical individual antennae, which have an electrically-active antenna height adapted to the respective received frequency range, is minimized with regard to the mutual electromagnetic coupling between the individual antennae, which are positioned at a small spacing distance.

11 Claims, 4 Drawing Sheets



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US007456801B2

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

(10) **Patent No.:** **US 7,456,801 B2**

(45) **Date of Patent:** **Nov. 25, 2008**

(54) **ANTENNA COVER AND ANTENNA APPARATUS**

(75) Inventors: **Hiroaki Kubokawa**, Sagamihara (JP);
Kazutaka Nakatsuchi, Hino (JP)

(73) Assignee: **Olympus 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 6 days.

(21) Appl. No.: **11/629,761**

(22) PCT Filed: **Jun. 15, 2005**

(86) PCT No.: **PCT/JP2005/010972**

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

(87) PCT Pub. No.: **WO2005/122864**

PCT Pub. Date: **Dec. 29, 2005**

(65) **Prior Publication Data**

US 2007/0188401 A1 Aug. 16, 2007

(30) **Foreign Application Priority Data**

Jun. 16, 2004	(JP)	2004-178562
Jun. 23, 2004	(JP)	2004-185554
Jun. 23, 2004	(JP)	2004-185555

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

(52) **U.S. Cl.** **343/872**

(58) **Field of Classification Search** 343/872;
383/5, 40, 93, 209

See application file for complete search history.

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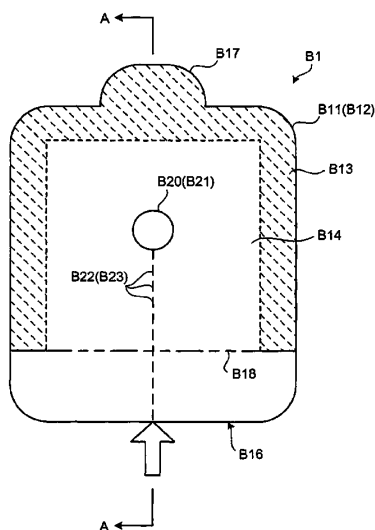
Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—Scully, Scott, Murphy & Presser, P.C.

(57) **ABSTRACT**

After a receiving antenna (A1) is inserted from a slot (B16) into a housing portion (B14) formed between cover members (B11, B12), the slot (B16) is pasted so as to secure the receiving antenna (A1). The receiving antenna (A1) is thus housed. Further, a tab (B17) which extends from one side of a pasted edge portion, holes (B20, B21) that penetrate opposing surfaces of the cover members (B11, B12), and perforated lines (B22, B23) running from the slot (B16) to the holes (B20, B21), respectively, are provided. Therefore, the receiving antenna (A1) can be easily attached to the antenna cover (B1) and to an outer surface of a subject (1), and the receiving antenna (A1) can be easily removed from the antenna cover (B1) and from the outer surface of the subject (1).

8 Claims, 10 Drawing Sheets



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US00D581400S

(12) **United States Design Patent**
Montgomery

(10) **Patent No.:** **US D581,400 S**
(45) **Date of Patent:** **** Nov. 25, 2008**

(54) **ANTENNA STRUCTURE**

(75) Inventor: **Mark T. Montgomery**, Melbourne
Beach, FL (US)

(73) Assignee: **SkyCross, Inc.**, Viera, FL (US)

(**) Term: **14 Years**

(21) Appl. No.: **29/283,563**

(22) Filed: **Aug. 17, 2007**

(51) **LOC (8) Cl.** **14-03**

(52) **U.S. Cl.** **D14/230**

(58) **Field of Classification Search** D14/138,
D14/230-238, 299, 358; D12/42, 43; 343/700 MS,
343/700 R-705, 711-713, 741, 748, 767,
343/795, 819, 840, 846, 866, 871-908; 455/90.2,
455/90.3, 91, 128, 269, 344, 347, 562.1
See application file for complete search history.

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Primary Examiner—Robert M. Spear

Assistant Examiner—John Windmuller

(74) *Attorney, Agent, or Firm*—Rajesh Vallabh; Boston IP
Law Group

(57) **CLAIM**

The ornamental design for an antenna structure, as shown and
described.

DESCRIPTION

FIG. 1 is a perspective view of a first embodiment of an
antenna structure showing my new design;

FIG. 2 is an inverted rear elevational view thereof;

FIG. 3 is a left side elevational view thereof;

FIG. 4 is a top plan view thereof;

FIG. 5 is a right side elevational view thereof;

FIG. 6 is a front elevational view thereof;

FIG. 7 is a bottom plan view thereof;

FIG. 8 is a perspective view of a second embodiment of an
antenna structure;

FIG. 9 is an inverted rear elevational view thereof;

FIG. 10 is a left side elevational view thereof;

FIG. 11 is a top plan view thereof;

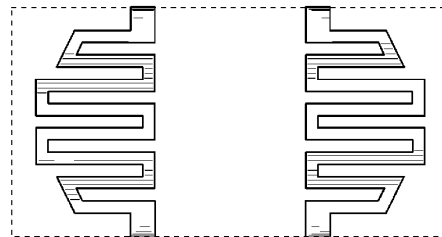
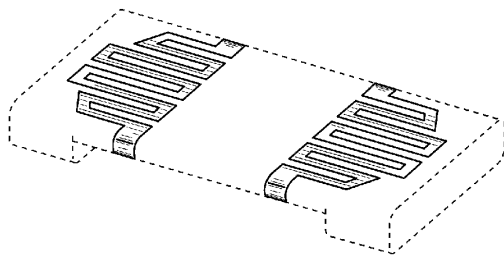
FIG. 12 is a right side elevational view thereof;

FIG. 13 is a front elevational view thereof; and,

FIG. 14 is a bottom plan view thereof.

The portions shown in broken lines are for illustrative pur-
poses only and do not form any part of the claimed design.

1 Claim, 2 Drawing Sheets



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US00D581401S

(12) **United States Design Patent**
Miyoshi

(10) **Patent No.:** **US D581,401 S**
(45) **Date of Patent:** **** Nov. 25, 2008**

(54) **ANTENNA**

(75) Inventor: **Akira Miyoshi**, Tokyo (JP)

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

(**) Term: **14 Years**

(21) Appl. No.: **29/299,109**

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

(30) **Foreign Application Priority Data**

Aug. 7, 2007 (JP) 2007-021482

(51) **LOC (8) Cl.** **14-03**

(52) **U.S. Cl.** **D14/230**

(58) **Field of Classification Search** D14/138,

D14/230-238, 299, 358; D12/42, 43; 343/700 MS,
343/700 R-705, 711-713, 741, 748, 767,
343/795, 819, 840, 846, 866, 871-908; 455/90.2,
455/90.3, 91, 128, 269, 344, 347, 562.1

See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Robert M. Spear

Assistant Examiner—John Windmuller

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

(57) **CLAIM**

The ornamental design for an antenna, as shown.

DESCRIPTION

FIG. 1 is a perspective view of the top, front and right side of an antenna showing my new design;

FIG. 2 is a perspective view of the bottom, rear and left side thereof;

FIG. 3 is a front elevational view thereof;

FIG. 4 is a rear elevational view thereof;

FIG. 5 is a right side elevational view thereof;

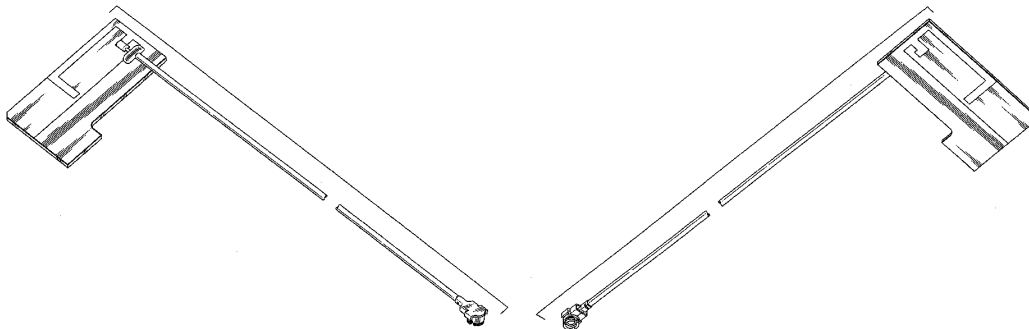
FIG. 6 is a left side elevational view thereof;

FIG. 7 is a top plan view thereof; and,

FIG. 8 is a bottom plan view thereof.

The antenna is shown broken away in the middle to indicate it has no specific length.

1 Claim, 5 Drawing Sheets



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US00D581402S

(12) **United States Design Patent**
Wu et al.

(10) **Patent No.:** **US D581,402 S**

(45) **Date of Patent:** **** Nov. 25, 2008**

(54) **DOUBLE-BAND ANTENNA**

(75) Inventors: **Hsin Tsung Wu**, 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)

(**) Term: **14 Years**

(21) Appl. No.: **29/300,801**

(22) Filed: **May 15, 2008**

(51) **LOC (8) Cl.** **14-03**

(52) **U.S. Cl.** **D14/230**

(58) **Field of Classification Search** D14/138,
D14/230-238, 299, 358; D12/42, 43; 343/700 MS,
343/700 R-705, 711-713, 741, 748, 767,
343/795, 819, 840, 846, 866, 871-908; 455/90.2,
455/90.3, 91, 128, 269, 344, 347, 562.1
See application file for complete search history.

(56) **References Cited**

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D534,527 S * 1/2007 Hung et al. D14/230

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D535,290 S * 1/2007 Su et al. D14/230
D554,111 S * 10/2007 Su et al. D14/230
D555,155 S * 11/2007 Su et al. D14/230
2008/0030407 A1 * 2/2008 Hung et al. 343/700 MS

* cited by examiner

Primary Examiner—Robert M. Spear

Assistant Examiner—John Windmuller

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

(57) **CLAIM**

The ornamental design for a double-band antenna, as shown and described.

DESCRIPTION

FIG. 1 is a perspective view of a double-band antenna showing our new design;

FIG. 2 is a front elevational view thereof;

FIG. 3 is a rear elevational view thereof;

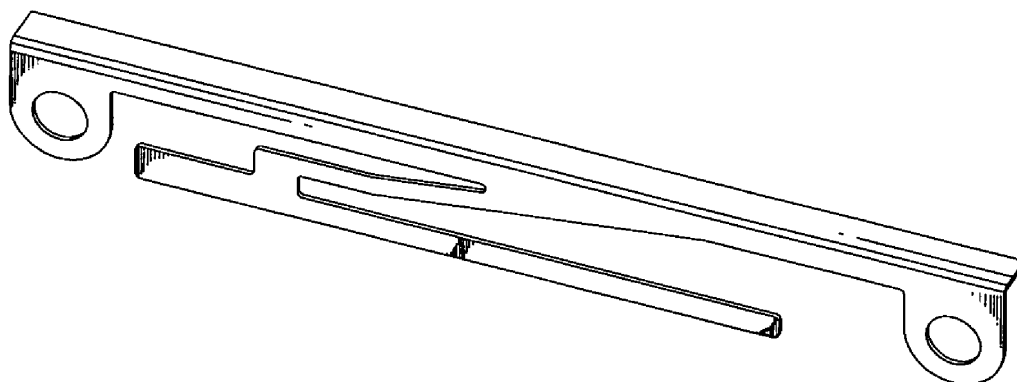
FIG. 4 is a left side elevational view thereof;

FIG. 5 is a right side elevational view thereof;

FIG. 6 is a top plan view thereof; and,

FIG. 7 is a bottom plan view thereof.

1 Claim, 7 Drawing Sheets



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