



US008049670B2

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

(10) **Patent No.:** **US 8,049,670 B2**
(45) **Date of Patent:** **Nov. 1, 2011**

(54) **PORTABLE TERMINAL**
(75) Inventors: **Kang-Jae Jung**, Seoul (KR); **An-Sun Hyun**, Seoul (KR); **Chang-Won Yun**, Gyeonggi-Do (KR)
(73) Assignee: **LG Electronics Inc.**, Seoul (KR)
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 352 days.

(52) **U.S. Cl.** **343/702**; 343/846
(58) **Field of Classification Search** 381/312, 381/323, 322, 315, 60; 343/841, 702; 455/575.1, 455/575.7
See application file for complete search history.

(21) Appl. No.: **12/394,224**
(22) Filed: **Feb. 27, 2009**
(65) **Prior Publication Data**
US 2009/0243944 A1 Oct. 1, 2009
(30) **Foreign Application Priority Data**
Mar. 25, 2008 (KR) 10-2008-0027548

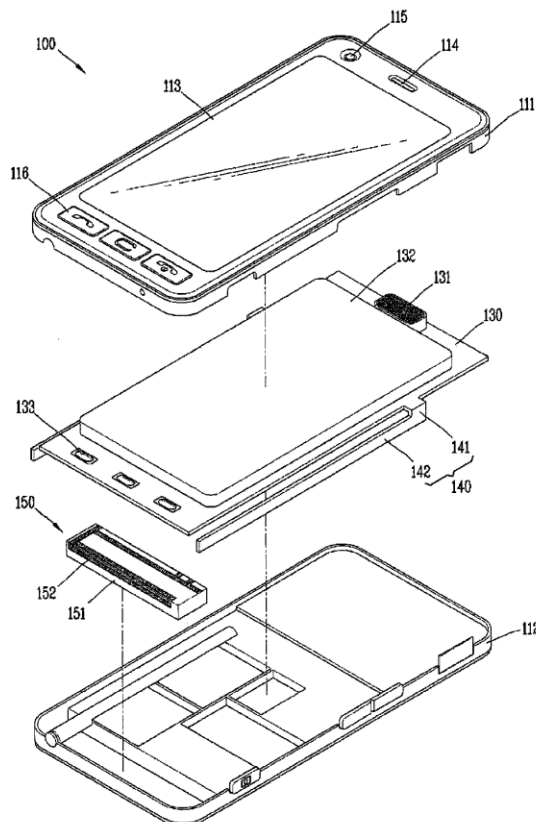
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Primary Examiner — Hoanganh Le
(74) *Attorney, Agent, or Firm* — KED & Associates, LLP

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

(57) **ABSTRACT**
A portable terminal may include a terminal body, a printed circuit board having a ground unit coupled to an antenna, and an electric field reducing unit to transfer a current flowing in the ground unit to a side surface of the terminal body and to reduce strength of an electric field.

11 Claims, 5 Drawing Sheets





US008049672B2

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

(10) **Patent No.:** **US 8,049,672 B2**
(45) **Date of Patent:** **Nov. 1, 2011**

(54) **ULTRA WIDEBAND ANTENNA WITH BAND-NOTCHED CHARACTERISTICS**

(75) Inventors: **The-Nan Chang**, Taipei (TW); **Min-Chi Wu**, Taipei (TW)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 400 days.

(21) Appl. No.: **12/314,398**

(22) Filed: **Dec. 10, 2008**

(65) **Prior Publication Data**
US 2010/0066621 A1 Mar. 18, 2010

(30) **Foreign Application Priority Data**
Sep. 18, 2008 (TW) 097135741 A

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

(52) **U.S. Cl.** 343/767; 343/700 MS; 343/769; 343/770

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

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Primary Examiner — Jacob Y Choi

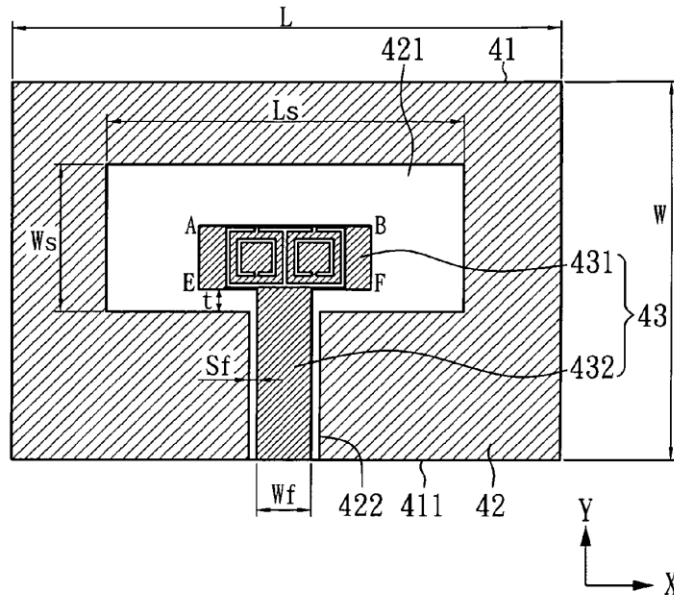
Assistant Examiner — Hasan Islam

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

(57) **ABSTRACT**

An ultra wideband antenna includes: a substrate; a grounding unit, installed on the substrate and scooped with a first slot and a first strip hole; a signal feeding unit, installed on the substrate and including a horizontal portion and a vertical portion, in which the horizontal portion is located in the first slot and the vertical portion is located in the first strip hole; a first complementary, separate, circular resonator; and a second complementary, separate, circular resonator, wherein the first complementary, separate, circular resonator and the second complementary, separate, circular resonator are installed in the horizontal portion of the signal feeding unit and are connected with each other.

11 Claims, 6 Drawing Sheets





US008049673B2

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

(10) **Patent No.:** **US 8,049,673 B2**
(45) **Date of Patent:** **Nov. 1, 2011**

(54) **ELECTRONIC DEVICE AND
MULTI-FREQUENCY ANTENNA THEREOF**

(75) Inventors: **Po-Chuan Hsieh**, Taipei Hsien (TW);
Yu-Chang Pai, Taipei Hsien (TW);
Hsiao-Yun Su, Taipei Hsien (TW);
Chien-Hung Liu, Taipei Hsien (TW);
Jia-Chi Chen, Taipei Hsien (TW)

(73) Assignee: **Hon Hai Precision Industry Co., Ltd.**,
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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 385 days.

(21) Appl. No.: **12/475,512**

(22) Filed: **May 30, 2009**

(65) **Prior Publication Data**
US 2010/0283697 A1 Nov. 11, 2010

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

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

(58) **Field of Classification Search** **343/767,**
343/702, 700 MS, 770, 846

See application file for complete search history.

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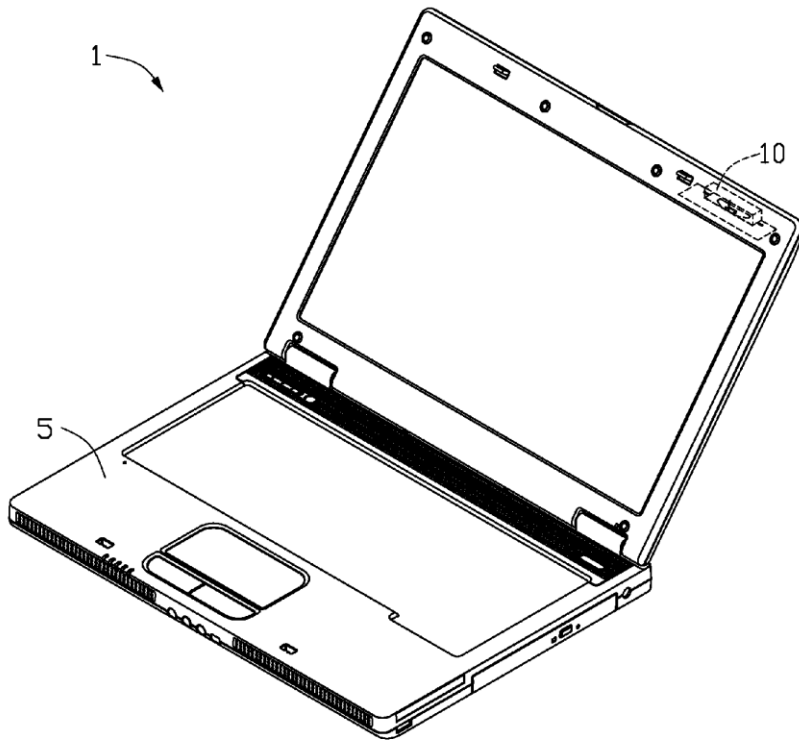
Primary Examiner — Huedung Mancuso

(74) *Attorney, Agent, or Firm* — Altis Law Group, Inc.

(57) **ABSTRACT**

An electronic device includes a multi-frequency antenna. The multi-frequency antenna includes a ground portion, a support body, a radiation portion, and a strap. The ground portion defines a gap, and two grooves communicating with the gap and located at opposite ends of the gap. The radiation portion resists against a sidewall bounding the gap, and is connected to the strap. The radiation portion is accommodated in the gap and substantially coplanar with the ground portion. The radiation portion defines a slot. The support body is located in the gap and on the radiation portion, to support the strap.

13 Claims, 5 Drawing Sheets





US008054227B2

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

(10) **Patent No.:** **US 8,054,227 B2**
(45) **Date of Patent:** **Nov. 8, 2011**

- (54) **CHIP ANTENNA**
- (75) Inventors: **Ki Won Chang**, Gyeonggi-do (KR); **Jeong Sik Seo**, Gyeonggi-do (KR); **Hyun Do Park**, Gyeonggi-do (KR); **Jae Suk Sung**, Gyeonggi-do (KR)
- (73) Assignee: **Samsung Electro-Mechanics Co., Ltd.**, 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 845 days.

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(21) Appl. No.: **11/944,575**

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

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(65) **Prior Publication Data**
US 2008/0122722 A1 May 29, 2008

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(30) **Foreign Application Priority Data**
Nov. 22, 2006 (KR) 10-2006-0115951

Primary Examiner — Jacob Y Choi
Assistant Examiner — Robert Karacsony
(74) *Attorney, Agent, or Firm* — Lowe, Hauptham, Ham & Berner, LLP

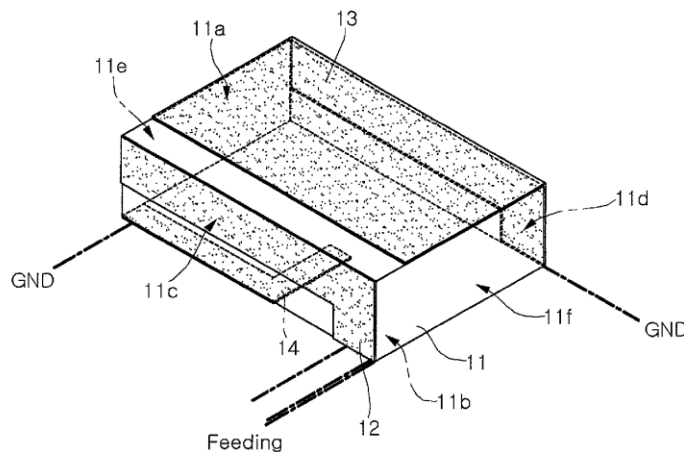
- (51) **Int. Cl.**
H01Q 1/38 (2006.01)
- (52) **U.S. Cl.** **343/700 MS; 343/702**
- (58) **Field of Classification Search** **343/846, 343/700 MS, 702**
See application file for complete search history.

(57) **ABSTRACT**

There is provided a chip antenna including: a dielectric block; a first conductive pattern formed on at least one surface of the dielectric block to connect to an external feeding part; a second conductive pattern spaced apart from the first conductive pattern at a certain distance so as to be capacitively coupled to the first conductive pattern to act as a radiator, the second conductive pattern having one end connected to an external ground part; and a third conductive pattern spaced apart from the first conductive pattern at a certain distance so as to be capacitively coupled to the first conductive pattern to enable impedance matching of the antenna, the third conductive pattern having one end connected to the external ground part.

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13 Claims, 5 Drawing Sheets





US008054229B2

(12) **United States Patent**
Kaneoya

(10) **Patent No.:** **US 8,054,229 B2**
(45) **Date of Patent:** **Nov. 8, 2011**

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

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(75) Inventor: **Masanori Kaneoya**, Musashimurayama (JP)

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(73) Assignee: **Casio Hitachi Mobile Communications Co., Ltd.**, Tokyo (JP)

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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 826 days.

(21) Appl. No.: **11/820,130**

(Continued)

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

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(65) **Prior Publication Data**

US 2008/0001833 A1 Jan. 3, 2008

Office Action dated Apr. 8, 2008 (with English translation) issued for the Japanese Patent Application No. 2006-178830.

(30) **Foreign Application Priority Data**

Jun. 28, 2006 (JP) 2006-178830

Primary Examiner — Huedung Mancuso

(74) Attorney, Agent, or Firm — Cozen O'Connor

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

(57) **ABSTRACT**

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

(58) **Field of Classification Search** 343/702,
343/895, 700 MS; 455/90, 575.5

See application file for complete search history.

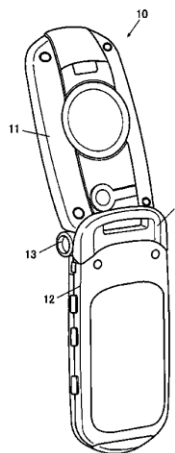
A dual-band antenna with little limitation on the mounting space, which allows two antenna elements coping with different frequency bands to be laid out at a narrow space, and a portable wireless device having the same are provided. A band-like first antenna element, a sheet-like dielectric element, and a band-like second antenna element are fitted in a groove of a support member. The end portion of the second antenna element overlaps with the end portion of the first antenna element, and the dielectric element is sandwiched therebetween. The sandwiched dielectric element constitutes a capacitor, and first antenna element, the capacitor and the second antenna element are connected in series. The other end portion of the second antenna element is connected to a circuit in a bottom casing, and power is supplied through the other end portion thereof.

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17 Claims, 11 Drawing Sheets





US008054230B2

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

(10) **Patent No.:** **US 8,054,230 B2**
(45) **Date of Patent:** **Nov. 8, 2011**

(54) **MULTI-BAND ANTENNA**

(75) Inventors: **Wen-Fong Su**, Tu-cheng (TW);
Shu-Yean Wang, Tu-cheng (TW);
Hsien-Sheng Tseng, Tu-cheng (TW);
Shang-Jen Chen, Tu-cheng (TW);
Chun-Ming Chiu, Tu-cheng (TW)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 622 days.

(21) Appl. No.: **12/221,290**

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

(65) **Prior Publication Data**
US 2009/0033560 A1 Feb. 5, 2009

(30) **Foreign Application Priority Data**
Jul. 31, 2007 (TW) 96212499 A

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

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

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

(56) **References Cited**

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Primary Examiner — Tho G Phan

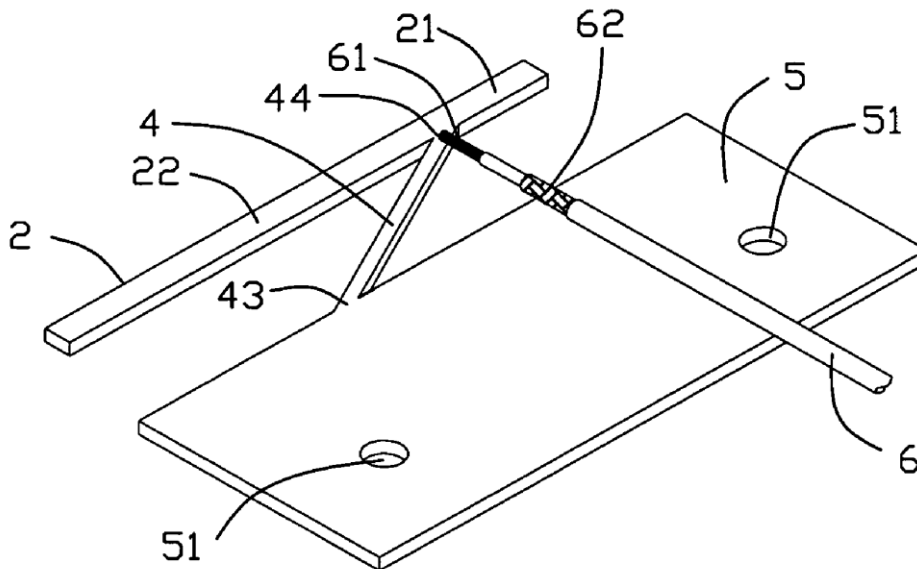
(74) *Attorney, Agent, or Firm* — Wei Te Chung; Andrew C. Cheng; Ming Chieh Chang

(57) **ABSTRACT**

A multi-band antenna includes a grounding element having a first side, a radiating element separated from the first side of the grounding element, and a connecting element. The connecting element connects the grounding element to the radiating element and includes a first end slantwise extending from the grounding to form a first angle except a right angle between the connecting element and the grounding element.

19 Claims, 3 Drawing Sheets

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US008054231B2

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

(10) **Patent No.:** **US 8,054,231 B2**
(45) **Date of Patent:** **Nov. 8, 2011**

(54) **MOBILE TERMINAL HAVING METAL CASE AND ANTENNA STRUCTURE**

(75) Inventors: **Jung Ho Ahn**, Seoul (KR); **Yong Jin Kim**, Seoul (KR); **Dong Hwan Kim**, Hwaseong-si (KR); **Jae Ho Lee**, Yongin-si (KR); **Seung Hwan Kim**, Suwon-si (KR)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 312 days.

(21) Appl. No.: **12/419,503**

(22) Filed: **Apr. 7, 2009**

(65) **Prior Publication Data**
US 2009/0278757 A1 Nov. 12, 2009

(30) **Foreign Application Priority Data**
May 6, 2008 (KR) 10-2008-0041704

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

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

(58) **Field of Classification Search** 343/702, 343/767, 770, 872
See application file for complete search history.

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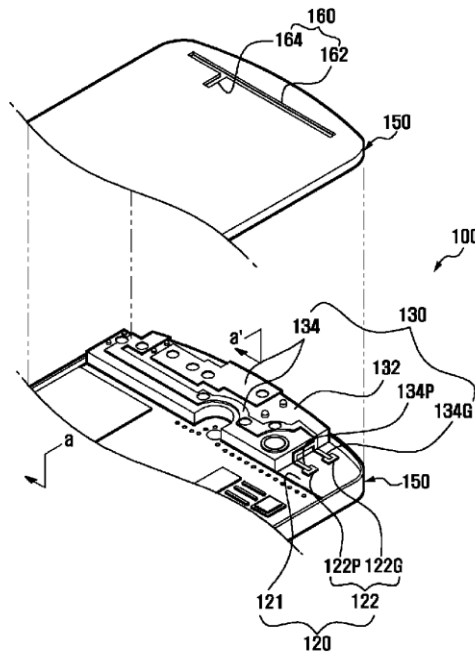
Primary Examiner — Hoang V Nguyen

(74) *Attorney, Agent, or Firm* — Jefferson IP Law, LLP

(57) **ABSTRACT**

A mobile terminal including a metal case and an antenna structure that can exhibit optimum radiation performance is provided. The antenna structure includes an antenna having a radiation unit for transmitting and for receiving electric waves, a Printed Circuit Board (PCB) to which the antenna is mechanically coupled at one surface thereof and having a power supply unit electrically coupled to the radiation unit, and a case constructed using a metal material within which the PCB is disposed, wherein the case has at least one slot formed in a surface thereof opposite to the surface to which the PCB is fastened and adjacent to the radiation unit.

15 Claims, 12 Drawing Sheets





US008054232B2

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

(10) **Patent No.:** **US 8,054,232 B2**

(45) **Date of Patent:** **Nov. 8, 2011**

(54) **ANTENNAS FOR WIRELESS ELECTRONIC DEVICES**

(75) Inventors: **Bing Chiang**, Cupertino, CA (US); **Douglas Blake Kough**, San Jose, CA (US); **Enrique Ayala Vazquez**, Watsonville, CA (US); **Eduardo Lopez Camacho**, Watsonville, CA (US); **Gregory Allen Springer**, Sunnyvale, CA (US)

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(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

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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.: **12/871,825**

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(22) Filed: **Aug. 30, 2010**

Primary Examiner — Hoang V Nguyen

(65) **Prior Publication Data**

US 2010/0321249 A1 Dec. 23, 2010

(74) *Attorney, Agent, or Firm* — Treyz Law Group; David C. Kellogg; G. Victor Treyz

Related U.S. Application Data

(62) Division of application No. 12/104,359, filed on Apr. 16, 2008, now Pat. No. 7,804,453.

(57) **ABSTRACT**

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/48 (2006.01)
(52) **U.S. Cl.** **343/702**; 343/700 MS; 343/846
(58) **Field of Classification Search** 343/700 MS, 343/702, 846
See application file for complete search history.

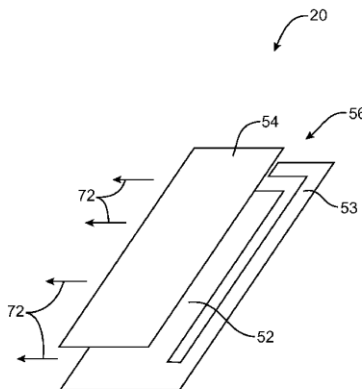
Antenna window structures and antennas are provided for electronic devices. The electronic devices may be laptop computers or other devices that have conductive housings. Antenna windows can be formed from dielectric members. The dielectric members can have elastomeric properties. An antenna may be mounted inside a conductive housing beneath a dielectric member. The antenna can be formed from a parallel plate waveguide structure. The parallel plate waveguide structure may have a ground plate and a radiator plate and may have dielectric material between the ground and radiator plates. The ground plate can have a primary ground plate portion and a ground strip. The ground strip may reflect radio-frequency signals so that they travel through the dielectric member. The antenna may handle radio-frequency antenna signals in one or more communications bands. The radio-frequency antenna signals pass through the dielectric member.

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6 Claims, 10 Drawing Sheets





US008054238B2

(12) **United States Patent**
Lin

(10) **Patent No.:** **US 8,054,238 B2**

(45) **Date of Patent:** **Nov. 8, 2011**

(54) **BALANCED PIFA AND METHOD FOR MANUFACTURING THE SAME**

(75) Inventor: **Junn Yi Lin**, Hsinchu County (TW)

(73) Assignee: **Ralink Technology Corporation**,
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 411 days.

(21) Appl. No.: **12/470,906**

(22) Filed: **May 22, 2009**

(65) **Prior Publication Data**

US 2010/0085270 A1 Apr. 8, 2010

(30) **Foreign Application Priority Data**

Oct. 2, 2008 (TW) 97137847 A

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

(52) **U.S. Cl.** **343/859**

(58) **Field of Classification Search** **343/859,**
343/821, 850, 860, 749, 853; 333/25-26;
455/333, 338

See application file for complete search history.

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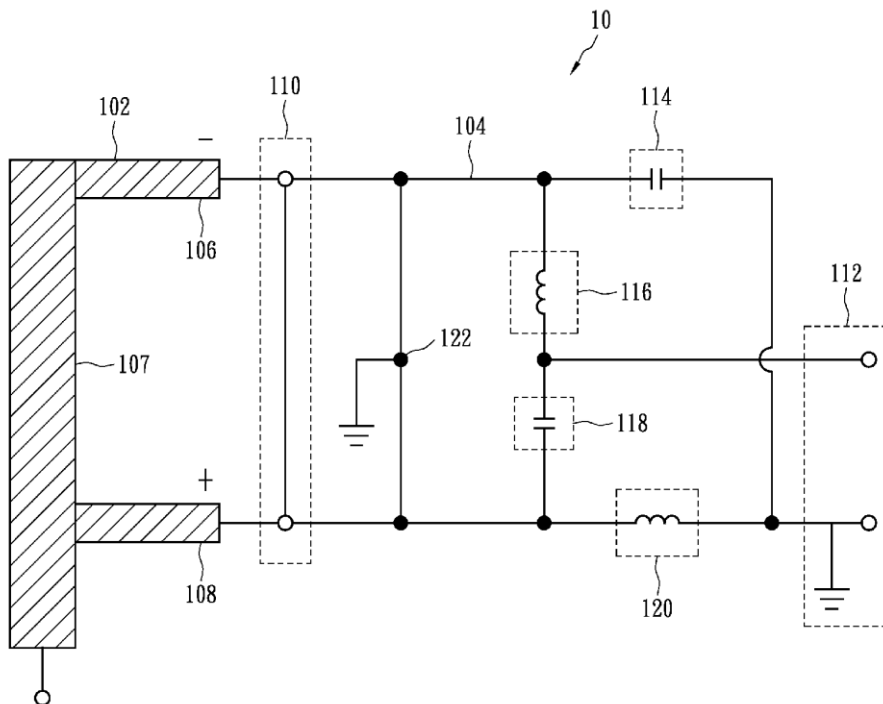
Primary Examiner — Huedung Mancuso

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

(57) **ABSTRACT**

A balanced patched inverse F antenna comprises a radiation conductor and a balun circuit. The radiation conductor includes a main body, a first branch and a second branch. The balun circuit includes an unbalanced port, a balanced port, and first, second, third and fourth components, with the first, second, third and fourth components being serially connected. A feeding input of the unbalanced port is connected to the second and third components, a grounding wire of the unbalanced port is connected to the first and fourth components, an inverting terminal of the balanced port is connected to the first and second components, a non-inverting terminal of the balanced port is connected to the third and fourth components, and the inverting and non-inverting terminals are respectively connected to the first and second branches.

18 Claims, 6 Drawing Sheets





US008059033B2

(12) **United States Patent**
Säily

(10) **Patent No.:** **US 8,059,033 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

(54) **PATCH ANTENNA**
(75) Inventor: **Jussi Säily**, Espoo (FI)
(73) Assignee: **Nokia Siemens Networks GmbH & Co. KG**, Munich (DE)

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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 421 days.

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(21) Appl. No.: **12/320,067**

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(22) Filed: **Jan. 15, 2009**

Saily J: "Proximity-coupled and dual-polarized microstrip patch antenna for WCDMA base station arrays" Proceedings of 2006 Asia Pacific Microwave Conference, Dec. 12, 2006, Dec. 12-15, 2006 (2006-12-15) pp. 628-631, XP002476331 Yokohama, Japan * the whole document*.

(65) **Prior Publication Data**

US 2009/0201211 A1 Aug. 13, 2009

(30) **Foreign Application Priority Data**

Jan. 15, 2008 (EP) 08000696

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Primary Examiner — Tho G Phan

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

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

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

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

See application file for complete search history.

(57) **ABSTRACT**

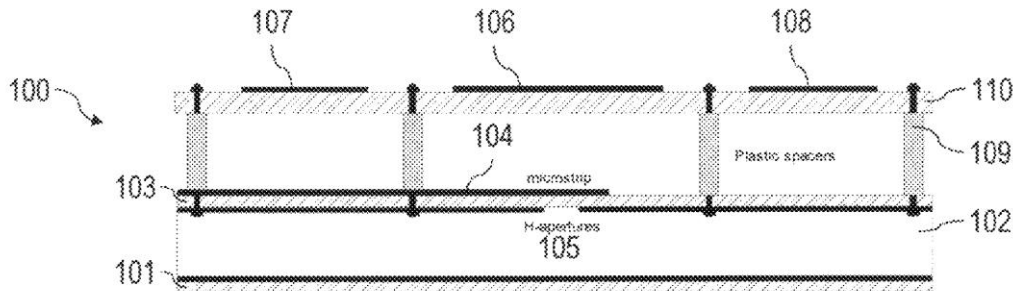
A patch antenna has a primary radiator, a dual microstrip feed line configured to utilize corner-feeding to enable substantially diagonal radiating modes, and at least two parasitic patches that are arranged adjacent and on opposite sides to the primary radiator.

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20 Claims, 7 Drawing Sheets





US008059035B2

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

(10) **Patent No.:** **US 8,059,035 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

(54) **ANTENNA STRUCTURE CAPABLE OF INCREASING ITS FREQUENCY BANDWIDTH/FREQUENCY BAND BY BENDING A CONNECTION ELEMENT THEREOF**

(52) **U.S. Cl.** **343/700 MS**; 343/848
(58) **Field of Classification Search** 343/700 MS, 343/702, 848
See application file for complete search history.

(75) Inventors: **Cheng-Wei Chang**, Taipei Hsien (TW);
Shen-Pin Wei, Taipei Hsien (TW)

(56) **References Cited**

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

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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 298 days.

6,864,841 B2* 3/2005 Dai et al. 343/700 MS
2006/0279464 A1* 12/2006 Mei 343/700 MS
* cited by examiner

Primary Examiner — Tan Ho

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

(21) Appl. No.: **12/464,889**

(57) **ABSTRACT**

(22) Filed: **May 13, 2009**

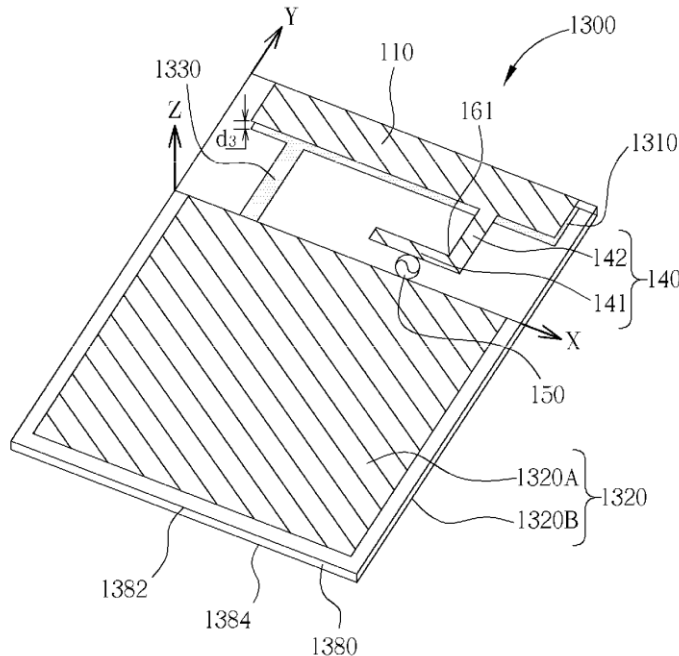
An antenna structure consists of a radiation element, a grounding element, a short element, a connection element, and a signal feeding element. The short element is coupled between the radiation element and the grounding element. The connection element is disposed between the radiation element and the grounding element. The connection element has at least a first segment and a second segment, wherein the first segment and the second segment form a bend. The signal feeding element is coupled between the connection element and the grounding element. The first segment of the connection element is substantially parallel to the grounding element and is at a designated distance from the grounding element.

(65) **Prior Publication Data**
US 2010/0220014 A1 Sep. 2, 2010

(30) **Foreign Application Priority Data**
Feb. 27, 2009 (TW) 98203007 U

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

21 Claims, 14 Drawing Sheets





US008059036B2

(12) **United States Patent**
Bengtsson

(10) **Patent No.:** **US 8,059,036 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

- (54) **ENHANCED RADIATION PERFORMANCE ANTENNA SYSTEM**
- (75) Inventor: **Erik Bengtsson**, Eslöv (SE)
- (73) Assignee: **Nokia Corporation**, Espoo (FI)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 974 days.

- (21) Appl. No.: **11/810,749**
- (22) Filed: **Jun. 6, 2007**
- (65) **Prior Publication Data**
US 2008/0303723 A1 Dec. 11, 2008

- (51) **Int. Cl.**
H01Q 1/24 (2006.01)
 - (52) **U.S. Cl.** **343/702; 343/846**
 - (58) **Field of Classification Search** **343/702, 343/846, 848**
- See application file for complete search history.

(56) **References Cited**

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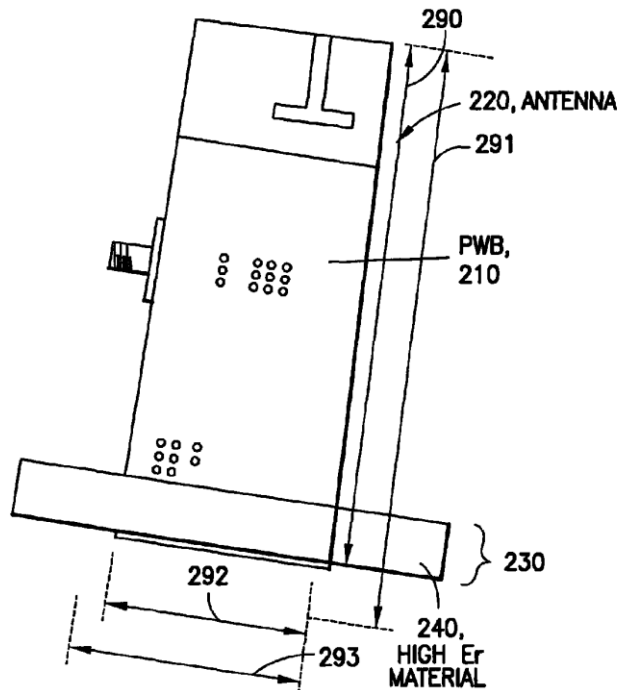
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Primary Examiner — Hoanganh Le
(74) *Attorney, Agent, or Firm* — Harrington & Smith

(57) **ABSTRACT**

A wireless electronic device is disclosed that includes one or more ground planes and an antenna electrically coupled to the one or more ground planes. The antenna is positioned adjacent to a portion of the one or more ground planes. The wireless electronic device includes a material placed in a position and having a dielectric constant selected to increase an effective electrical size of the one or more ground planes relative to the effective electrical size of the one or more ground planes without the material. Other wireless electronic devices and methods for forming the same are also disclosed.

32 Claims, 15 Drawing Sheets





US008059039B2

(12) **United States Patent**
Ayala Vazquez et al.

(10) **Patent No.:** **US 8,059,039 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

(54) **CLUTCH BARREL ANTENNA FOR WIRELESS ELECTRONIC DEVICES**
(75) Inventors: **Enrique Ayala Vazquez**, Watsonville, CA (US); **Hao Xu**, Cupertino, CA (US); **Gregory A. Springer**, Sunnyvale, CA (US); **Bing Chiang**, Cupertino, CA (US); **Eduardo Lopez Camacho**, Watsonville, CA (US); **Douglas B. Kough**, San Jose, CA (US)

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2001/0040529 A1* 11/2001 Cheng et al. 343/702

(Continued)

(73) Assignee: **Apple Inc.**, Cupertino, CA (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.

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(Continued)

(21) Appl. No.: **12/238,385**

Primary Examiner — Hoanganh Le

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

(74) *Attorney, Agent, or Firm* — Treyz Law Group; G. Victor Treyz; David C. Kellogg

(65) **Prior Publication Data**
US 2010/0073242 A1 Mar. 25, 2010

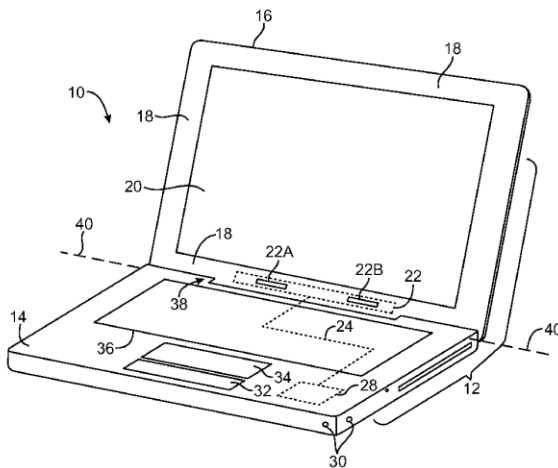
(57) **ABSTRACT**

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
(52) **U.S. Cl.** **343/702; 343/767**
(58) **Field of Classification Search** 343/702, 343/700 MS, 767, 770
See application file for complete search history.

Wireless portable electronic devices such as laptop computers are provided with antennas. An antenna may be provided within a clutch barrel in a laptop computer. The clutch barrel may have a dielectric cover. Antenna elements may be mounted within the clutch barrel cover on an antenna support structure. There may be two or more antenna elements mounted to the antenna support structure. These antenna elements may be of different types. A first antenna element for the clutch barrel antenna may be formed from a dual band antenna element having a closed slot and an open slot. A second antenna element for the clutch barrel antenna may be formed from a dual band antenna element of a hybrid type having a planar resonating element arm and a slot resonating element. Flex circuit structures may be used in implanting the first and second antenna elements for the clutch barrel antenna.

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18 Claims, 13 Drawing Sheets





US008059042B2

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

(10) **Patent No.:** **US 8,059,042 B2**
(45) **Date of Patent:** ***Nov. 15, 2011**

(54) **SHORTED MONOPOLE ANTENNA**

(75) Inventors: **Saou-Wen Su**, Taipei (TW); **Jui-Hung Chou**, Taichung (TW)

(73) Assignees: **Silitek Electronic (Guangzhou) Co., Ltd.**, Guangzhou (CN); **Lite-On Technology Corporation**, Taipei (TW)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/956,353**

(22) Filed: **Nov. 30, 2010**

(65) **Prior Publication Data**

US 2011/0074654 A1 Mar. 31, 2011

Related U.S. Application Data

(63) Continuation of application No. 12/230,302, filed on Aug. 27, 2008, now abandoned.

(30) **Foreign Application Priority Data**

Jul. 11, 2008 (CN) 2008 1 0133548

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

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

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

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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Primary Examiner — Jacob Y Choi

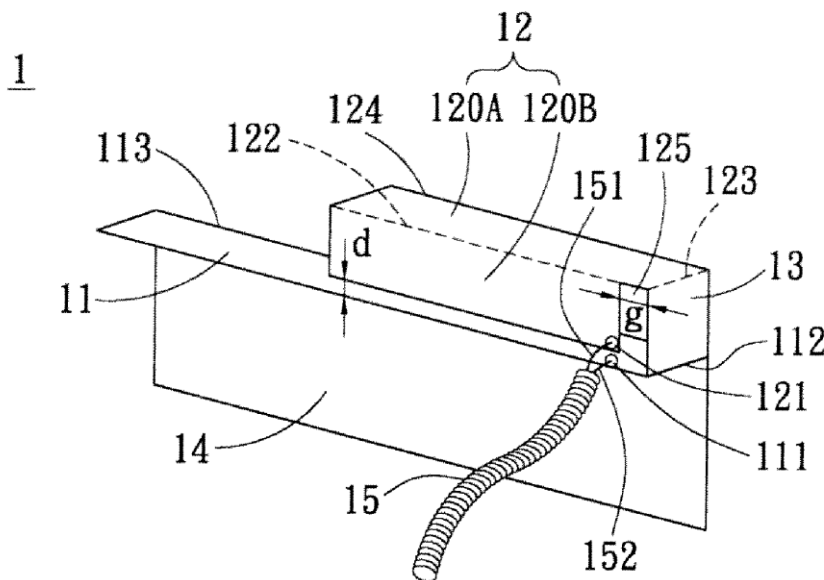
Assistant Examiner — Kyana R McCain

(74) *Attorney, Agent, or Firm* — Li&Cai Intellectual Property (USA) Office

(57) **ABSTRACT**

The present invention is related to a shorted monopole antenna. The antenna includes a ground portion, a radiating portion, a shorting portion, an assembling portion, and a coaxial cable. The ground portion includes a signal grounding point. The radiating portion is located above the ground portion and bent at least once, and includes a signal feeding point. One end of the shorting portion is connected to one of the short edges of the ground portion, and the other end is connected to one edge portion of the radiating portion. The assembling portion is connected to the long edge of the ground portion. The coaxial cable includes an inner conductor and an outer conductor, which are connected to the signal feeding point and the signal grounding point respectively. The antenna invented has good impedance bandwidth and radiation characteristics, can easily be installed inside the housing of an electronic device, and is well suitable for applications in wireless communications devices.

9 Claims, 5 Drawing Sheets





US008059047B2

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

(10) **Patent No.:** **US 8,059,047 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

(54) **CAPACITIVELY LOADED DIPOLE ANTENNA OPTIMIZED FOR SIZE**

(75) Inventors: **Laurent Desclos**, San Diego, CA (US); **Mark Krier**, Fountain Valley, CA (US); **Shane Thornwall**, Moreno Valley, CA (US); **Vaneet Pathak**, San Diego, CA (US); **Gregory Poilasne**, San Diego, CA (US); **Sebastian Rowson**, San Diego, CA (US)

(73) Assignee: **Ethertronics, Inc.**, 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 1895 days.

(21) Appl. No.: **10/375,423**

(22) Filed: **Feb. 27, 2003**

(65) **Prior Publication Data**
US 2004/0169614 A1 Sep. 2, 2004

(51) **Int. Cl.**
H01Q 7/00 (2006.01)
H01Q 9/32 (2006.01)

(52) **U.S. Cl.** **343/749; 343/741; 343/846**

(58) **Field of Classification Search** 343/702, 343/795, 741-749, 700 MS, 793, 802, 803, 343/806, 828, 846
See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Michael C Wimer

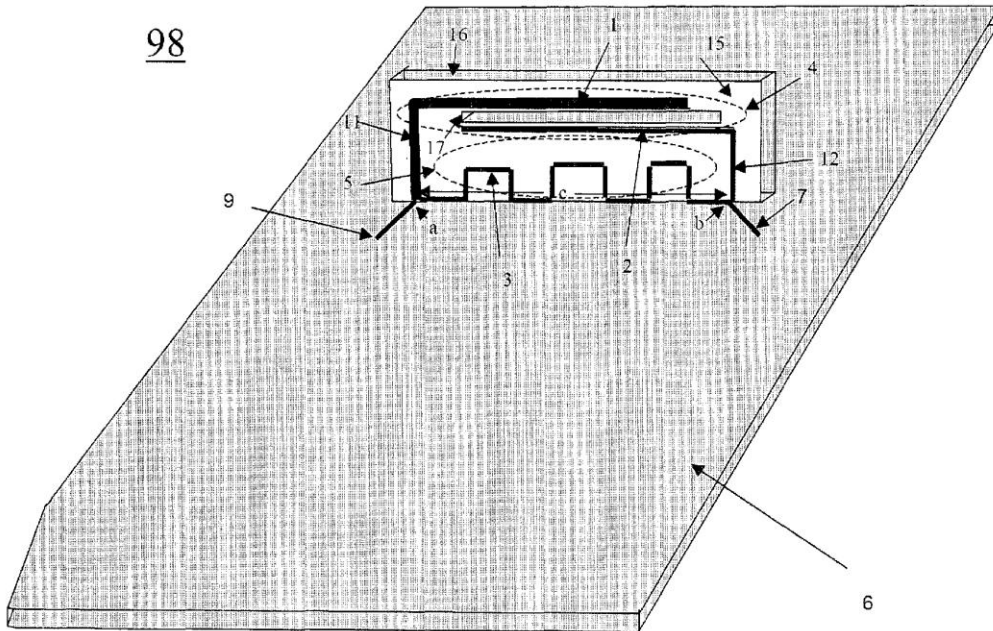
(74) *Attorney, Agent, or Firm* — Coastal Patent, LLC

(57) **ABSTRACT**

A capacitively loaded magnetic dipole antenna is provided with a portion that comprises a length that is longer than a straight line distance between a first end and a second end of the third portion such that antenna with a tower profile and/or smaller form factor is achieved.

17 Claims, 5 Drawing Sheets

98





US008059055B2

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

(10) **Patent No.:** **US 8,059,055 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

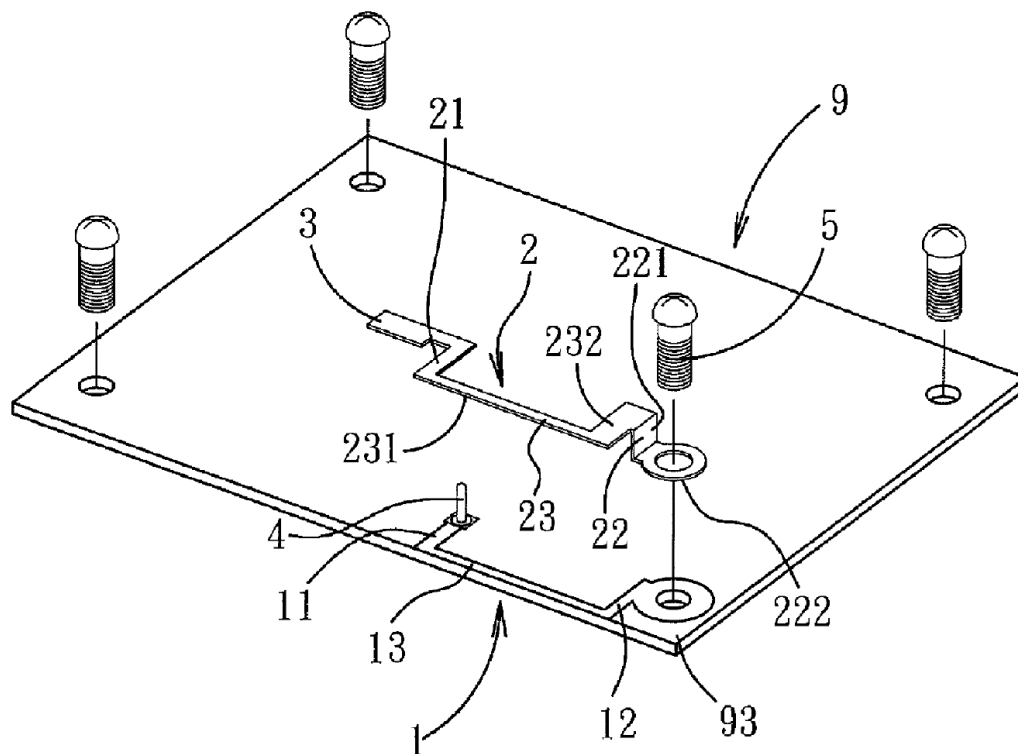
- (54) **ULTRA-WIDEBAND ANTENNA**
- (75) Inventors: **Tiao-Hsing Tsai**, Yungho (TW);
Chih-Wei Liao, Yilan Shien (TW);
Chao-Hsu Wu, Tao Yuan Shien (TW);
Chi-Yin Fang, Pingtung (TW)
- (73) Assignee: **Quanta Computer Inc.** (TW)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 529 days.
- (21) Appl. No.: **12/169,346**
- (22) Filed: **Jul. 8, 2008**
- (65) **Prior Publication Data**
US 2009/0237307 A1 Sep. 24, 2009
- (30) **Foreign Application Priority Data**
Mar. 19, 2008 (TW) 97109618 A
- (51) **Int. Cl.**
H01Q 1/38 (2006.01)
- (52) **U.S. Cl.** **343/826**; 343/702
- (58) **Field of Classification Search** 343/702,
343/844, 828, 829, 846, 825, 826, 843
See application file for complete search history.

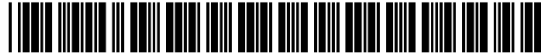
- (56) **References Cited**
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- Primary Examiner — Michael C Wimer
- (74) Attorney, Agent, or Firm — Sunstein Kann Murphy & Timbers LLP

- (57) **ABSTRACT**
- An antenna includes first and second radiating elements and a conductive arm. The second radiating element has opposite feeding and grounding end portions, each of which is coupled to a respective one of feeding and grounding end portions of the first radiating element. The conductive arm is coupled to the feeding end portion of the second radiating element.
- 16 Claims, 11 Drawing Sheets**





US008059056B2

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

(10) **Patent No.:** **US 8,059,056 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

- (54) **DIRECTIONAL ANTENNA AND PORTABLE ELECTRONIC DEVICE USING THE SAME**
- (75) Inventors: **Chin-Hung Ma**, Taoyuan County (TW); **Shih-Liang Tsai**, Taoyuan County (TW)
- (73) Assignee: **Foxconn Communication Technology Corp.**, 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 998 days.

- (21) Appl. No.: **11/961,156**
- (22) Filed: **Dec. 20, 2007**

- (65) **Prior Publication Data**
US 2009/0109118 A1 Apr. 30, 2009

- (30) **Foreign Application Priority Data**
Oct. 31, 2007 (TW) 96140955 A

- (51) **Int. Cl.**
H01Q 19/00 (2006.01)
H01Q 3/24 (2006.01)
- (52) **U.S. Cl.** **343/833**; 343/836; 343/876
- (58) **Field of Classification Search** 343/702,
343/846, 833, 834, 700 MS, 876, 912, 835,
343/836

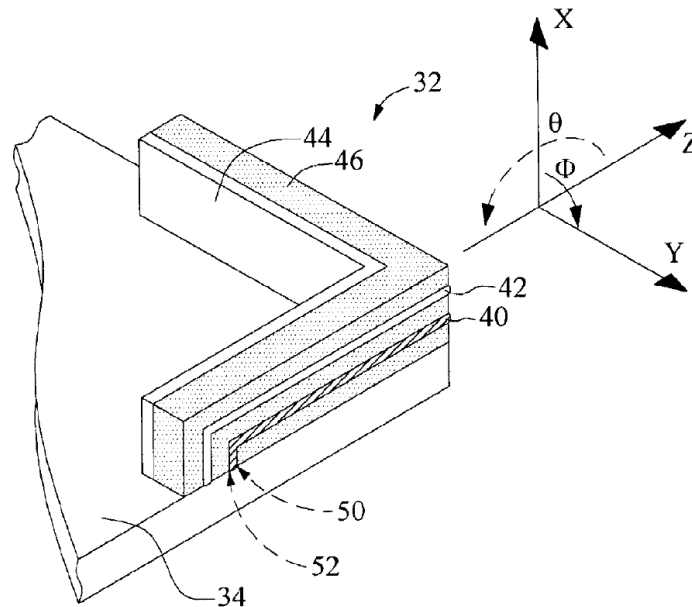
See application file for complete search history.

- (56) **References Cited**
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- Primary Examiner* — Jacob Y Choi
Assistant Examiner — Robert Karacsony
(74) *Attorney, Agent, or Firm* — Altis Law Group, Inc.

- (57) **ABSTRACT**
A directional antenna and a portable electronic device using the same are provided. The directional antenna includes L-shaped radiator, L-shaped oscillator, and L-shaped reflector and it is preferred that the directional antenna is positioned at corners of the substrate. The L-shaped radiator is made resonant by the L-shaped oscillator and has higher gain to maximize performance of signal transmission. The directional antenna achieves signal transmission in a specific direction over a long distance by the L-shaped reflector. In addition, with the gravity sensor, the processor and the switches, the directional antenna is automatically adjusted to a predetermined direction to transmit and receive signals even through orientation of the electronic device is changing at any time.

19 Claims, 5 Drawing Sheets





US008059061B2

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

(10) **Patent No.:** **US 8,059,061 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

(54) **SUBMINIATURE INTERNAL ANTENNA**

(75) Inventors: **Byung-Hoon Ryou**, Seoul (KR);
Won-Mo Sung, Gyeonggi-do (KR);
Je-Hun Seo, Seoul (KR)

(73) Assignee: **EMW Co., Ltd.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 241 days.

(21) Appl. No.: **12/088,074**

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

(86) PCT No.: **PCT/KR2006/003963**

§ 371 (c)(1),
(2), (4) Date: **Sep. 22, 2008**

(87) PCT Pub. No.: **WO2007/040327**

PCT Pub. Date: **Apr. 12, 2007**

(65) **Prior Publication Data**

US 2009/0033583 A1 Feb. 5, 2009

(30) **Foreign Application Priority Data**

Oct. 4, 2005 (KR) 20-2005-0028301

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

(52) **U.S. Cl.** **343/895; 343/741**

(58) **Field of Classification Search** 343/741,
343/866, 895

See application file for complete search history.

(56) **References Cited**

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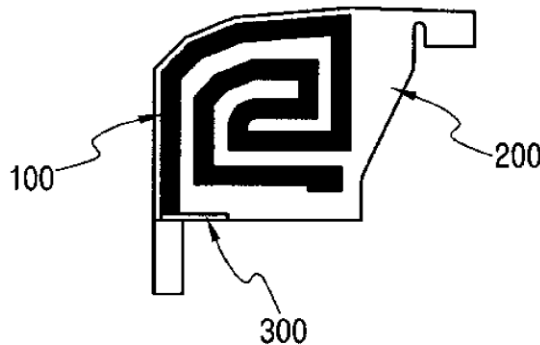
Primary Examiner — Tho G Phan

(74) *Attorney, Agent, or Firm* — Blakely, Sokoloff, Taylor & Zafman LLP

(57) **ABSTRACT**

Disclosed herein is a subminiature internal antenna, which exhibits a multi-band characteristic. The internal antenna includes a radiator electrically coupled at one end thereof to a feed element of a communication device and formed in a spiral shape as a whole. The radiator is disposed in such a manner as to extend at the other end thereof outwardly from the spiral shape. According to the present invention, the electromagnetic coupling is achieved in the radiator of the internal antenna and the other end of the radiator is disposed outwardly from the spiral shape so that the radiation interference is reduced to thereby obtain the multi-band characteristic.

6 Claims, 2 Drawing Sheets





US008060167B2

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

(10) **Patent No.:** **US 8,060,167 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

- (54) **PORTABLE WIRELESS MACHINE**
- (75) Inventors: **Yutaka Saitou**, Ishikawa (JP); **Yoshio Koyanagi**, Kanagawa (JP); **Kenichi Yamada**, Kanagawa (JP); **Masashi Koshi**, Ishikawa (JP); **Yukari Yamazaki**, Ishikawa (JP)
- (73) Assignee: **Panasonic Corporation**, Osaka (JP)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 99 days.

- (21) Appl. No.: **10/521,490**
- (22) PCT Filed: **Jun. 26, 2003**
- (86) PCT No.: **PCT/JP03/08149**
§ 371 (c)(1),
(2), (4) Date: **Jan. 18, 2005**
- (87) PCT Pub. No.: **WO2004/010530**
PCT Pub. Date: **Jan. 29, 2004**

- (65) **Prior Publication Data**
US 2005/0239519 A1 Oct. 27, 2005

- (30) **Foreign Application Priority Data**
Jul. 19, 2002 (JP) 2002-210612
Jan. 24, 2003 (JP) 2003-015675
Jun. 12, 2003 (JP) 2003-167962

- (51) **Int. Cl.**
H04M 1/00 (2006.01)
- (52) **U.S. Cl.** **455/575.7; 455/575.3; 455/550.1**
- (58) **Field of Classification Search** **455/129, 455/575.1, 575.3, 575.7, 550.1, 562.1, 575.5, 455/90.3**

See application file for complete search history.

- (56) **References Cited**
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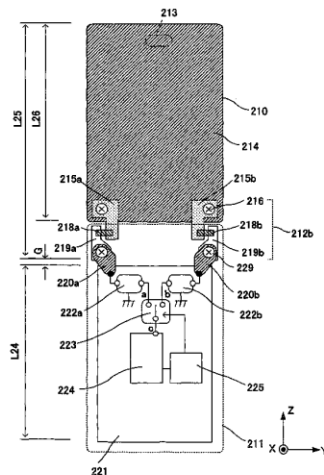
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Primary Examiner — Ping Hsieh
(74) *Attorney, Agent, or Firm* — Pearne & Gordon LLP

- (57) **ABSTRACT**
An upper case (1) is connected to a lower case (2) in a hinge portion (3) so as to freely rotate. A plate shaped conductor (4) and a plate shaped conductor (5) are disposed along the surface of the case in the upper case (1). A ground plate (6) is formed in a ground pattern of a circuit board disposed in the lower case (2). The plate shaped conductor (4) and the plate shaped conductor (5) are selected by a high frequency switch (14) and connected to one end of a feeding portion (15). The other end of the feeding portion (15) is connected to the ground plate (6) to form a dipole antenna.

27 Claims, 28 Drawing Sheets





US008061621B2

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

(10) **Patent No.:** **US 8,061,621 B2**
(45) **Date of Patent:** **Nov. 22, 2011**

(54) **INTEGRATED CIRCUIT DEVICE
INCLUDING TUNABLE SUBSTRATE
CAPACITORS**

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(75) Inventors: **Hannes Mio**, Taufkirchen (DE);
Thomas Beer, Mauerstetten (DE)

FOREIGN PATENT DOCUMENTS

(73) Assignee: **Infineon Technologies AG**, Neubiberg (DE)

WO 2007051571 5/2007

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 828 days.

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(21) Appl. No.: **12/044,329**

Brunnbauer et al., Embedded Wafer Level Ball Grid Array (eWLB), Electronics Packaging Technology Conference, 2006, pp. 1-5.

(22) Filed: **Mar. 7, 2008**

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(65) **Prior Publication Data**

US 2009/0224055 A1 Sep. 10, 2009

Primary Examiner — Ahshik Kim

(51) **Int. Cl.**
G06K 19/06 (2006.01)

(74) *Attorney, Agent, or Firm* — Dicke, Billig & Czaja, PLLC

(52) **U.S. Cl.** **235/492**; 235/451

(58) **Field of Classification Search** 235/492,
235/451; 340/572.5, 572

See application file for complete search history.

(57) **ABSTRACT**

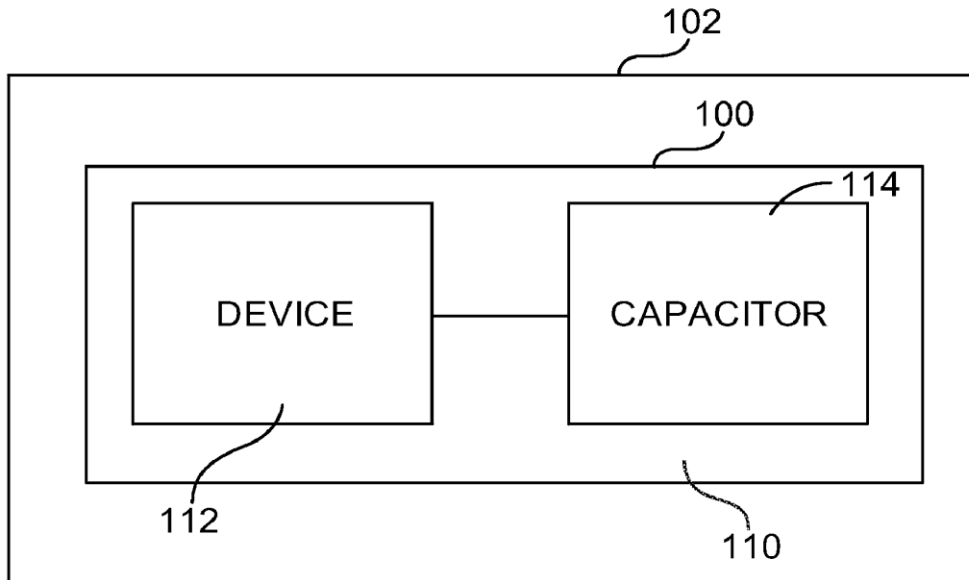
An integrated circuit device and method. A substrate having contacts has a plurality of capacitors thereon. A plurality of fusible links selectively connect the plurality of capacitors to one another and selected ones of the capacitors to the contacts. In this manner, for example, the capacitance value can be adjusted to tune an antenna mounted on the substrate during testing of the integrated circuit device.

(56) **References Cited**

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15 Claims, 2 Drawing Sheets





US008063827B2

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

(10) **Patent No.:** **US 8,063,827 B2**
(45) **Date of Patent:** **Nov. 22, 2011**

(54) **ANTENNA DEVICE AND RADIO APPARATUS OPERABLE IN MULTIPLE FREQUENCY BANDS**

(75) Inventors: **Hiroyuki Hotta**, Tokyo (JP); **Masao Teshima**, Tokyo (JP)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 549 days.

(21) Appl. No.: **12/142,050**

(22) Filed: **Jun. 19, 2008**

(65) **Prior Publication Data**
US 2009/0189815 A1 Jul. 30, 2009

(30) **Foreign Application Priority Data**
Jan. 30, 2008 (JP) 2008-019299

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/700 MS**; 343/702; 343/741; 343/846; 343/895
(58) **Field of Classification Search** 343/700 MS, 343/702, 833, 834, 846, 895
See application file for complete search history.

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Primary Examiner — Douglas W Owens

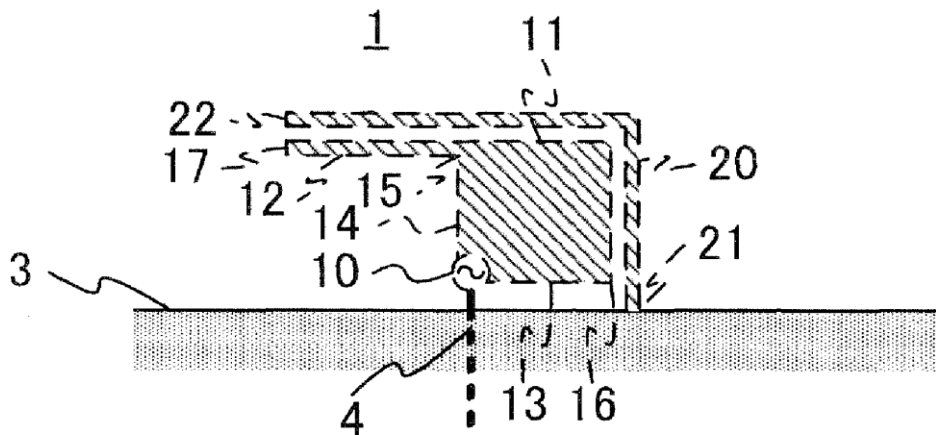
Assistant Examiner — Chuc Tran

(74) *Attorney, Agent, or Firm* — Holtz, Holtz, Goodman & Chick, PC

(57) **ABSTRACT**

An antenna device usable in a radio apparatus including a printed board includes a ground conductor of the printed board, a first partial element, a second partial element and a parasitic element. The first partial element is shaped into an area having a first side facing a side of the ground conductor and a second side directed to cross the side of the ground conductor, and is provided with a feed portion around a first end of the first side being closer to the second side. The second partial element branches off from the first partial element around one of two ends of the second side being farther from the feed portion, and is directed almost against a direction from the feed portion to a second end of the first side being farther from the second side. The parasitic element has an end grounded around the second end.

18 Claims, 11 Drawing Sheets





US008063828B2

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

(10) **Patent No.:** **US 8,063,828 B2**
(45) **Date of Patent:** **Nov. 22, 2011**

(54) **SOLID ANTENNA**
(75) Inventors: **Su Xu**, Shenzhen (CN); **Mao-Hsiu Hsu**, Taipei Hsien (TW)
(73) Assignees: **Hong Fu Jin Precision Industry (ShenZhen) Co., Ltd.**, Shenzhen, Guangdong Province (CN); **Hon Hai Precision Industry Co., Ltd.**, Tu-Cheng, New Taipei (TW)

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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 594 days.

Primary Examiner — Douglas W Owens

Assistant Examiner — Chuc Tran

(74) *Attorney, Agent, or Firm* — Altis Law Group, Inc.

(21) Appl. No.: **12/211,038**

(22) Filed: **Sep. 15, 2008**

(65) **Prior Publication Data**
US 2009/0267840 A1 Oct. 29, 2009

(30) **Foreign Application Priority Data**
Apr. 28, 2008 (CN) 2008 1 0301380

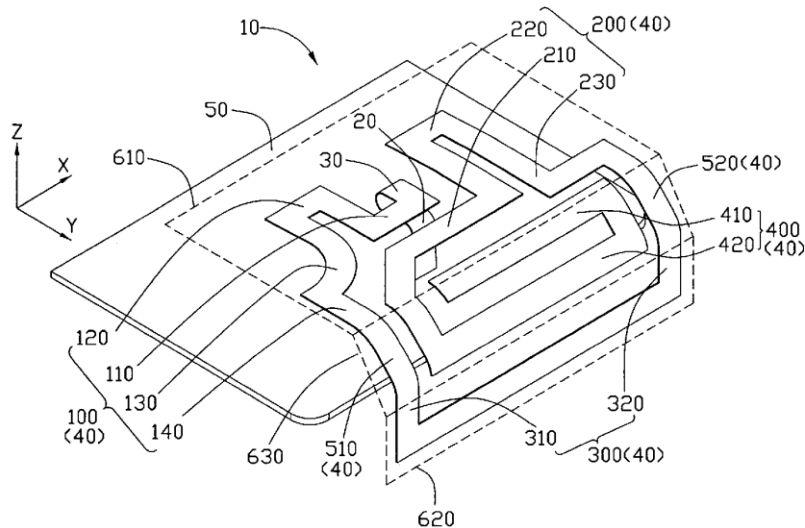
(51) **Int. Cl.**
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/700 MS; 343/702; 343/895**
(58) **Field of Classification Search** **343/700 MS; 343/702, 895**
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS
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6,124,831 A * 9/2000 Rutkowski et al. 343/700 MS

(57) **ABSTRACT**

A solid antenna positioned on a substrate, includes a feeding portion for feeding electromagnetic signals and a radiating portion for transceiving the electromagnetic signals. The radiating portion includes a first radiator, a second radiator, a third radiator, a fourth radiator, a first connecting section, and a second connecting section. The first radiator and the second radiator are positioned on a first plane, and respectively comprise a first inverted-U-shaped radiating section and a second inverted-U-shaped radiating section. The third U-shaped radiator is positioned on a second plane perpendicular to the first plane. The first connecting section connects the first radiator to the third radiator. The second connecting section connects the second radiator to the third radiator. The fourth radiator is connected to the second radiator. The first connecting section, the second connecting section, and the fourth radiator comprise one radiating section positioned on a third plane.

18 Claims, 5 Drawing Sheets





US008063829B2

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

(10) **Patent No.:** **US 8,063,829 B2**

(45) **Date of Patent:** ***Nov. 22, 2011**

(54) **COMPLEX ANTENNA**

(75) Inventors: **Chen-Ta Hung**, Tu-cheng (TW);
Po-Kang Ku, Tu-cheng (TW);
Shu-Yean Wang, Tu-cheng (TW)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 525 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/287,932**

(22) Filed: **Oct. 14, 2008**

(65) **Prior Publication Data**

US 2009/0135070 A1 May 28, 2009

(30) **Foreign Application Priority Data**

Nov. 26, 2007 (TW) 96144713 A

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

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

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

See application file for complete search history.

(56) **References Cited**

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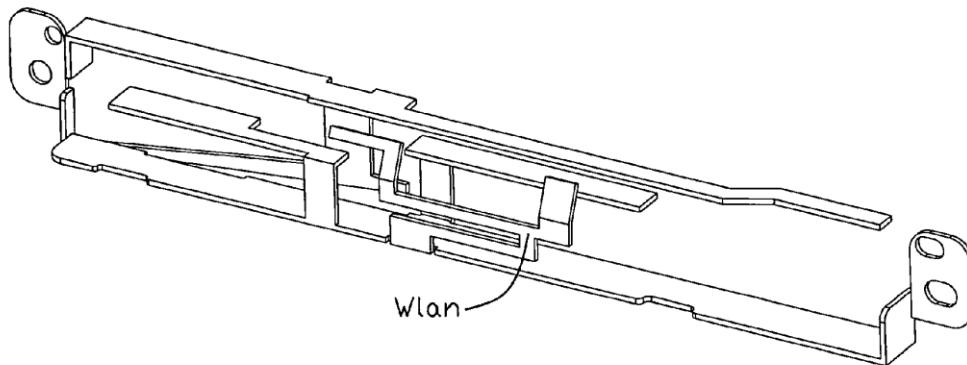
Primary Examiner — Huedung Mancuso

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

(57) **ABSTRACT**

A complex antenna (100) comprises a grounding patch (3) extending in a longitudinal direction and having opposite first and second sides; a first antenna (1) comprising a first radiating element (11), a second radiating element (12), a third radiating element (13), and a first connecting element (14); a second antenna (2) comprising a fourth radiating element (21), a fifth radiating element (22), and a second connecting element (23). A gap is formed in the middle portion of the second side of the grounding patch. The first connecting element extends from an end of the gap and comprises a first connecting arm coplanar with the grounding patch and a second connecting arm vertical to the grounding patch. The first connecting arm and the grounding patch is formed a slot. The second connecting element extends from an end of the grounding patch.

20 Claims, 6 Drawing Sheets





US008063830B2

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

(10) **Patent No.:** **US 8,063,830 B2**

(45) **Date of Patent:** **Nov. 22, 2011**

(54) **ANTENNA DEVICE**

(56) **References Cited**

(75) Inventors: **Masahiro Yoshioka**, Tokyo (JP);
Masato Kikuchi, Tokyo (JP); **Shunsuke Mochizuki**, Tokyo (JP); **Ryosuke Araki**, Tokyo (JP); **Masaki Handa**, Kanagawa (JP); **Takashi Nakanishi**, Tokyo (JP); **Hiroto Kimura**, Tokyo (JP); **Seiji Wada**, Kanagawa (JP); **Hiroshi Ichiki**, Kanagawa (JP); **Tetsujiro Kondo**, Tokyo (JP)

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

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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 394 days.

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(21) Appl. No.: **12/324,980**

U.S. Appl. No. 12/273,038, filed Nov. 18, 2008, Kikuchi, et al.
Japanese Office Action issued Sep. 6, 2011 in Japanese Patent Application No. 2007-319568 filed Dec. 11, 2007.

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

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(65) **Prior Publication Data**

US 2009/0146886 A1 Jun. 11, 2009

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

(30) **Foreign Application Priority Data**

Dec. 11, 2007 (JP) 2007-319568

(57) **ABSTRACT**

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

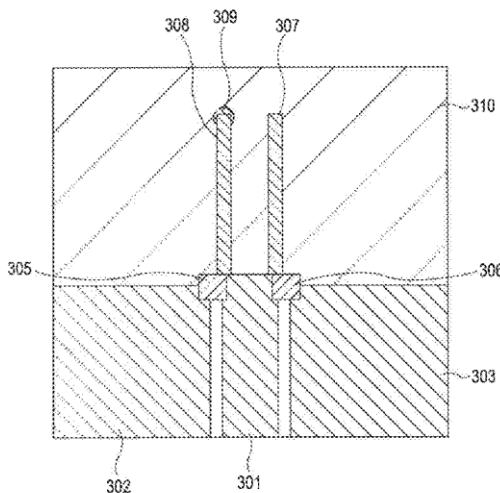
A planar antenna device is mounted on a board including a dielectric layer and two conductor layers vertically sandwiching the dielectric layer. The upper conductor layer includes a first radiating element having an end portion connected through a via hole to a ground formed by the lower conductor layer, a second radiating element having an open end portion, first and second ground conductors connected to respective base portions of the first and second radiating elements via resistors, and a feeder line configured to feed power to the first and second radiating elements.

(52) **U.S. Cl.** **343/700 MS**; 343/829; 343/846; 343/893

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

See application file for complete search history.

3 Claims, 8 Drawing Sheets





US008063831B2

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

(10) **Patent No.:** **US 8,063,831 B2**
(45) **Date of Patent:** **Nov. 22, 2011**

(54) **BROADBAND ANTENNA**

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

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 326 days.

(21) Appl. No.: **12/348,613**

(22) Filed: **Jan. 5, 2009**

(65) **Prior Publication Data**
US 2010/0045534 A1 Feb. 25, 2010

(30) **Foreign Application Priority Data**
Aug. 22, 2008 (TW) 97132206 A

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

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

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

(56) **References Cited**

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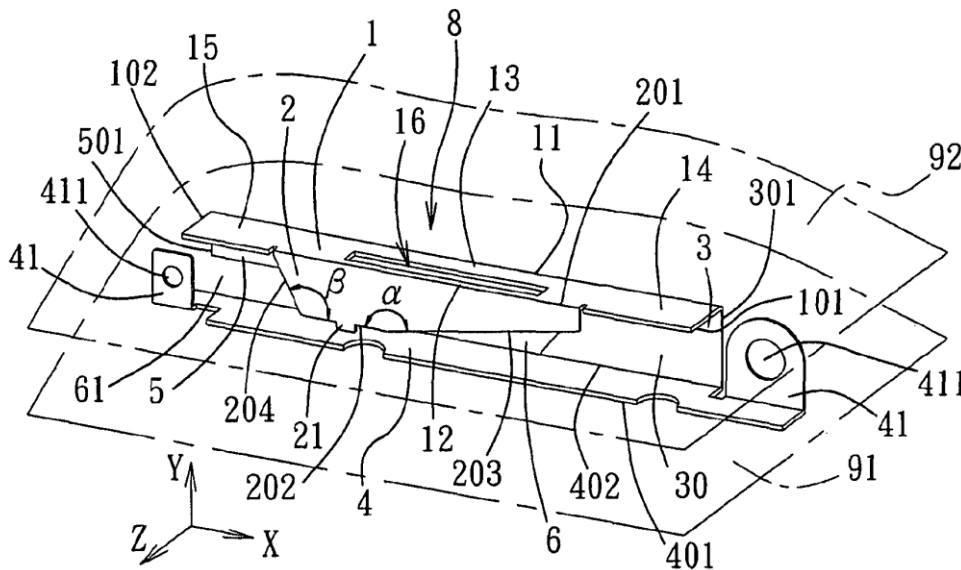
Primary Examiner — Tan Ho

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

(57) **ABSTRACT**

An antenna includes: a grounding element extending along a first plane; a radiating element having a first side and extending along a second plane substantially parallel to the first plane, the radiating element being aligned with the grounding element in a normal direction transverse to the first and second planes; a bridging element interconnecting the grounding and radiating elements; and a feeding element extending and tapered from the first side of the radiating element toward the grounding element.

9 Claims, 6 Drawing Sheets





US008063834B2

(12) **United States Patent**
Boyle

(10) **Patent No.:** **US 8,063,834 B2**
(45) **Date of Patent:** **Nov. 22, 2011**

(54) **MOBILE TELEPHONE WITH A BUILT-IN PLANAR TELEVISION ANTENNA ADAPTED FOR RADIOTELEPHONE SIGNAL REJECTIONS**

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

(56) **References Cited**

(75) Inventor: **Kevin R. Boyle**, Horsham (GB)
(73) Assignee: **NXP B.V.**, Eindhoven (NL)
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 536 days.

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(21) Appl. No.: **11/720,833**
(22) PCT Filed: **Nov. 30, 2005**
(86) PCT No.: **PCT/IB2005/053962**
§ 371 (c)(1),
(2), (4) Date: **Aug. 25, 2009**
(87) PCT Pub. No.: **WO2006/059279**
PCT Pub. Date: **Jun. 8, 2006**

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Primary Examiner — Trinh Dinh

(65) **Prior Publication Data**
US 2009/0305738 A1 Dec. 10, 2009

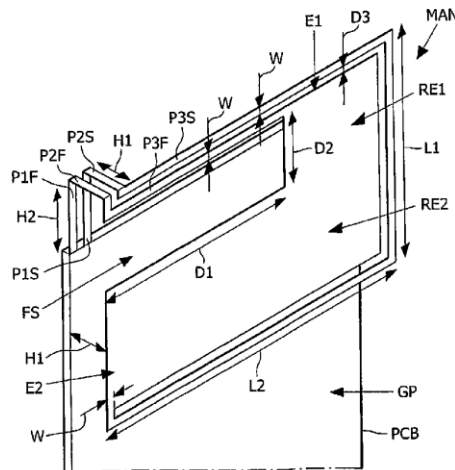
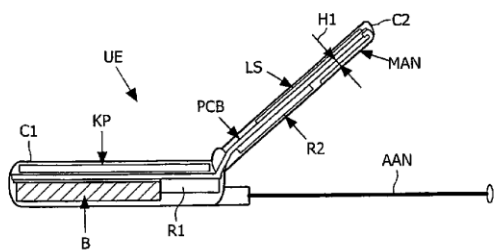
(57) **ABSTRACT**

(30) **Foreign Application Priority Data**
Dec. 2, 2004 (EP) 04257502

A mobile telephone comprises a casing housing a telephone set to receive and transmit radiotelephone signals and a television set comprising a main television antenna (MAN) to receive radiotelevision signals, a television receiver arranged to process the received radiotelevision signals to output television signals to be displayed, and a display means display the outputted television signals. The main television antenna (MAN) is made in planar technology, is built-in inside the casing and comprises a filtering slot (FS) having chosen dimensions (D1, D2) to be resonant around the frequency of the radiotelephone signals to reject them at least partly.

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/702; 343/700 MS**

19 Claims, 4 Drawing Sheets





US008063835B2

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

(10) **Patent No.:** **US 8,063,835 B2**

(45) **Date of Patent:** **Nov. 22, 2011**

(54) **ANTENNA ARRANGEMENT AND A PORTABLE RADIO COMMUNICATION DEVICE FOR SUCH AN ANTENNA ARRANGEMENT**

(75) Inventors: **Johan Sjöberg**, Sollentuna (SE); **Jerry Nilsson**, Hågersten (SE)

(73) Assignee: **Laird Technologies AB**, Kista (SE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 453 days.

(21) Appl. No.: **12/282,109**

(22) PCT Filed: **Mar. 5, 2007**

(86) PCT No.: **PCT/SE2007/000211**

§ 371 (c)(1),
(2), (4) Date: **Nov. 12, 2008**

(87) PCT Pub. No.: **WO2007/106012**

PCT Pub. Date: **Sep. 20, 2007**

(65) **Prior Publication Data**

US 2009/0066591 A1 Mar. 12, 2009

(30) **Foreign Application Priority Data**

Mar. 13, 2006 (SE) 0600548

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

(52) **U.S. Cl.** **343/702**; 343/700 MS; 455/575.1;
455/575.7

(58) **Field of Classification Search** 343/911 R,
343/702, 700 MS; 204/192.22

See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Jacob Y Choi

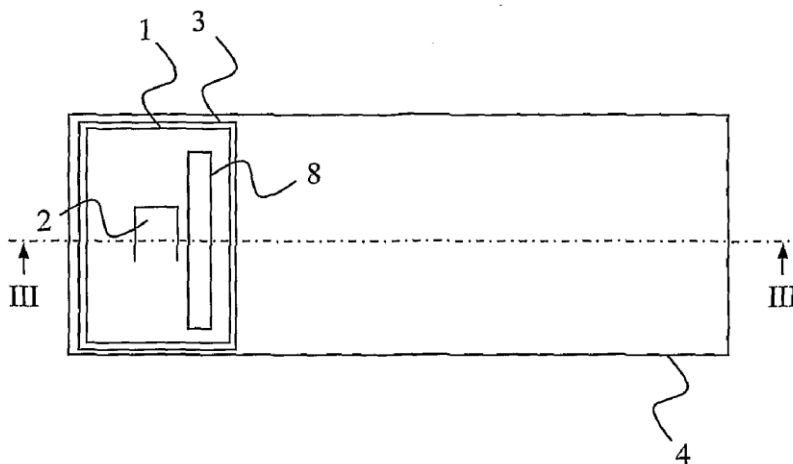
Assistant Examiner — Amal Patel

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

(57) **ABSTRACT**

The present invention relates to an antenna arrangement comprising a flexible film (1) having a radiating element (8) mounted to a first side of a dielectric carrier (3). The dielectric carrier (3) has a through hole (5) from the first side thereof to a second side, opposite the first side, thereof. The flexible film (1) is dielectric and comprises a cut linear pattern providing a flip (2) positioned over said through hole (5), wherein said flip (2) is flush with said flexible film (1).

20 Claims, 2 Drawing Sheets





US008063837B1

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

(10) **Patent No.:** **US 8,063,837 B1**

(45) **Date of Patent:** **Nov. 22, 2011**

(54) **SYSTEM FOR PROVIDING A PRESSURE VESSEL, RADOME, RF SUB-SYSTEM BOX AND ELECTRICALLY SMALL, WIDEBAND OMNI AND/OR ADAPTABLE BEAM ANTENNA**

(75) Inventors: **William C. Jennings**, Iowa City, IA (US); **James B. West**, Cedar Rapids, IA (US); **John Mather**, Cedar Rapids, IA (US); **Ross K. Wilcoxon**, Cedar Rapids, IA (US)

(73) Assignee: **Rockwell Collins, Inc.**, Cedar Rapids, IA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 665 days.

(21) Appl. No.: **12/284,558**

(22) Filed: **Sep. 23, 2008**

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

(52) **U.S. Cl.** **343/705; 343/708**

(58) **Field of Classification Search** **343/705**
See application file for complete search history.

(56) **References Cited**

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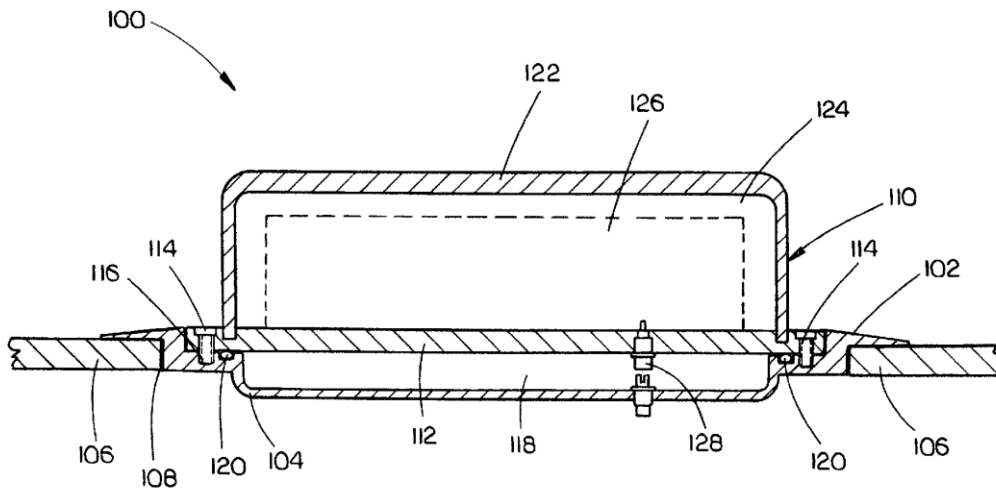
Primary Examiner — Trinh Dinh

(74) *Attorney, Agent, or Firm* — Daniel M. Barbieri

(57) **ABSTRACT**

The present invention is a system which includes an interposer. The interposer may include a mounting plate for mounting the interposer to a fuselage of an aircraft. The interposer may interface with the fuselage to form a seal for maintaining pressure within the aircraft. The system may further include an antenna module. The antenna module may include a ground plane, an aircraft antenna, and a radome. The ground plane may be connected to the aircraft antenna and may be configured for allowing the antenna module to be mounted to the interposer. The radome may be connected to the ground plane to form an enclosure for housing the antenna. The antenna module may be removably connected to the interposer. The system may further include an interconnect for electrically connecting the antenna module to electronics located within the aircraft. The antenna module may be disconnected from the interposer without breaking the seal formed between the interposer and the fuselage.

20 Claims, 2 Drawing Sheets





US008063839B2

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

(10) **Patent No.:** **US 8,063,839 B2**
(45) **Date of Patent:** **Nov. 22, 2011**

(54) **TUNABLE ANTENNA SYSTEM**
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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 832 days.

(21) Appl. No.: **11/872,700**

(22) Filed: **Oct. 15, 2007**

(65) **Prior Publication Data**
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H04B 1/18 (2006.01)
(52) **U.S. Cl.** **343/745**; 343/861; 343/895; 455/193.3
(58) **Field of Classification Search** 343/700 MS,
343/745, 750, 828, 852, 861, 868, 895, 703;
455/193.1, 193.3, 269, 280, 281
See application file for complete search history.

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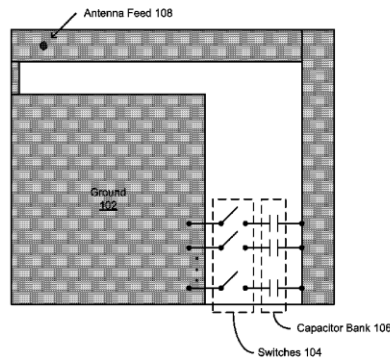
Co-pending U.S. Appl. No. 11/653,135, filed Jan. 11, 2007.
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Primary Examiner — Michael Wimer
(74) *Attorney, Agent, or Firm* — Sheppard Mullin Richter & Hampton LLP

(57) **ABSTRACT**

A technique for tuning an antenna may include one or more of the following: working against a ground plane, utilizing the third dimension by alternating layers on a substrate, integrating an inductive short stub in the substrate to improve port matching, and making a tuning port available for capacitive loading and resonance modification.

18 Claims, 11 Drawing Sheets





US008063843B2

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

(10) **Patent No.:** **US 8,063,843 B2**

(45) **Date of Patent:** **Nov. 22, 2011**

(54) **ANTENNA STRUCTURES MADE OF BULK-SOLIDIFYING AMORPHOUS ALLOYS**

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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 498 days.

(21) Appl. No.: **11/884,431**

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

(86) PCT No.: **PCT/US2006/005815**

§ 371 (c)(1),
(2), (4) Date: **Nov. 24, 2008**

(87) PCT Pub. No.: **WO2006/089213**

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(65) **Prior Publication Data**

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

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

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

See application file for complete search history.

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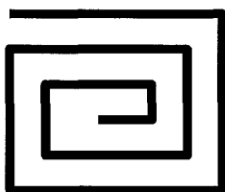
Primary Examiner — Tho G Phan

(74) Attorney, Agent, or Firm — Pillsbury Winthrop Shaw Pittman LLP

(57) **ABSTRACT**

Antenna structures made of bulk-solidifying amorphous alloys and methods of making antenna structures from such bulk-solidifying amorphous alloys are described. The bulk-solidifying amorphous alloys providing form and shape durability, excellent resistance to chemical and environmental effects, and low-cost net-shape fabrication for the highly intricate antenna shapes.

20 Claims, 2 Drawing Sheets



Schematic forms of antenna structures in wire form (circular cross-section). For illustrative purposes only.



US008063845B2

(12) **United States Patent**
Rabinovich

(10) **Patent No.:** **US 8,063,845 B2**
(45) **Date of Patent:** **Nov. 22, 2011**

(54) **SYMMETRICAL PRINTED MEANDER**
DIPOLE ANTENNA

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(73) Assignee: **Flextronics Automotive Inc.**, Milpitas, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 296 days.

(21) Appl. No.: **12/232,197**

(22) Filed: **Sep. 12, 2008**

(65) **Prior Publication Data**
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Related U.S. Application Data
(60) Provisional application No. 60/960,034, filed on Sep. 12, 2007.

(51) **Int. Cl.**
H01Q 9/16 (2006.01)
(52) **U.S. Cl.** **343/793; 343/795; 343/820; 343/713**
(58) **Field of Classification Search** **343/793, 343/795, 803, 806, 850, 852, 865, 711, 713, 343/820, 700 MS**
See application file for complete search history.

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Primary Examiner — Dieu H Duong

(74) *Attorney, Agent, or Firm* — Patton Boggs LLP

(57) **ABSTRACT**

A symmetrical printed meander dipole antenna includes a dielectric board including a ground plane; a first antenna trace line disposed on a first portion of the dielectric board and in electrical contact with the dielectric board, the first antenna trace line including a plurality of first vertical meandered traces; a second antenna trace line disposed on a second portion of the dielectric board and in electrical contact with the dielectric board, the second antenna trace line including a plurality second vertical meandered traces, wherein the first and second plurality of vertical meandered traces are symmetrical to each other; and an inductor in contact with the first and second antenna trace lines for tuning the impedance of the symmetrical printed meander dipole antenna.

12 Claims, 18 Drawing Sheets

